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UNIVERSAL CYCLOPÆDIA AND ATLAS

VOLUME I

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INTRODUCTION.

THE world moves, and we must move with it. So long as there is life and activity around us, no book of reference like a great cyclopædia can remain forever perfect in all its parts. The story of the past may be true and unalterable, but it must have an added chapter when the sun goes down and to-day becomes another yesterday. By far the greater part of a work like this, if it is well done in the beginning, remains trustworthy for a long time. But in certain matters frequent revision is desirable. In our country the most urgent call for this is created by the Federal Census, which is taken every tenth year. Others are occasioned by the mortality among eminent men; changes in the progressive sciences; discoveries, treaties, and alteration of political boundaries. These furnish the reason why this revision of the "Universal Cyclopædia and Atlas" now follows closely upon the thorough revision that it underwent only five years ago. The new figures of the Census of 1900 have been inserted in the articles on the States and cities; while every article on an important American city has also been subjected to careful revision by a competent person in the city itself, and thereby many items of information not touched by the census have been freshened. In some foreign countries there has been a new census, and the figures, so far as available, have been used. Men of thought and action whose history is written here have passed away, and others have been promoted to higher rank or have achieved new successes; the religious denominations have fresh results to show in their various activities; political changes have come with each revolving year; and the destructive operations of war, from which the world is seldom free, still go on. These are now recorded, the numerous maps have been subjected to careful scrutiny and correction, and a number of new maps have been inserted. The present revision has been made with every attention to accuracy, and it is believed to be sufficient to adapt the work to the needs of to-day and keep good its character as *the best cyclopædia* now offered to American readers.

ROSSITER JOHNSON.

September, 1901.

P R E F A C E .

THIS Cyclopædia first appeared in 1874, under the title of Johnson's Universal Cyclopædia, and at once took a leading place among the great works of General Reference. In 1884-86 it was subjected to a thorough revision by a large staff of distinguished editors and contributors. Many important articles were at that time rewritten, many new ones were added, and every new impression that came from the press had the advantage of such revision as could be made without changing the identity of the plates. It was subjected in 1892-95 to a still more thorough revision, and was greatly extended and reset in larger type; and another new edition, in twelve volumes, with appendices containing nearly two thousand new articles, is now issued under the title UNIVERSAL CYCLOPÆDIA AND ATLAS, with several new maps, the census figures of 1900, and such corrections as were necessary to bring it down to date.

The original plan of the work comprised five main features :

I. A special editor, recognized as an authority, in charge of each department.

II. Original work by distinguished specialists, chosen by the different departmental editors because of their thorough acquaintance with the subjects on which they wrote, and their ability to present these subjects in a way that would satisfy both the scholar and the general reader. Original Plan.

III. An analytical method of treating the larger and more complex subjects by presenting "each elementary topic under its own heading," thus avoiding the more lengthy treatises fitted only for professional experts, and facilitating ready reference by presenting in alphabetical order information adapted to the wants of men and women busily occupied with the affairs of life.

IV. The authentication of each article of importance by appending to it the author's name.

V. The inclusion among the biographies of brief sketches of noted *living men and women* in every department of learning, science, and action.

While many minor changes were introduced, the editors of the successive editions saw no reason to depart from this very admirable plan. In the edition of 1892-95 it was strengthened and developed at many points; the spelling of proper names was made uniform throughout the work, and more in keeping with modern usage; a new but simple system of respelling was introduced to indicate the pronunciation of difficult names; etymologies were added by the editor of the philological department whenever they seemed to be necessary; a more complete system of cross-references was introduced and carefully used; and a more compact method of treatment made it possible for the editors to introduce thousands of new articles. In the present greatly extended edition these admirable features have all been retained.

In General Physics, the department in charge of Edward L. Nichols, Professor of Physics in Cornell University, many of the articles—for example, that on *Acoustics*, prepared by Professor Ogden N. Rood—needed little change. Others were considerably revised, while several were somewhat abridged in order to make room for such new subjects of a special nature as had recently attracted great attention. Physics. The editor pre-

pared at least two hundred new articles on electricity and its applications. Among the more elaborate articles in this department may be mentioned *Electricity*, *Electric Lighting*, *Electric Discharge*, *Hygrometer*, *Ice*, *Induction Coil*, *Interference*, *Laboratory*, *Lightning*, *Lightning-rods*, *Liquids*, *Liquefaction of Gases*, *Pneumatics*, *Polarization*, *Radiometer*, *Spectroscope*, *Spectrum*, *Thermometer*, *Thermometry*, *Voltmeter*, etc., by Professor Nichols himself; *Electric Railways* and *Electric Motors*, by Professor Harris J. Ryan, of Cornell University; *Fluorescence*, by President Henry Morton, of the Stevens Institute, Hoboken, N. J.; *Magnetism* and *Transformers*, by Professor Frederick Bedell, of Cornell University; *Terrestrial Magnetism*, by Professor Frank H. Bigelow, of the U. S. Weather Bureau; *Thermodynamics*, by Professor Ernest Merritt, of Cornell University; *Refraction of Sound*, *Safety-lamps*, *Stereoscope*, *Stroboscope*, *Vision*, etc., by Professor W. Le Conte Stevens, of the Rensselaer Polytechnic Institute, Troy, N. Y.; *Thermo-electricity*, *Units*, *Wattmeters*, etc., by Professor H. S. Carhart, of the University of Michigan; and *Waves*, by Professor J. S. Ames, of Johns Hopkins University. Some of the latest articles are *Chronophotography*, *Kathode Rays*, *Liquefaction of Hydrogen*, *Liquid Air*, *Luminescence*, *Radiation*, *Standards of Light*, *Storage Batteries*, and *X-rays*, by Professor Nichols; *Telegraphy without Wires*, by Professor Ernest Merritt; *Transmission of Power*, by W. S. Franklin, Professor of Physics, Lehigh University; *Uranium Rays*, by O. M. Stewart, Instructor in Physics, Cornell University; and *Force of Gravity*, by Erasmus D. Preston, of the U. S. Coast and Geodetic Survey.

The department of the Higher Mathematics and Astronomy was intrusted to Professor Simon Newcomb, LL. D., the editor of the *Nautical Almanac*, and then Professor of Mathematics and Astronomy in Johns Hopkins University. He sought to give in condensed form under each head an account of the established facts, the latest discoveries, and the most mature opinions on the various topics in his department. Technical details were for the most part avoided, in the belief that the few who need them will ordinarily resort to special treatises on the subject—and these are named in the bibliography appended to each of the more important articles, as, for example, those on *Astronomy*, *Solar Parallax*, *Stars*, and *Time*, by Professor Newcomb himself, and those on the *Sun* and the *Spectroscope*, by Professor C. A. Young, of Princeton University.

The science of Chemistry was and is making great advances, and applications of the results of recent discoveries are finding their way into the manufactures in many directions. Since the preceding edition of the Cyclopædia was prepared important changes then in progress had been accomplished. The great Periodic Law had been established, and was manifesting its influence in every department of the science of Chemistry. Professor Remsen, the editor of the department, sought to present everything likely to be of interest to the general reader as well as of value to the practical student. Many new articles were prepared, notably the one on *Chemistry*, and all articles retained from the former edition were so revised as to represent fully the present state of chemical knowledge. An article on *Acetylene* is now added, by Edward Renouf, Collegiate Professor of Chemistry, Johns Hopkins University. Many discoveries of chemical substances, probably elementary, have been made since the last previous printing of the Cyclopædia, and an article on each of these is now given, by Dr. Marcus Benjamin, of the U. S. National Museum. Dr. Benjamin has also written a new article on *Perfumery*.

The treatment of Geology was enlarged by the addition of special chapters on *Structural Geology*, or the arrangement and interrelation of rock masses; on *Dynamic Geology*, or the agen-

cies by which rocks and rock structures are produced; and on *Geologic Technology*, or the methods employed by the geologist in determining the horizontal and vertical distribution of rocks, in representing this distribution by means of maps and sections, and in discriminating between rocks by means of their composition and minute

Geology.

structure. In the article on *Historic Geology* the physical changes and life changes which characterize the various periods of geological chronology receive more attention than in previous editions. Each geological period is described in a special article devoted to the subject, and the number of short articles on American formations is much increased. The article on *Rocks*, rewritten by an eminent specialist, Professor George H. Williams, of Johns Hopkins University, was greatly enlarged, and the articles on individual rocks, such as granite, gneiss, etc., were rewritten or carefully revised. Among the more prominent articles in Applied or Economic Geology may be mentioned *Geology of Petroleum and Natural Gas*, by Mr. I. C. White, the mining engineer who originated the "anticlinal theory" of gas occurrence; the articles *Asphalt*, *Bitumen*, and *Petroleum*, by Professor S. F. Peckham, formerly of the University of Minnesota; *Building-stone*, by Dr. G. P. Merrill, curator of rock collections in the U. S. National Museum; and *Artesian Wells* and *Well-drilling*, by Mr. F. H. Newell, topographer U. S. Geological Survey, in charge of the investigation of water-supply with reference to irrigation. The department of Mineralogy was in charge of Mr. Charles Kirchoff, editor of the *Iron Age*, New York, who himself revised most of the articles. The articles on Gems and Precious Stones were revised or rewritten by the eminent specialist, Mr. George F. Kunz,

Mineralogy.

gem-expert for Messrs. Tiffany & Co. and of the U. S. Geological Survey. In the department of Physical Geography, which was united with Geology, under the charge of Mr. Grove K. Gilbert, chief geologist of the U. S. Geological Survey, the material was arranged so as to distribute under such heads as *Valleys*, *Mountains*, *Volcanoes*, *Continent*, *Islands*, and *Ocean* much that was previously gathered into an extended article on the

Physical Geography.

Earth. In process of reconstruction a genetic classification of topographic features was adopted, and in other ways attention was directed to their mode of origin. Among articles in this department that may be mentioned are those on *Earth*, *Earthquakes*, *Valleys*, *Mountains*, and *Volcanoes*, by the associate editor; *Glaciers*, *Ocean*, *Lakes*, and *Rivers*, by William M. Davis, Professor of Physical Geography in Harvard University; *Gulf Stream*, *Kuro Siwo*, and *Deep-sea Explorations*, by Dr. William H. Dall, formerly in charge for many years of explorations and surveys by the U. S. Coast Survey; *Thermal Springs*, by Mr. Arnold Hague, of the U. S. Geological Survey; and *Floods*, by Mr. Thomas Russell, of the U. S. Weather Bureau, in charge of river-flood predictions.

In Meteorology such changes were introduced as to represent its present state both as a science and an art; and new articles were prepared describing the phenomena named by such new but familiar terms as are used in the bulletins of the National and State Weather Bureaus. This, with Climatology, was in charge of Professor

Meteorology.

M. W. Harrington, chief of the U. S. Weather Bureau, who had made a special study of these subjects for many years. The article *Climate*, embodying the most recent conclusions on that subject, may be specially mentioned as coming from the pen of the asso-

Climatology.

ciate editor himself. Attention may also be called to the article *Clouds*, by Mr. A. L. Rotch, of Blue Hill Observatory. Political or Descriptive Geography, one of the largest departments in the Cyclopædia, was also cared for by Professor Harrington. In this great work he had as collaborators Mr. Gardiner G. Hubbard, president of the National Geographic Society, Washington, D. C.; Mr. Cyrus C. Adams, president of the department of Geography

in the Brooklyn Institute of Arts and Sciences, who had written articles on many African topics and on out-of-the-way places in every part of the world; Mr. Herbert H. Smith, a naturalist, who had been engaged for more than twenty years in special geographic and scientific explorations in tropical America, and traveled extensively in South America, Mexico, and the West Indies; and Dr. Robert Lilley, the managing editor, who resided for many years in China and Japan, and traveled extensively in the Far East. The number of articles in the geographical department was very considerably increased, and additional space was given to those regions which had awakened special interest in consequence of recent explorations. Attention may be called to the elaborate article on *Africa* by the editor of the department, as well as to Spanish and Portuguese America, the South Sea islands, Central Asia, and British India. The descriptions of the large cities were intrusted to persons selected for their local knowledge as well as for their personal fitness: *Constantinople*, for example, written by Professor E. A. Grosvenor, late of Robert College, Turkey; *London*, by Mr. Francis Espinasse, a well-known literary worker of that city; and *Paris*, by Mr. Theodore Stanton, for several years a resident of the French capital.

Many new geographical articles are now added, all written by Mr. Cyrus C. Adams, who has also revised a number of the older articles. Among the important articles given in the Appendix is a new and full description of the *Philippine Islands*, placed there because of lack of space in the body of the work. Some of the other added titles of new and supplementary articles are *Change-of-day Line*, *China*, *Cuba*, *Devil's Island*, *Egypt*, *Fashoda*, *France*, *German Empire*, *Greece*, *Iceland*, *Nyassaland*, and *Witwatersrand*.

The Universal Cyclopædia is notably full in its treatment of U. S. towns and cities. The articles dealing with these have been revised by persons on the spot and familiar with the localities they describe, and thanks are due to the many local journalists and others who have responded to the call for information in regard to their towns. Canadian towns and villages have also been included, and the most recent census returns of population, manufactures, etc., have been fully utilized.

Biology, through the researches of such men as Darwin, Huxley, and Virchow, has attained a position of great prominence among the sciences, and has in recent years laid much claim to public attention and thoughtful study. This subject is very fully cared for in articles which will be found to embody the most recent discoveries and discussions. Special mention may be made of the articles *Biology*, by Professor Theodore Gill; *Bacteriology*, by Dr. Billings and Dr. Abbott; *Darwinism* and *Evolution*, by Professor J. S. Kingsley; as well as of an able anti-Darwinian article, by Sir J. W. Dawson, of Montreal, probably the most eminent living opponent of Darwinism.

In the department of Zoölogy, Comparative Anatomy, and Animal Physiology, in charge of President David S. Jordan, of the Leland Stanford Junior University, California, all the shorter articles were carefully revised, and nearly all the longer ones rewritten. An effort was made to avoid as far as possible all strictly technical terms, and to adapt all discussions and descriptions to those who have not been trained in zoölogical science. The only considerable departure from this general method of treatment is in the elaborate article by Professor E. D. Cope on *Comparative Anatomy*—a departure thought necessary on account of the importance and peculiar nature of the subject. President Jordan had the assistance of Professor Charles Henry Gilbert, Ph. D., in general zoölogy; of Professor Oliver P. Jenkins, Ph. D., in several physiological and anatomical subjects; of Professor J. S. Kingsley, of Tufts

College, who dealt chiefly with invertebrate zoölogy, and wrote most of the articles on Insects, Crustacea, and Worms; and lastly, in vertebrate zoölogy, of Mr. Frederic A. Lucas, a curator in the U. S. National Museum in Washington, who wrote the article on *Fisheries*, and revised or rewrote a large number of the articles on birds (such as those on the *Auk*, *Capercaillie*, and *Dodo*), and on many other subjects, e. g. those on the *Armadillo*, *Crocodile*, *Elephant*, *Taxidermy*, and *Zoölogical Geography*. The article *Entomology*, finely illustrated, was furnished by Professor J. Henry Comstock, of Cornell University; that on the *Bee* by his assistant, Mr. McGillivray; and that on *Pisciculture* by Dr. Tarleton H. Bean, assistant U. S. Fish Commissioner, and curator of the fishes in the National Museum. This department was so exhaustively treated that no supplementary matter was found necessary other than an article on the *Gypsy Moth*, by Professor Kingsley, and a few short items by Mr. F. A. Lucas.

In arranging for the department of Botany and Vegetable Physiology, Economic Botany was assigned to Professor L. H. Bailey, of Cornell University, who took charge of Agriculture, Horticulture, and kindred subjects; and the more general subjects of Botany as a science to Dr. Charles E. Bessey, Professor of Botany in the University of Nebraska. In order to adapt this whole department to the modern state of the science, many of the old articles were omitted, and many new ones introduced. The article *Botany* is entirely new, and is in accord with the modern idea that the term includes the whole vegetable kingdom, and not merely flowering plants and ferns. Mention may also be made of the articles *Bacteria* and *Vegetable Histology*. One of the features of the present edition is the attention paid to the orders of plants, as well as to plant diseases and plant histology.

Palæontology, in the department of Mr. G. K. Gilbert, is treated in four principal articles and a number of minor ones. The history of ancient life is given in three articles: *Fossil Plants*, by Dr. Lester F. Ward, of the Smithsonian Institution; *Fossil Invertebrates* (both in a separate article and in the article *Palæontology*), by Dr. H. S. Williams, Professor of Geology in Yale University; and *Fossil Vertebrates*, by Professor O. C. Marsh, palæontologist of the U. S. Geological Survey, and president of the National Academy of Sciences.

Anthropologic science covers a wide and varied field. Attention may be called to an article on *Anthropology*, by Major J. W. Powell, director of the U. S. Bureau of Ethnology; one on *Criminal Anthropology*, by Dr. Robert Fletcher, of the Army Medical Museum, now supplemented by a new one on *Criminology*, giving much additional information, by Mr. F. Sturges Allen, a member of the New York Bar; another on *Anthropometry*, by Dr. J. S. Billings, superintendent of the Army Medical Museum; and the article on *Man*, by Dr. Daniel G. Brinton, a professor in the University of Pennsylvania, who had long been engaged in anthropologic researches. Major J. W. Powell had charge of that branch of the subject which relates to American Archæology and Ethnology. The editor of this department has probably devoted more time and thought than any other person to the ethnic relations of the aborigines of America, and his investigations enable him to speak with a confidence which perhaps no one else would be entitled to. His classification of the Indians of North America will be found of great interest and value to those who as yet have had but limited facilities for the study of the subject. The materials here brought together have never been published in any other cyclopædia, and to an important extent they are new to science. Among Major Powell's collaborators, besides Dr. Billings, Dr. Brinton, and Dr. Fletcher, above referred to, mention may be made of Mr. Frank H. Cushing, formerly chief of the Hemenway exploring expedition, which operated in New Mexico and Arizona; Rev. J. Owen Dorsey, formerly a mis-

sionary among the Ponca Indians; Mr. Albert S. Gatschet, Mr. J. N. B. Hewitt, an Iroquois Indian, Mr. F. Webb Hodge, Professor William H. Holmes, and Col. Garrick Mallery, all of the Bureau of Ethnology at Washington.

The departments of Language and Literature were very carefully planned and arranged for, with a view to making the Cyclopædia as strong on its literary side as it has ever been on its scientific side. It is confidently believed that in no other general cyclopædia can such a complete, comprehensive, and scholarly presentation of these subjects be found. Professor (now President) Benjamin Ide Wheeler, the editor in charge of Philology. Linguistics and Comparative Philology, strove to present the phenomena of language in the light of their historical significance, and to treat these in accordance with the methods of the modern science of historical grammar, as distinguished from the merely descriptive methods of earlier linguistic discussions. This and the great advances made in linguistic science necessitated an almost entire abandonment of the old material in the Cyclopædia, and a new grouping and distribution of the topics. The plan of his work includes the following divisions of the new matter:

(a) Articles on the various groups or families of languages, such as the Indo-European, the Semitic, and the Teutonic. These articles undertake to characterize each group, with reference to its geographical location and distribution, its division into separate languages and dialects, with the determining marks or other characteristics of the division, its historical development, and its main characteristics of sound, form, and syntax, considered from a strictly scientific point of view.

(b) Articles on each separate language or dialect that has attained the position of a literary language, with discussion of its main characteristics, geographical extent, division into dialects, and with references to the most important lexicographical and grammatical treatises, as well as to convenient handbooks for acquiring a practical knowledge of the language.

(c) Articles explanatory of the technical terms of scientific and descriptive grammar, as of prosody or metre.

(d) Articles on various phases of general grammar, the philosophy of language, the history of scientific grammar, and the history of writing.

(e) A brief etymological explanation of all titles in the Cyclopædia whose form or meaning could be made clearer by the addition of such an etymology. In selecting the material to be used in these etymological explanations, the etymology is not viewed as an end unto itself, as may be the case, for example, in an etymological dictionary, but rather as a practical convenience for the purposes mentioned. All these etymologies were supplied by Professor Wheeler himself.

In carrying out this widely comprehensive plan the associate editor called to his aid some of the most eminent specialists to be found in Europe and America. Semitic Languages were assigned to Professor C. H. Toy and Professor D. G. Lyon, of Harvard University, and to Professor Jewett, of Brown University; Iranian Languages to Professor A. V. Williams Jackson, of Columbia College; Germanic Languages to Professor H. C. G. Brandt, of Hamilton College; Scandinavian Languages to Professor George L. Kittredge, of Harvard University, and later to Professor Carpenter, of Columbia College, New York; Slavic Languages to Professor Jagič, of Vienna; Lithuanian and other Baltic Languages to Professor Bezenberger, of Königsberg, Prussia; Celtic Languages to Professor Thurneysen, of Freiburg, Germany; Low German Languages to Professor Collitz, of Bryn Mawr, Pennsylvania; Romance Languages to Professor E. S. Sheldon, of Harvard University; Prosody, Metre, etc., to Professor M. W. Humphreys, of the University of Virginia. Among individual articles, attention may be directed to *Language*, by Pro-

fessor W. D. Whitney, of Yale University; *Sanskrit*, by Professor Charles R. Lanman, of Harvard University; *English*, by Professor Albert S. Cook, of Yale University; *Pāli*, by Professor T. W. Rhys Davids, of London; *Greek*, by Professor Frederick D. Allen, of Harvard; *Prākṛit*, by Professor Hermann Jacobi, of Bonn, Germany; *Chinese, Korean, and Japanese*, by Dr. Addison Van Name, librarian of Yale University; *Egyptian*, by Rev. Charles R. Gillett, librarian of Union Theological Seminary, New York; *Syntax*, by Professor B. Delbrück, Jena, Germany; *Inscriptions*, by Dr. Isaac H. Hall, of the Metropolitan Museum, New York; *Pronunciation, Punctuation, and Lexicography*, by Professor O. F. Emerson, of Cornell; and *Ablaut, Umlaut, Alphabet, Gothic, Modern Greek, Folk-etymology*, etc., by the associate editor.

In the treatment of the various subjects that come under the head of Greek and Roman Literature, in charge of Professor B. L. Gildersleeve, of Johns Hopkins University, an effort was made to bring into relief the important facts of the lives and careers of the different authors, to present their leading characteristics in a few sharp, clear lines, and to indicate the great editions of the various works; and, generally, to point out the best and most accessible sources of information. The Latin section of the department was assigned to Professor Minton Warren, of Johns Hopkins University, and Dr. Alfred Gudeman prepared biographical sketches of the great classical scholars of modern times. The article *Greek Literature* is by Professor F. D. Allen, of Harvard University, and that on *Homer* by Professor Thomas D. Seymour, of Yale University. Professor J. R. S. Sterrett, of Amherst College, had charge of *Greek Antiquities*, and Professor George L. Hendrickson, of the University of Wisconsin, of *Roman Antiquities*.

Greek and Roman
Literature.

English Literature, that is, Literature in English wherever produced, was in charge of Professor Henry A. Beers, of Yale University. Several hundred new articles were introduced, chiefly notices of authors, and everything was brought down to date. Professor Beers carefully revised and supplemented the excellent article on *English Literature*. The article *Anglo-Saxon Literature* was carefully revised by its author, Professor F. A. March, of Lafayette College. A new article on the *Novel* was written by Thomas Sergeant Perry, author of *English in the Eighteenth Century*, and another, by Professor Charles Davidson, on *Miracle-plays*. The one on *Browning* is by Professor Hiram Corson, of Cornell University. The biographies of *Carlyle, Pope*, etc., are written by Professor Beers himself. An interesting article on *Canadian Literature*, by Professor Goldwin Smith and G. Mercer Adam, includes an account of the French-Canadian as well as of the English Literature of Canada.

English Literature.

The important department of Comparative Literature, at the head of which Professor A. R. Marsh, of Harvard University, labored so assiduously and effectively, is practically a new feature in cyclopædia-making. His aim was to bring foreign literature to our very doors in a series of sketches prepared by persons so familiar with their subjects that they can give the main lines of each foreign literature without wasting words upon needless or vague descriptions and characterizations. His plan also includes a brief biography of every writer of real importance and interest in all these foreign literatures, the selection of these names, and the writing of the biographies themselves, being left, as far as possible, to the authorities who had undertaken the preparation of the main articles. The bibliographical information which follows each article will give the reader an indication of the latest discussions of the subject in hand, and enable him to supplement the information given, if he so desires. In arranging for this department, Sanskrit and allied literatures were assigned to Professor Charles R. Lanman; Indo-Iranian to Professor A. V. Williams Jackson; Semitic to Professor C. H. Toy; Assyrian

Comparative Literature.

and Chaldee to Professor D. G. Lyon; Egyptian to Rev. Charles R. Gillett; Chinese, Korean, and Japanese to Dr. Addison Van Name, of Yale; Arabic to Professor J. R. Jewett; German to Professor Julius Goebel, of Leland Stanford Junior University; Scandinavian to Professor G. L. Kittredge, of Harvard, and Professor D. K. Dodge, of the University of Illinois; Catalan to Professor T. F. Crane, of Cornell; Italian, Basque, and Roumanian to Professor E. S. Sheldon, of Harvard; French to Professor Canfield, of the University of Kansas; while Provençal Literature, Humanism, etc., were cared for by the associate editor himself. Among the special articles may be mentioned *Ballad Poetry*, by Professor Francis J. Child, of Harvard University; *Beast-fables*, by Professor Kittredge; and *Finnish Language and Literature*, by Professor R. B. Anderson.

Attention may here very properly be called to the fact that this is the first cyclopædia ever published that contains an account of the already extensive and important literature of South America, together with notices of the most eminent South American writers, both past and present. Now that South America is attracting so much attention, both in the U. S. and in Europe, this feature will, it is hoped, be found both useful and interesting.

All the articles that come within the scope of the departments of History, Politics, and Education, reserved for the special care of the editor-in-chief, were carefully revised. All the historical articles were critically examined, many of them rewritten, and a considerable number of new subjects for the first time introduced into the Cyclopædia. Among those from the pen of the editor-in-chief may be mentioned *Bacon's Rebellion*, *Berlin Congress*, *Columbus*, *Modern Egypt*, *Frederick the Great*, *Mecklenburg Declaration*, *Napoleon*, *Nullification*, *United States*, *George Washington*, and *Waterloo*.

In the field of politics, while numerous articles on questions involving matters of a partisan nature were intrusted to eminent representatives of the several parties, political topics of a non-partisan nature were written by scholars thoroughly versed in what may be called the science of comparative politics. In accordance with this method such articles as those on *Democratic Party*, *Republican Party*, *Free Trade*, *Protection*, *Reciprocity*, etc., are written by persons advocating these doctrines, while such articles as *Lobby*, *Law-making*, *Caucus*, *Ballot Reform*, *Civil-service Reform*, *Representative Government*, and other topics of a kindred nature are treated by scholars who approach the subject from a non-partisan point of view. An effort has thus been made to give to this particular department of the Cyclopædia the exceptional strength that must be called for by the present state of political science. Prominent among these articles may be mentioned *Government and Political Parties*, by the editor-in-chief; *Ballot Reform*, by Professor J. W. Jenks, of Cornell University; *Civil-service Reform*, by Dorman B. Eaton and Theodore Roosevelt; *Prohibition* and *Prohibition Party*, by Miss Frances E. Willard; and *Free Trade*, by the Hon. D. A. Wells.

The articles on educational subjects required even more rigorous treatment, for the reason that since the first edition of the Cyclopædia was issued the methods, if not the systems, of education had been completely revolutionized. A new article on *Education* was prepared by Chancellor W. H. Payne, of the State Normal University in Nashville, Tenn. This has been supplemented in the present edition by articles on the *Literature of Education*, *Methods of Education*, and *Nature-study*, by Charles H. Thurber, Professor of Pedagogy in the University of Chicago; an article on *Child-study*, by William L. Bryan, Professor of Philosophy and vice-president of Indiana University; and an article on *Manual Training*, by Professor C. M. Woodward, of Washington University, St. Louis, Mo. The articles on *Agricultural College*, *Agricultural Experiment Station*, *College*, *Schools*, and many other educa-

tional subjects of a kindred nature, are by the editor-in-chief. The article on *Schools* has been supplemented by a fine series, including *Kindergarten*, by Professor W. N. Hailmann; *Common Schools*, by Professor Earl Barnes, of the Leland Stanford Junior University; *Primary Schools* and *Secondary Schools*, by Professor Thurber; *Normal Schools*, by President De Garmo, of Swarthmore College; *Theological Schools*, by Nathaniel Schmidt, Professor of Semitic Languages and Literature, Theological School of Colgate University; *Medical Schools*, by Henry M. Hurd, Professor of Psychiatry, Johns Hopkins University; *Law Schools*, by James Barr Ames, Bussey Professor of Law, Harvard University; *Technical Schools*, by President Mendenhall, of the Worcester Polytechnic Institute, Worcester, Mass.; *Trade Schools*, by C. R. Richards, Director of the Department of Science and Technology, Pratt Institute, Brooklyn, N. Y.; *Schools of the Fine Arts*, by Mr. William A. Coffin, of the Society of American Artists; *School Gardens*, *Vacation Schools*, and *School Statistics*, by Professor Thurber. The article on *University* is by President D. C. Gilman, of Johns Hopkins University, and the descriptions of institutions of learning were prepared, almost without exception, either by the officers at the head of such institutions or by persons doing the work under official direction.

The department of Economics, or Political Economy, under the general charge of Professor (now President) Arthur T. Hadley, of Yale University, was extended so as to include on the one hand the whole science of Sociology, and on the other the great domain of Finance, public and private. The different subjects not treated by the associate editor himself were intrusted to the hands of the most eminent specialists that could be found. The method pursued in former editions of dealing with controverted questions, by giving both sides a hearing, was retained; while systematic articles on *Finance*, *Currency*, *Taxation*, *Tariff*, *Reciprocity*, etc., furnish an impartial presentation of facts to supplement or correct the arguments of special advocates. There is a much fuller treatment of social problems than formerly. Carroll D. Wright deals with the *Factory System*; Henry George with the *Single Tax*; H. N. Hyndman, of London, with *Socialism*; Stepniak with *Nihilism*; Jacob A. Riis with *Tenement-houses*; Professor Giddings with *Sociology*; etc. In consequence of the great advances in recent years in the treatment of social and economic questions, the space given to these subjects was more than doubled.

First in order among the Industrial Arts comes Agriculture, which, with Horticulture, Forestry, and Economic Botany, was placed in the editorial charge of Professor Liberty H. Bailey, of Cornell University. He not only subjected all the articles that were retained from the former edition to a most thorough revision, but wrote or secured many new articles of prime importance. Among these may be mentioned *Butter*, by Professor H. H. Wing, of Cornell; *Cheese*, by Professor James P. Robertson, Dairy Commissioner of Canada; *Ensilage* and *Reaping and Mowing Machines*, by Professor I. P. Roberts, of Cornell; and *Forestry*, by Mr. B. E. Fernow, chief of the Forestry division of the U. S. Department of Agriculture. The article on *Horticulture*, by the associate editor, will be found to embody briefly, but as fully as is practicable, the results of the latest investigations and experience in the production of the different kinds of grains, fruits, and vegetables.

Mining and Metallurgy are very fully treated by Mr. Charles Kirchhoff, who has endeavored to embody in the several articles which come within the scope of his department the results of the most recent experience in both of these branches. Such articles as *Coal*, *Aluminium*, *Blast Furnace*, *Tin*, *Tin-plate*, etc., clearly show his methods and the value of what he has done.

The editor of the department of Mechanical Science endeavored to present the whole field of Applied Science, as exhibited in the mechanical arts, in the simplest, most concise, and most complete manner possible, and the history, structure, and principles of construction of all important inventions and machines, accuracy being secured by obtaining contributions from acknowledged authorities in each class. Every department of manufacturing industry receives attention. The very complete article on the *Steam-engine*, contributed to the former edition by the late Professor Trowbridge, was revised by his successor, Professor F. R. Hutton. The articles on *Flying-machines* and *Aëronautics* are by the associate editor himself.

Dr. Mansfield Merriman, Professor of Civil Engineering in Lehigh University, well known as a teacher and investigator in technical science and as the author of standard technical books, had charge of the department of Civil Engineering. The most important new articles prepared by Dr. Merriman for this edition of the Cyclopædia are *Arch, Bridges, Block System, Creeping of Rails, Flexure, Hydraulics, Mountain Railways, Moment, Roads, Stresses, and Viaduct*. He revised and brought down to date a number of articles like those on *Brick, Cements, Leveling, and Surveying*, and introduced many short articles, such as those on *Adhesion, Abutment, and Ballast*. A still larger number of articles were prepared by engineers and professors of distinction, among whom it will suffice to mention Gen. Henry L. Abbot, whose article on *River Hydraulics* was retained and revised; Mr. Elmer L. Corthell, C. E., who rewrote the articles *Ship-canal* (on which Mr. Cyrus C. Adams has now furnished a supplementary article, giving later facts), *Ship-railways, Jetties, and Levees*. Mr. J. James R. Croes, a civil and hydraulic engineer of wide experience, supplied articles on *Aqueducts, Canals, and Reservoir, Street and Suburban Railways, etc.*; Mr. Joseph P. Frizell revised the articles *Hydrostatics, Turbines, Water-works*, and a number of shorter articles, written by him for former editions; Mr. Lewis M. Haupt, C. E., wrote the articles *Breakwater, Docks, Dredging, and Harbors*; Mr. William Rich Hutton, chief engineer of the Hudson River Tunnel, revised and consolidated all the articles on *Tunnels and Tunneling*, and supplied the biographical sketches of European engineers of note; Dr. Mendenhall rewrote the article describing the *U. S. Coast and Geodetic Survey*; Dr. Cady Staley, president of the Case School of Applied Science, Cleveland, O., contributed the article on *Sewerage*; and that on *Plumbing* is by Mr. George S. Pierson, civil and sanitary engineer, Kalamazoo, Mich. The article *Railways* was revised by its author, Col. Julius W. Adams; and Mr. A. M. Wellington, editor, and Mr. E. E. R. Tratman, associate editor, of the *Engineering News*, New York, wrote new articles on *Railway Equipment and Railway Operation*. All these articles are freely illustrated whenever the nature of the subject requires it. The historical development of Civil Engineering, both as an art and as a science, is noted.

Everything pertaining to Navigation and Naval Science generally was in charge of Admiral Luce, as in former editions. The more important topics were submitted to experts, who in some instances revised the old articles, but for the most part supplied entirely new articles. *Ship-building*, by Commodore Philip Hichborn, U. S. Navy, may be mentioned; also *Armor and Submarine Navigation*, by Professor Philip R. Alger, U. S. Navy; *Ships of War*, by F. T. Bowles, Assistant Naval Constructor, U. S. Navy; *Torpedo-boats*, by Lieut. George F. W. Holman, U. S. Navy; and *Nautical Schools*, by Lieut.-Commander Charles Belknap. New articles are now added on *Resistance of Ships, Screw Propeller, and Search-light*, by W. F. Durand, Associate Professor of Marine Engineering, Cornell University.

The field of Military Engineering and the Science of War was in charge of Professor James Mercur, of West Point Military Academy. The articles on *Tactics, Organization, Fortifications, Arms, Armor, Gunnery, etc.*, were brought up to the present time, with indications, when possible, of the directions in which future developments may be expected. Articles of this nature were placed in the hands of specialists. It will suffice here to mention such names as Gen. Henry L. Abbot, on *Explosives, Torpedo*; Gen. Brialmont, of Belgium, on *Intrenched Camps*; Lieut. J. C. W. Brooks, Fourth Artillery, on *Projectiles*; Capt. L. L. Bruff, on *Machine and Rapid-fire Guns*; Capt. J. W. Ingalls, on *Gunpowder*; Major O. H. Ernst, on *War, Siege, and Fortification*; and Gen. John C. Tidball, on *Ordnance*. The articles on *Army, Arsenal, Brevet, and Discipline* are by Professor Mercur himself, who also wrote or revised many of the articles describing battles. New articles are now added on *Electro-ballistics* and on *Range-finders and Position-finders*, by Lieut. I. N. Lewis, of the Board of Ordnance and Fortifications; also one on *Military Insignia*, by Lieut. Cornelis De W. Willcox, of the Army Bureau of Information. Science of War.

Medical Science has made most remarkable and interesting advances during recent years. There is scarcely any department of medicine or surgery that has not been profoundly influenced or quite revolutionized by the germ theory of disease. The results of the latest investigations were embodied in several articles dealing with this theory and its developments. The list of specialists secured by Dr. Pepper, the editor of this department, includes the names of many of the most eminent authorities in the United States. All matters pertaining to *Materia Medica* were attended to either by Dr. H. C. Wood or by Dr. H. A. Hare; *Veterinary Medicine* and diseases of animals, by Dr. Leonard Pearson; *Anatomy, Histology, etc.*, by Dr. Piersol; *Surgery, Tracheotomy, etc.*, by Dr. John Ashhurst, Jr.; *Obstetrics*, by Dr. P. F. Mundé, of New York; *Pathology, etc.*, by Dr. W. T. Councilman; *Leprosy and Skin Diseases*, by Dr. George H. Fox; *Anatomy of the Ear*, by Dr. St. John Roosa; *Cholera, Cancer, Bright's Disease, etc.*, by Dr. Pepper; and *Medical Jurisprudence*, by Dr. Seneca Egbert. Medicine and Surgery.

Of the *Æsthetic Arts*, Music was in charge of Mr. Dudley Buck, who expunged much that was purely technical in the former edition in order to make room for many new articles on various musical subjects. Painting, Sculpture, Architecture, and Archæology were under the superintendence of Dr. Russell Sturgis, who remodeled the method of treatment, with the view of establishing a better proportion between the more important and the less important articles. In former editions of the Cyclopædia the Fine Arts were for the most part treated by literary men and scholars who approached their subjects from without. In the remaking the work was done by persons who had devoted their lives principally to the fine arts, and this resulted in a more intelligent general treatment of the subjects that come within the scope of the department. In the important field of Classical Archæology a large part of the work was done by Professor Alfred Emerson, of Cornell University. The very able article in the former edition on *Roman Archæology*, by Professor Helbig and Professor Lanciani, of Rome, was revised by the latter. European Art was in the hands of Mr. W. J. Stillman, of Rome; Modern Painters were described by Mr. William A. Coffin, secretary of the Society of American Artists. Professor A. D. F. Hamlin, of Columbia College, New York, wrote on *Architecture* and architectural subjects generally. Decorative Art in its different branches was treated with special care by the associate editor; and it will be found that Fresco-painting, Silverware, Painted Pottery, Embossed The Fine Arts.

and Chased Armor, Tapestries, and other subjects of a kindred nature are treated with the fullness each topic seems to deserve.

Dr. W. T. Harris, U. S. Commissioner of Education, and Professor J. Mark Baldwin, Ph. D., of Princeton University, had editorial care of Philosophy, Psychology, and Ethics. Dr. Harris took great pains to present each topic in the light of its historical development, and endeavored to present the more obvious thoughts which the great thinkers of the past have left us on the problems of life. Under various titles the essential characteristics of the Greek and German philosophic movements are indicated. The scholastic philosophy receives additional attention; and the New Philosophy, based on observation, and especially on the study of the functions of the brain and the cerebral ganglia, is treated at considerable length. This department was more particularly in charge of Professor Baldwin, who has now added many new articles. Among the articles contributed by Professor Baldwin, the following may be mentioned: *Genetic Psychology*, *Genius*, *Hypnotism*, *Ideal Feelings*, *Illusion*, *Imagination*, *Instinct*, *Love*, *Metaphysics*, *Muscle-sense*, *Pain and Pleasure*, *Perception*, *Psychology*, *Psychometry*, *Psycho-physics*, *Self-consciousness*, *Sensation*, *Sentiment*, *Suggestion*, *Suicide*, *Thought*, *Utilitarianism*, and *Will*. The article on *Induction* is by Professor Ormond, of Princeton; that on *Moral Philosophy*, by Professor Dewey, of the University of Chicago; that on *Memory*, by Professor J. Cattell, of Columbia College; and that on *Symbolic Logic*, by Professor Halstead, of the University of Texas. Attention is directed to Dr. Harris's fine article on *Hindu Philosophy*, and to the splendid series of six articles by Professor Garbe, of Königsberg, on the six darshanas or schools of Hindu philosophy, viz., *Mīmāṃsā*, *Nyāya*, *Sāṅkhya*, *Vaiśeṣhika*, *Vedānta*, and *Yoga*.

It has always been the policy of the editors of this Cyclopædia to hold the balance fairly in controverted matters, and to be impartial in every way. In no department has this policy been more rigorously carried out than in that which relates to religious belief and Church polity. In the last remaking the venerable Dr. Schaff, of Union Theological Seminary, New York, at first had charge of General Church History and Biblical Literature, and the Rev. Samuel Macauley Jackson, D. D., LL. D., Professor of Church History in New York University, took charge after Dr. Schaff's death. Seven other associate editors had charge of the History, Polity, and Dogmatics of as many sections of the Christian Church, and a bare list of their names is a sufficient indication of the strength of the Cyclopædia in theological and ecclesiastical matters. For the sake of completeness they are here given in alphabetical order:

Willis J. Beecher, D. D., Professor of Hebrew Language and Literature in Auburn Theological Seminary.

George P. Fisher, D. D., LL. D., Professor of Church History in Yale University.

John F. Hurst, D. D., LL. D., bishop in the Methodist Episcopal Church, and Chancellor of the American University, Washington, D. C.

Henry E. Jacobs, D. D., LL. D., Professor of Church History in the Evangelical Lutheran Theological Seminary, Mt. Airy, Philadelphia.

John J. Keane, D. D., bishop in the Roman Catholic Church, and Rector of the Catholic University of America.

William Stevens Perry, D. D. (Oxon.), LL. D., bishop in the Protestant Episcopal Church in the U. S., Davenport, Iowa.

William H. Whitsitt, D. D., Professor of Church History in the Baptist Theological Seminary, Louisville, Ky.

To these names should be added those of the Rev. J. W. Chadwick, of Brooklyn, N. Y., to whom were referred all matters connected with Unitarianism, Universalism, etc.; and the Rev. J. H. Garrison, D. D., Editor of the *Christian Evangelist*, St. Louis, Mo., who prepared the articles which relate to the Disciples of Christ.

Among individual articles not coming within the scope of any of these departments may be mentioned one on the *Mormon Church*, by Mr. Byron Groo, of the *Salt Lake Herald*; another on *The Friends*, by Professor Gummere, of Haverford College; one on *Christian Endeavor*, by the Rev. F. E. Clark; and one on *The Salvation Army*, by F. de L. Booth-Tucker.

Law is a twofold department: (a) Municipal, Civil, and Constitutional Law, and (b) International Law. During the progress of about the first third of the work the former was in charge of President Henry Wade Rogers, of the Northwestern University, and thereafter of Francis M. Burdick, LL. D., Dwight Professor of Law, Columbia University, who received important aid from the following professors in the Columbia University School of Law: Frank J. Goodnow, A. M., LL. B.; William A. Keener, LL. B.; George W. Kirchwey, A. B.; Munroe Smith, A. M., J. U. D. Mr. F. Sturges Allen, a member of the New York Bar, wrote many important articles and revised many others, and has now added still more, including *Expert Testimony*, *Farm Laws*, *Handwriting*, *Liquor Laws*, *Lunacy Laws*, *Police Powers*, *Probate Courts*, and *School Laws*. The department of International Law was in charge of Professor Theodore S. Woolsey, of Yale University, who endeavored to give, under a number of separate headings, rather than under one, a complete practical treatment of the subject. Among individual articles of this nature may be mentioned *Asylum*, *Balance of Power*, *International Arbitration*, *International Law*, *Belligerency*, *Blockade*, *Exterritoriality*, *Extradition*, *Naturalization*, *Treason*, and *Treaties*.

Almost every elaborate article in the Cyclopædia is accompanied by copious bibliographical information, so that the student who desires to pursue the subject further may know where to turn for the information he seeks. This has always been a feature of the Cyclopædia, but in no other edition has it been so thoroughly carried out. Wherever possible, reference is made to special rather than to general treatises, to works in English, either original or translated, in preference to works in foreign languages, and to recent and accessible rather than to out-of-the-way books.

In organizing the editorial staff no separate provision was made for the great department of Biography. It was arranged that each editor should have charge of the biographies in his own department, selecting the names of persons considered worthy of a place in the Cyclopædia, and preparing or arranging for the preparation of the biographical sketches. This arrangement has greatly increased the value of the Cyclopædia, as the sketches have the authority of men familiar with the standing and achievements of the persons described. They are all written on the same model, as far as possible, and an effort is made to have each indicate instantly just who the person was or is, and his or her relative importance. Many biographical sketches are now added in the Appendix, including notices of persons prominent in connection with important events, discoveries, etc., since the general revision was completed.

A very large number of miscellaneous articles which do not come within the scope of any of the editorial departments were arranged for by the editor-in-chief, with the assistance of Professor

Miscellaneous. C. H. Thurber, M. A., of the University of Chicago. Among these may be mentioned such subjects as games and sports (*Base-ball* and *Foot-ball*, by Professor A. Alonzo Stagg, formerly of Yale, now of the University of Chicago; *Cricket*, by Professor F. B. Gunnere, of Haverford College; *Physical Education*, by Professor D. A. Sargent; *Curling*, by the Hon. John Johnston, of Milwaukee, Wis.; *Chess*, by W. Steinitz; *Whist*, by R. F. Foster; and *Lacrosse*, *Lawn Tennis*, *Croquet*, *Golf*, etc., by others equally well qualified); *Cookery*, by Miss Parloa; *Dress*, by Mrs. Jenness Miller; *Preservation of Food*, by Marion Harland; *Clubs*, by Hobart Chatfield Chatfield-Taylor; *College Fraternities*, by W. H. Baird, of New York; *Charity Organization*, by C. D. Kellogg; *Women's Rights*, by Susan B. Anthony and Elizabeth Cady Stanton, etc.

A new feature of this Cyclopædia is the introduction of etymologies—prepared by Professor (now President) Benj. Ide Wheeler—when such would serve to fix in the mind either (1) the sig-

Etymology. nification of a term by the indication of its historical relations, or (2) the form of the term itself by associating with it other known terms. Most of the terms which require etymological explanation fall under one of the three following heads: (a) Scientific terms constructed out of Greek or Latin elements: It has generally been deemed sufficient in these cases simply to indicate the Greek or Latin words entering into the construction, without comment as to the principle of structure, etc. (b) Words of Romance origin: These have generally been traced back along the route by which they entered English to their Latin form, or to their source in other languages. (c) Teutonic words: These, or their Old English forms, have been brought into comparison with the cognate forms in other Teutonic languages, especially Modern German, and finally reduced through their fundamental Teutonic form to such comparison with their Indo-European cognates as seemed practicable and serviceable.

In tracing the history of words a careful discrimination must be made between descent and adoption. In the case of descent, as from Indo-European to Teutonic to Old English to Middle English to Modern English, or from Indo-European to Latin to Old French to Modern French, the sign > has been universally employed, the movement from the older to the younger being viewed as from greater to less, i. e. the sign is interpreted as an arrow-head. The opposite sign < is used in tracing back the line of descent, as from Middle English to Old English, etc. The colon (:) has been used to connect forms which represent in sister languages or dialects descent from one and the same word; e. g. French *mûr* : Italian *maturo* : Spanish *maduro* < Latin *maturus*. In the case of adoption, attention has been first of all directed to the route by which the word came, and when the citation of the form in an intermediate stage seemed unnecessary this route has been indicated by use of "viâ," e. g. *abundance* viâ Old French from Latin *abundantia*. To indicate adoption the word "from" has been universally employed, e. g. *feast* from Old French *feste*, but when no essential change of form is involved the sign = is used; e. g. *fête* = French *fête*; Latin *cœnobium* = Greek *κοινόβιον*. The common and confusing use of the word "from" as indicating derivation is displaced by the expression "deriv. of" (derivative of); thus Latin *capita'lis*, deriv. of *caput*. The word "from," while always implying a loan from another language, may, however, also cover derivation from a loan-word, when the necessities of space forbid the enumeration of all the steps in the history of the form; thus "*conduct*, from Latin *condu'cere*."

As the pronunciation of foreign names is often a source of much difficulty, even to many well-educated persons, an effort has been made to remove this difficulty by introducing a simple system of phonetic respelling, a key to which is given on another page. No refinements have been attempted, the purpose being simply to represent in a fairly accurate manner the sounds of the names respelled. The pronunciation adopted in cases of doubt is that of the most approved authorities. As a rule, English names need no such respelling, the pronunciation being sufficiently shown by indicating the primary accent, but names that are irregularly pronounced, e. g. Cholmondeley (chŭm'lēē), have been respelled. No attempt has been made to use in every case a separate symbol for each distinct sound, as such a scheme would necessarily be intricate, and, to a great extent, confusing to those for whose benefit it is intended. Different sounds which are so nearly alike as not to be distinguished by the ordinary observer have been represented by the same symbol. Thus Spanish *b* and *v*, and German *w*, are represented by the symbol *v*; Spanish *j*, German *ch* and *g* (when following immediately after the vowels *a*, *o*, *u*), and Russian *kh* have all been represented by the symbol *kh*; while Spanish *d*, Danish *d* (at the end of a syllable), and English *d* have been represented by the letter *d*. It has not been thought best to indicate the peculiar gutturals of the Oriental languages, as they could not be pronounced even with approximate accuracy except by persons already familiar with them.

Pronunciation.

In the typographical execution of the Cyclopædia, as well as in the editorial work, no effort has been spared to achieve the highest possible excellence. The maps have all been carefully revised by competent geographers, and many new ones added. Many new illustrations have been introduced, including a fine series of colored representations of birds, birds' eggs, cereals, orchids, fungi, poultry, pigeons, art porcelain, rugs, etc., which will convey through the eye more information than could be given by mere word descriptions.

Although the Cyclopædia is the work of a very large number of different writers, each preserving to a certain extent his own individuality of method, it has been the aim of the editor-in-chief to bring the whole into such reasonable proportions and such uniformity of style as the importance of the various subjects has seemed to require and the individuality of the writers would permit. To guard in every practicable way against typographical errors, the proofs have been read not only by the proof-readers in the printing-house and by the individual writers, but also by the managing editor and his editorial assistants, and by several experienced proof-readers, in the office of publication; and, finally, they have all been subjected to the scrutiny of the editor-in-chief.

The result of all these efforts is given to the public in the confident hope that something has been accomplished for the wider dissemination of accurate knowledge.

CHARLES KENDALL ADAMS.

MAPS IN VOL. I.

POLITICAL.

	PAGE
AFRICA	62
ALABAMA	90
ALASKA	96
AMERICA, NORTH	148
" CENTRAL	150
" SOUTH	152
ARIZONA	316
ARKANSAS	318
ASIA	366
AUSTRALIA	416
AUSTRIA-HUNGARY	418

CITIES.

BALTIMORE	474
BERLIN	592

PLATES.

ASTRONOMICAL PHENOMENA	386
BACTERIA	442

PECULIAR PHONETIC SYMBOLS

USED IN THE WRITING OR TRANSLITERATION OF THE DIFFERENT LANGUAGES.

- | | |
|--|--|
| <p>ā, ē, etc.: long vowels; in the Scandinavian languages the accent (<i>á, é, etc.</i>) is used to denote length.</p> <p>ą: a nasalized <i>a</i>; so used in the transliteration of the Iranian languages.</p> <p>å: labialized guttural <i>a</i> in Swedish.</p> <p>æ: open <i>a</i> of Eng. <i>hat</i>, used chiefly in O. Eng.</p> <p>ái: used in Gothic to denote <i>e</i> (open), in distinction from <i>ái</i>, the true diphthong.</p> <p>aú: used in Gothic to denote <i>o</i> (open), in distinction from <i>áu</i>, the true diphthong.</p> <p>bh: in Sanskrit a voiced labial aspirate (cf. <i>ch</i>).</p> <p>ḃ: voiced bilabial (or labio-dental?) spirant, used in discussions of Teutonic dialects.</p> <p>ç: voiceless palatal sibilant, similar to Eng. <i>sh</i>, used especially in transliteration of Sanskrit.</p> <p>č: frequently used, e. g. in Slavonic languages, to denote the sound of Eng. <i>ch</i> in <i>cheek</i>.</p> <p>c: voiceless palatal explosive, commonly used in transliteration of Sanskrit and the Iranian languages.</p> <p>ch: as used in the transliteration of Sanskrit, a voiceless palatal aspirate, an aspirate being an explosive with excess of breath; as used in German grammar, the symbol for a voiceless palatal or guttural spirant.</p> <p>dh: voiced dental aspirate (cf. <i>ch</i>) in Sanskrit.</p> <p>ḍ: voiced cerebral explosive, so used in transliteration of Sanskrit.</p> <p>ḍh: voiced cerebral aspirate (cf. <i>ch</i>) in Sanskrit.</p> <p>ḍ̣: voiced dental (interdental) spirant, equivalent to Eng. <i>th</i> in <i>then</i>; so used in the Teutonic and Iranian languages and in phonetic writing.</p> <p>ë: a short open <i>e</i>, used in Teutonic grammar, particularly in writing O. H. G.</p> <p>e: the short indefinite or "obscure" vowel of Eng. <i>gardener</i>; used in the reconstruction of Indo-Eur. forms, and in transliterating the Iranian languages.</p> <p>gh: in Sanskrit a voiced guttural aspirate (cf. <i>ch</i>).</p> <p>g: voiced velar (back-guttural) explosive, used most frequently in Indo-Eur. reconstructions.</p> <p>ǰ: voiced guttural (or palatal) spirant, equivalent to Mod. Greek <i>γ</i>, and used in transliteration of Iranian languages and O. Eng.</p> <p>ḥ: a voiceless breathing, the Sanskrit <i>visarga</i>.</p> <p>lv: a labialized <i>h</i>, similar to <i>wh</i> in Eng. <i>what</i>; used in transliteration of Gothic and the Iranian languages.</p> <p>ḫ: voiceless guttural (or palatal) spirant, equivalent to German <i>ch</i>, and used in transliteration of the Iranian languages.</p> <p>ï: the semi-vowel <i>y</i>, or consonant form of <i>i</i>; used in phonetic writing and reconstructions of Indo-Eur. forms.</p> | <p>j: in the transliteration of Sanskrit and the Iranian languages a voiced palatal explosive; in the Teutonic languages a semi-vowel (= <i>y</i>), for which in Indo-Eur. reconstructions <i>i</i> is generally used.</p> <p>jh: in Sanskrit a voiced palatal aspirate (cf. <i>ch</i>).</p> <p>kh: in Sanskrit a voiceless guttural aspirate (cf. <i>ch</i>).</p> <p>ĭ: the guttural ("thick" or "deep") of the Slavonic and some of the Scandinavian languages.</p> <p>ł: vowel <i>l</i>; used in transliterating Sanskrit, in reconstructing Indo-Eur. forms, and in other phonetic writing.</p> <p>ŋ: nasal vowel; used in reconstruction of Indo-Eur. forms and in phonetic writing.</p> <p>ṅ: in Sanskrit the cerebral nasal.</p> <p>ñ: in Sanskrit the guttural nasal (see following).</p> <p>n: the guttural nasal, equivalent to Eng. <i>n</i> in <i>longer</i>; used in transliteration of Iranian languages.</p> <p>ñ: palatal nasal, similar to <i>gn</i> in Fr. <i>regner</i>; used in transliterating Sanskrit and in phonetic writing.</p> <p>ö: palatalized <i>o</i>; used in German and in phonetic writing.</p> <p>o: short open <i>o</i> in Scandinavian.</p> <p>ø: short palatalized <i>o</i> (ö) in Scandinavian.</p> <p>ph: in Sanskrit, voiceless labial aspirate (cf. <i>ch</i>).</p> <p>q: voiceless velar (back-guttural) explosive; used in reconstructions of Indo-Eur. forms and in other phonetic writing.</p> <p>r: vowel <i>r</i>; used in transliterating Sanskrit, in reconstructions of Indo-Eur. forms, and in other phonetic writing.</p> <p>š: voiceless cerebral sibilant, equivalent to Eng. <i>sh</i>; used in transliterating the Iranian languages and in phonetic writing.</p> <p>ṣ: voiceless cerebral spirant; used in transliterating Sanskrit.</p> <p>th: in Sanskrit a voiceless dental aspirate (cf. <i>ch</i>).</p> <p>ṭh: in Sanskrit a voiceless cerebral aspirate (cf. <i>ch</i>).</p> <p>ṭ: in Sanskrit a voiceless cerebral explosive.</p> <p>ṭ̣: a form of dental spirant used in transliterating the Iranian languages (represented in Justi's transliteration by ṭ).</p> <p>ḥ: voiceless dental (interdental) spirant, equivalent to Eng. <i>th</i> in <i>thin</i>; used in Teutonic dialects and in phonetic writing.</p> <p>u: consonant form of <i>u</i>; used in phonetic writing.</p> <p>ž: voiced cerebral sibilant, equivalent to <i>s</i> in Eng. <i>pleasure</i>, and to <i>j</i> in Fr. <i>jardin</i>; used in Iranian, Slavonic, and in phonetic writing.</p> <p>z: a symbol frequently used in the writing of O. H. G. to indicate a voiced dental sibilant (Eng. <i>z</i>), in distinction from <i>z</i> as sign of the affricata (<i>ts</i>).</p> |
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EXPLANATION OF THE SIGNS AND ABBREVIATIONS USED IN THE ETYMOLOGIES.

>, yielding by descent, i. e. under the operation of phonetic law.

<, descended from.

=, borrowed without change from.

:, cognate with.

+, a sign joining the constituent elements of a compound.

*, a sign appended to a word the existence of which is *inferred*.

ablat.	ablative	Dan.	Danish
accus.	accusative	Eng.	English
adjec.	adjective	Fr.	French
adv.	adverb	Germ.	German
cf.	compare	Goth.	Gothic
conjunc.	conjunction	Gr.	Greek
deriv. of	derivative of	Heb.	Hebrew
dimin.	diminutive	Icel.	Icelandic
fem.	feminine	Ital.	Italian
genit.	genitive	Lat.	Latin
imper.	imperative	Lith.	Lithuanian
impf.	imperfect	Mediæv. Lat.	Mediæval Latin
indic.	indicative	Mod. Lat.	Modern Latin
infin.	infinitive	M. Eng.	Middle English
masc.	masculine	M. H. Germ.	Middle High German
nomin.	nominative	O. Bulg.	Old Bulgarian (= Church Slavonic)
partic.	participle	O. Eng.	Old English (= Anglo-Saxon)
perf.	perfect	O. Fr.	Old French
plur.	plural	O. Fris.	Old Frisian
prep.	preposition	O. H. Germ.	Old High German
pres.	present	O. N.	Old Norse
pron.	pronoun	O. Sax.	Old Saxon
sc.	scilicet, supply	Pers.	Persian
sing.	singular	Portug.	Portuguese
subst.	substantive	Prov.	Provençal
vocat.	vocative	Sanskrit.	Sanskrit
<hr style="width: 20%; margin-left: 0;"/>		Sc.	Scotch
Anglo-Fr.	Anglo-French	Span.	Spanish
Arab.	Arabic	Swed.	Swedish
Avest.	Avestan	Teuton.	Teutonic

KEY TO THE PRONUNCIATION.

<p>aa..... as <i>a</i> in <i>father</i>, and in the second syllable of <i>armada</i>.</p> <p>ää..... same, but less prolonged, as in the initial syllable of <i>armada</i>, <i>Arditi</i>, etc.</p> <p>a..... as final <i>a</i> in <i>armada</i>, <i>peninsula</i>, etc.</p> <p>ă..... as <i>a</i> in <i>fat</i>, and <i>i</i> in French <i>fin</i>.</p> <p>ay or ā.. as <i>ay</i> in <i>nay</i>, or as <i>a</i> in <i>fate</i>.</p> <p>āy or ā.. same, but less prolonged.</p> <p>ã..... as <i>a</i> in <i>welfare</i>.</p> <p>aw..... as <i>a</i> in <i>fall</i>, <i>all</i>.</p> <p>ee..... as in <i>meet</i>, or as <i>i</i> in <i>machine</i>.</p> <p>ě..... same, but less prolonged, as final <i>i</i> in <i>Arditi</i>.</p> <p>e..... as in <i>men</i>, <i>pet</i>.</p> <p>e..... obscure <i>e</i>, as in <i>Bigelow</i>, and final <i>e</i> in <i>Heine</i>.</p> <p>ê..... as in <i>her</i>, and <i>eu</i> in French <i>-eur</i>.</p> <p>î..... as in <i>it</i>, <i>sin</i>.</p> <p>ī..... as in <i>five</i>, <i>swine</i>.</p> <p>ĩ..... same, but less prolonged.</p> <p>ō..... as in <i>mole</i>, <i>sober</i>.</p> <p>ō..... same, but less prolonged, as in <i>sobriety</i>.</p> <p>o..... as in <i>on</i>, <i>not</i>, <i>pot</i>.</p> <p>oo..... as in <i>fool</i>, or as <i>u</i> in <i>rule</i>.</p> <p>õ..... as in <i>book</i>, or as <i>u</i> in <i>put</i>, <i>pull</i>.</p> <p>oi..... as in <i>noise</i>, and <i>oy</i> in <i>boy</i>, or as <i>eu</i> in German <i>Beust</i>.</p> <p>ow..... as in <i>now</i>, and as <i>au</i> in German <i>haus</i>.</p>	<p>ö..... as in <i>Göthe</i>, and as <i>eu</i> in French <i>neuf</i>, <i>Chintreuil</i>.</p> <p>ÿ..... as in <i>but</i>, <i>hub</i>.</p> <p>ÿ..... obscure <i>o</i>, as final <i>o</i> in <i>Compton</i>.</p> <p>ü..... as in German <i>süd</i>, and as <i>u</i> in French <i>Buzançais</i>, <i>vu</i>.</p> <p>y or l.... see <i>l</i> or <i>y</i>.</p> <p>yu..... as <i>u</i> in <i>mule</i>.</p> <p>ÿü..... same, but less prolonged, as in <i>singular</i>.</p> <p>ch..... as in German <i>ich</i>.</p> <p>g..... as in <i>get</i>, <i>give</i> (never as in <i>gist</i>, <i>congest</i>).</p> <p>hw..... as <i>wh</i> in <i>which</i>.</p> <p>kh..... as <i>ch</i> in German <i>nacht</i>, <i>g</i> in German <i>tag</i>, <i>ch</i> in Scotch <i>loch</i>, and <i>j</i> in Spanish <i>Badajos</i>, etc.</p> <p>ñ..... nasal <i>n</i>, as in French <i>fin</i>, <i>Bourbon</i>, and nasal <i>m</i>, as in French <i>nom</i>, Portuguese <i>Sam</i>.</p> <p>ñ or n-y.. Spanish ñ, as in <i>cañon</i>, <i>piñon</i>, French and Italian <i>gn</i>, etc., as in <i>Boulogne</i>.</p> <p>l or y.... French <i>l</i>, liquid or mouillé, as (-i)ll- in French <i>Baudrillart</i>, and (-i)l in <i>Chintreuil</i>.</p> <p>th..... as in <i>thin</i>.</p> <p>th..... as in <i>though</i>, <i>them</i>, <i>mother</i>.</p> <p>v..... as <i>w</i> in German <i>zwei</i>, and <i>b</i> in Spanish <i>Cordoba</i>.</p> <p>sh..... as in <i>shine</i>.</p> <p>zh..... as <i>s</i> in <i>pleasure</i>, and <i>j</i> in French <i>jour</i>.</p> <p style="text-align: center;">All other letters are used with their ordinary English values.</p>
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NOTE.

The values of most of the signs used in the above Key are plainly shown by the examples given. But those of ö, ü, ch, kh, ñ, and v, which have no equivalents in English, can not be sufficiently indicated without a brief explanation, which is here given.

ö. The sound represented by this symbol is approximately that of -u- in *hurt* or -e- in *her*, but is materially different from either. It is properly pronounced with the tongue in the position it has when *ā* is uttered and with the lips in the position assumed in uttering *ō*.

ü. This vowel is produced with the lips rounded as in uttering *oo* and with the tongue in the position required in uttering *ee*, into which sound it is most naturally corrupted.

ch and kh. These are both rough breathings or spirants made with considerable force, *ch* being made between the flat of the tongue and the hard palate, and *kh* between the tongue and the soft palate. *ch* approaches in sound to English *sh*, but is less sibilant and is made further back in the mouth; *kh* is a guttural and has a hawking sound.

l or y. These are both used to represent the sound of French *l* mouillé, in (-i)ll- and (-i)l, which resembles English -y- in *lawyer*. Final *l*, that is, (-i)l, may be approximated by starting to pronounce *lawyer* and stopping abruptly with the -y-.

ñ or n-y. The consonants represented by ñ (Spanish ñ, French and Italian *gn*, etc.) are practically equivalent to English -ni- or -ny- in *bunion*, *bunyon*, *onion*, etc., and except when final are represented by n-y. Final ñ, as French -gn(c), may be produced by omitting the sound of -on in the pronunciation of *onion*.

v. This may be pronounced by attempting to utter English *v* with the use of the lips alone.

See PREFACE (p. xli.) and the article PRONUNCIATION OF FOREIGN NAMES.

THE UNIVERSAL CYCLOPÆDIA.

A



the first letter of the alphabet. As the leading letter of the alphabet, A inherits its position from the ancient Phœnician alphabet, and as it evidently did not there indicate the vowel *a*, it can not be said to owe its primacy to the peculiar character of this vowel. (See ALPHABET.) Its original name, aleph, was pronounced alpha

by the Greeks. An old English name, *A-per-se*, or *Aper-se*, i. e. "A by itself," like *E-per-se*, etc., probably an adaptation of the Byzantine $\epsilon \psi\iota\lambda\delta\nu$ ("e simple" to distinguish from *ai*) and $\delta \psi\iota\lambda\delta\nu$ (to distinguish from *oi*), is now nearly obsolete (but cf. *ampersand* = & perse &). A with a stroke above it (*á*), in the ancient Greek, denoted the first numeral, but *α* with the stroke beneath stood for 1,000. In logic, A is the sign employed to denote a universal affirmative proposition. A¹ (or "A No. 1") is often applied in mercantile affairs to denote any article of the very highest class. In registering vessels, A designates the character of the hull of the vessel, while the figure 1 marks the efficient state of her anchors, cables, stores, etc. In Latin, A stands for several proper names, especially for the prænomen *Aulus*. For other uses of A as an abbreviation, see ABBREVIATIONS.

Revised by B. I. WHEELER.

A: a note in music, the major sixth of the scale of C major. It is the standard tone from which as a starting-point most instruments are tuned. See **PITCH**.

Å, å: Swedish *a*; sounded as English long *o* (*ō*).

A, Ab, or Abs: a Latin particle signifying "from," "off," "away," and forming the prefix of a multitude of English words, as *abduct*, to "lead or take away"; *abstract*, to "draw away or from"; *avert*, to "turn away." This must be discriminated in modern English from other *a* prefixes of various origin, as in *abed*, *alive*, *once a year*, where *a* represents the old English preposition *an*, or in *amuse*, *avenge*, where *a* is a French representative of Latin *ad*.

Aa: the name of several rivers or streams in Germany, Switzerland, Holland, Russia, and France. It is supposed to signify "water," and to be etymologically related to the Latin *aqua*. The Icelandic word for "river" is *á*. In Swedish this primitive form becomes *å*, and in Danish *aa*, and these syllables become very often the termination of names of rivers in the three countries mentioned. **Aach**, or **Ach**, another form of the same, constitutes a part of several geographical names, as *Aachen* (the German of Aix-la-Chapelle), *Biberach*, etc.

Aachen: See **AIX-LA-CHAPELLE**.

Aageson, **SVEND**: Danish historian; flourished in the second half of the twelfth century. He wrote *Compendiosa historia regum Daniæ*, the first continuous history of Denmark. It is written in Latin, and describes Denmark from Skjold down to the year 1185. The latest Danish translation of Aageson's work is by Fenger (1842).

Aal'borg: a seaport of Denmark, in Jutland, on the south shore of the Lymfiord, through which vessels pass into the Cattagat, and 63 miles N. W. of Aarhuus (see map of Europe, ref. 4-G). The number of vessels arriving here annually amounts to about 600. Pop. (1890) 19,503.

Aa'li Pash'a, **MEHEMED EMIN**: Turkish statesman; b. in 1815 at Constantinople; was appointed Minister of Foreign Affairs Aug. 15, 1845, which position he filled three times from 1846 to 1853. In Dec., 1845, he became chancellor of the divan, in 1846 pasha, and in 1852 for the first time grand vizier, which position he afterward held several times. In 1855 he represented Turkey at the conferences of Vienna and Paris, and signed the treaty of Paris of Mar. 30, 1856. In May, 1864, he presided at the conference of European powers for settling the Roumanian question. In 1867, while the sultan undertook a tour over the Continent, Aali Pasha was appointed regent of the empire. In the same year he went to Candia to settle the difficulties there. D. Sept. 6, 1871.

Aall, **JAKOB**: b. at Porsgrund, Southern Norway, July 27, 1773; studied theology at the University of Copenhagen, afterward natural history and mineralogy at the mining-school of Freiberg; settled in 1799 on his estate, Näs Iron-works, near Arendal; and divided his time between the development of his extensive possessions, public business, and literary occupations. He was one of the most prominent among the representatives who assembled at Eidsvold in 1814 and formed the present free Norwegian constitution, and he sat in the Storting from 1816-30. D. Aug. 4, 1844. His *Erindringer som Bidrag til Norges Historie fra 1800 til 1815* (3 vols., 1844-45) is one of the principal sources of the history of Norway during that period. He also published a translation of Snorre Sturlason's *Heimskringla* (2 vols., 1838-39).

Aar: a river of Switzerland, rising in the Grimsel and Schreckhorn mountains in the canton of Bern; forms the remarkable fall of Handeck; traverses the lakes of Brienz and Thun, and enters the Rhine opposite Waldshut; length, 175 miles. It is navigable from Thun to its mouth. **AAR** is also the name of several rivers of Germany.

Aa'rau: a town of Switzerland; capital of Aargau, on the river Aar, 63 miles by railway W. of Zurich (see map of Switzerland, ref. 3-F). It has manufactures of silk and cotton stuffs, mathematical instruments, etc. In 1798 it was the capital of the Helvetic republic. Pop. about 6,000.

Aard-Vark [Dutch of S. Afr. *aarde*, earth + *vark*, pig; Lat. *porcus*]: literally "earth-pig"; a mammal (*Orycteropus capensis*) of the order *Edentata*, found in South Africa. It is a plantigrade, is about 5 feet long, including the tail, burrows in the ground if pursued, and quickly enters so far that it is beyond the reach of the pursuer. It feeds on ants, seeking its prey by night; it readily breaks down the walls of the ant-hills, catching the insects with its long prehensile and slimy tongue. Its flesh is often used as food. A second species (*Orycteropus aethiopicus*) inhabits Northeastern Africa.

Aard-Wolf [Dutch of S. Afr. earth-wolf]: lit. "earth-wolf"; a carnivorous digitigrade mammal (*Proteles cristatus*).



Aard-Vark.

tus), a native of South Africa. It is about equal in size to a fox, and resembles a hyana in most details of structure and in general appearance, differing conspicuously in the greatly reduced molar teeth, which are almost rudimentary. It burrows in the ground, has nocturnal habits, and feeds on small insects, larvæ, and decomposing animal substances.

Aar'gan (Fr. *Aargovie*): a canton in the north of Switzerland, bounded on the N. by Germany, on the E. by Zurich, on the S. by Lucerne, and on the W. by Basel and Solothurn. Area, 542 sq. miles (see map of Switzerland, ref. 2-F). The chief rivers are the Aar and the Limmat. It consists chiefly of fertile and well-cultivated hills. Its minerals are unimportant, but it has remarkable paleontological remains in its rocks. Fruit of all kinds is produced in large quantities, and many cattle are raised here. It has important cotton-factories. There are mineral springs at Baden and Schinznach. Pop. (1880) 198,645, of whom 108,029 were Protestants, 88,893 Roman Catholics, 489 belonged to other Christian churches, and 1,234 were Jews; (1894) 190,246. Aargau formed part of the canton of Bern until 1798, but was erected into a separate canton after the Helvetic republic was proclaimed, and was organized in 1803. The constitution dates from 1841, and was revised in 1852 and 1862. Capital, Aarau. See Müller's *Der Aargau*.

Aar'huus: a seaport of Denmark, on the east coast of Jutland, on the Cattegat, 37 miles S. E. of Viborg (see map of Europe, ref. 4-E). It has a cathedral, a museum, a library, and various manufactories. Pop. (1880) 24,831; (1890) 33,308.

Aar'on (Heb. אהרן): the first high priest of Israel; was a great-grandson of Levi, unless there are omissions in the genealogy. He was three years older than his brother Moses (Ex. vii. 7). They had a sister, Miriam, and perhaps an older sister (Ex. ii. 4). An impulsive and eloquent man, he was appointed spokesman to Moses, whom he assisted in the deliverance of the Israelites from the bondage in Egypt. He died on Mount Hor, which is still called the "Mountain of Aaron," and was succeeded in the priesthood by his son Eleazar.

Revised by W. J. BEECHER.

Aaron ben-Asher: Jewish scholar of Tiberias of the tenth century. The variations in the text of our Hebrew Bibles are almost exclusively in the vowels. One of the two existing recensions, the Occidental or Palestinian, is the work of Aaron ben-Asher, and is generally preferred to that of his rival, Moses ben-Naphtali. The famous codex, called after Ben-Asher, was preserved at Berëa (the biblical Helbon), and is the original of our present Masoretic text. See Strack, *Prolegomena*; Graetz, *History of the Jews*.

C. H. TOY.

Aaron, SAMUEL: Baptist minister and educator; b. in 1800 at New Britain, Pa.; ordained in 1829; held pastorates at New Britain and Norristown, Pa., and at Burlington and Mt. Holly, N. J. He also gained great reputation as a teacher in various schools, especially at Treemount Seminary, near Norristown, and the Mt. Holly Institute. He was the author of various text-books. D. at Mt. Holly, N. J., Apr. 11, 1865.

Aar'sens, or Aarssens, FRANCISCUS van: b. at The Hague in 1572; son of the Dutch statesman Cornelis van Aarsens (1543-1624). The younger Van Aarsens was sent to the court of France as resident in 1598, and as ambassador in 1609 and in 1627; to Venice from 1609 to 1615, and again in 1619; to England in 1626 and in 1640, when he negotiated the marriage between the Prince of Orange (William II. of Nassau) and the Princess Mary, daughter of Charles I. of England. D. in 1641.

Aa'sen, IVAR ANDREAS: Norwegian writer; b. at Aasen in Söndmøre, Aug. 5, 1813; was at first a school-teacher, but subsequently devoted himself wholly to the study of the Norwegian dialects. He was supported in this study by the Dronheim Association of Sciences, which furnished him the means of visiting all parts of the country. He wrote *Det Norske folkesprogs grammatik* (1848); *Ordbog over det Norske folkesprog* (1852; new and much improved ed. 1873); and *Norske ordspog* (1856).

Aas'vær, or Vaero, Islands: a group of islands under the Arctic circle, about 10 miles from the Norwegian coast, formerly leased for a small price to two poor fishermen. At present they are one of the most important fishing-places in Europe. About Dec. 10, when the herrings arrive, over 10,000 fishermen come here, and in two or three weeks catch about 200,000 kegs of herrings. From Jan. 1 to Dec. 1 the

islands are inhabited by only a few families. (For location, see map of Norway and Sweden, ref. 5-D.)

Ab, or Abs: See A.

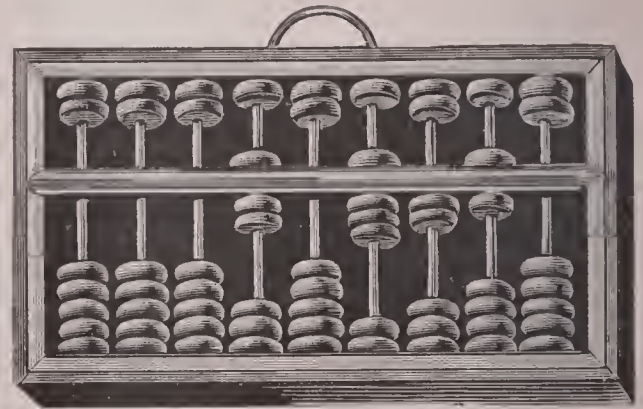
Ab: the eleventh month of the Jewish civil year, and the fifth of the ecclesiastical year, corresponding to part of July and part of August.

Abab'de: a village of Middle Egypt, on the east bank of the Nile, 8 miles S. of Beni-Hassan. Near it are the ruins of the ancient Antinoë (or Antinoöpolis), a city built by the Emperor Hadrian (or Adrian) in honor of his favorite Antinoüs.

Ab'aca: See MANILLA HEMP.

Ab'aco, or Great Abaco: the largest of the Bahama islands, 80 miles long; its N. E. point is in lat. 25° 51' N., lon. 77° 5' W. Area about 96 sq. miles (see map of North America, ref. 9-H). Carleton is the chief town.—LITTLE ABACO lies W. of the northern part of Abaco. Population of the two about 2,400.

Ab'acus [Lat., from Gr. ἀβαξ, reckoning-board]: a calculating instrument used in mercantile transactions by the ancient Greeks and Romans. It is still used by the Chinese, the Japanese, etc., and to a certain extent is used in a very simple form in the schools of Europe and America to illustrate addition and subtraction. As thus used, it usually consists of several parallel wires stretched from side to side of a rectangular frame, each wire carrying ten sliding beads, or counters. The wires represent successive *orders* of units,



Chinese abacus.

and the counters stand for *units* of the several orders. The Chinese abacus, or swan-p'an (literally "reckoning-board"), called in Japan *soro-ban*, has seven (or six) beads on each wire, divided into two unequal sections by a crosspiece, with five beads on one side and two (in Japan generally one) on the other. Each bead in the larger section represents one, and in the smaller section five (units, tens, hundreds, etc., as the case may be). Reckoning on the swan-p'an is decimal. One is represented by pushing up to the crosspiece a single bead on the larger section of the wire chosen to represent unity; 6 may be added to that by pushing up another bead on the same section of the wire and bringing down one of the two beads on the shorter section; 20 may be added to that by pushing up two of the five beads on the wire next on the left; and 800 by pushing up three of the five beads on the wire to the left of *that*, and bringing down one of the two on the shorter section of the same wire, and so on. The swan-p'an serving merely to set down the successive steps of a mental calculation. It is used for the most elaborate calculations, but has the drawback that in case of error one can not go back over these successive steps to find out where the error is. *Ab'acus Pythagor'icus* was anciently a name for the multiplication table. The word has also an architectural meaning, and signifies the level tablet placed between the entablature and the capital of a column.

Revised by R. LILLEY.

Abâd: an affix of Persian origin, signifying "abode," and occurring in the names of many cities in the East; as *Hyderâbâd*, the "abode or city of Hyder."

Abâd: the name of several kings who reigned in Moorish Spain. Abâd I. was the first Moslem king of Seville. He began to reign in 1023 and died in 1042. Abâd III., the last of this dynasty, died in 1095.

Abad, DIEGO JOSÉ, S. J.: Mexican Latinist and poet; b. July 1, 1727, in the state of Michoacan, Mexico; became in 1741 a member of the Jesuit Society, and devoted himself to

teaching. In 1767, when the Jesuits were expelled from Mexico, Abad, then rector of the College of Querétaro, was obliged to go into exile in Italy, where he lived for some years at Ferrara. Before leaving Mexico he had begun to write his greatest work, a Latin poem entitled *Heroica de Deo Carmina*. The first twenty-nine cantos of this were published in Cadiz in 1769; and this edition was followed by three others at short intervals, each containing more matter than the preceding (Venice, 1773; Ferrara, 1775; and the final, complete edition, Cesena, 1780). This last edition Abad never saw, as he died in Barcelona, Sept. 30, 1779.

A. R. MARSH.

Abad'don: a Hebrew name (meaning "destruction") applied to the angel of the bottomless pit; the same as the Asmodeus of Tobit iii. 8, and the Apollyon of Rev. ix. 11.

Abalone: See EAR-SHELL.

Ab'ana: the name of one of the rivers of Damascus mentioned in the Bible (2 Kings v. 12). Its identification with the modern Barada is now generally accepted. See Porter's *Five Years in Damascus* (1855).

Abancay, ab-an-kí': town of Peru, in the department of Cuzco; situated on the river Abancay, 74 miles W. S. W. of Cuzco (see map of South America, ref. 5-B). It has large sugar-refineries, and there are silver mines in the vicinity. Pop. estimated at about 1,200.

Aban'donment [from the Fr. *abandonner*]: in law, used in several senses, depending upon the subject to which it is applied:

1. *In Insurance*.—In certain cases of partial loss abandonment is the transfer by the insured (at his election) of the entire property to the insurers, in order to claim a total loss. The insurers would thus become the owners of the property in its impaired condition. This act is called abandonment, and the "total loss" thus occasioned is termed constructive. It is applicable particularly to marine insurance. The rules by which the subject is governed in Great Britain differ somewhat from those in force in the United States. The general principle is that a serious injury must have happened by a marine peril to the ship or cargo (the value must have usually been diminished more than one-half), or the purposes of the voyage as to the ship must have been substantially defeated, as in the case of an embargo for an indefinite time. The act of abandonment must be exercised by the insured not upon mere conjecture, but upon credible information, and without delay. No particular form is necessary.

2. *As to Personal Property*.—The act of an owner who casts away or otherwise relinquishes personal property, so as to cause his ownership to cease. This may readily occur in the case of property at sea. The intent is a principal subject of inquiry. Property in this condition is otherwise called "derelict."

3. *Real Estate*.—Abandonment in this branch of the law applies to the relinquishment of incorporeal rights, such as easements. There can be no abandonment of the ownership of the land itself. This must be parted with by some recognized mode of conveyance, such as a deed, or the principle of estoppel must be invoked or the rules of the statute of limitations.

4. *By Husband or Wife*.—In the legal relation of husband and wife the word abandonment is frequently employed as an equivalent to *desertion*. It is in some instances defined by statute.

5. *In the Civil Law*.—In this law a person could escape responsibility for a tort or trespass committed by his slave or animal by abandoning the slave or animal to the person injured.

Revised by HENRY WADE ROGERS.

6. In old ecclesiastical law *abandonment to the secular arm* meant the handing over of offenders by the church authorities to the civil power for such punishment as could not be administered by the ecclesiastical tribunals. In the case of the clergy, degradation from their priestly rank preceded such transfer to the secular authorities. W. S. PERRY.

Abano, PIETRO d' (also called *Petrus de Apono* or *de Padua*): b. in 1246 at Abano, near Padua; studied Greek at Constantinople, mathematics at Padua, and medicine at Paris, and settled at Padua, where he taught alchemy and astrology according to the methods of Averroës, and practiced medicine, also according to Arabic methods, with such success that he could charge Pope Honorius IV., who called him to Rome to consult him, 400 ducats a day. Envious of his fame and riches, the clergy denounced him as a sorcerer,

as possessor of the philosopher's stone, etc., and the Inquisition sentenced him to be burned. He died a natural death, however, in the dungeon at Padua, in 1315 or 1316, and his corpse was rescued by a friend, but his image was burned in the public square. His principal work, *Conciliator differentiarum, quæ inter philosophos et medicos versantur*, has often been reprinted.

Abar'ca, JOAQUIN: a Spanish bishop and leader of the absolutist party; b. in 1780; made a bishop by Ferdinand VII., on account of his zealous advocacy of the principles of absolutism. Subsequently he became prime minister of Don Carlos, but after a time fell into disfavor for being too moderate. He was banished, and died in 1844.

Aba'rim (meaning "regions beyond"): a mountain range of Moab, on the east side of Jordan, opposite Jericho, mentioned in Num. xxvii. 12 and elsewhere. Pisgah is either the same as Abarim or a part of it. This line of mountains rises to the height of nearly 3,000 feet above the Mediterranean, and more than 4,000 feet above the Dead Sea. As seen from Jericho or the Mount of Olives, the summit of the range is apparently almost level. But recent explorers report considerable inequalities of surface. The highest of the peaks, still called Mount Nebo or Nebbeh, is thought to be the Nebo from which Moses viewed the Land of Promise (Deut. xxxiv. 1-4).

Abascal', JOSÉ FERNANDO: Spanish commander; b. at Oviedo in 1743. He entered the army in 1762; served against the French and the British; became intendant of New Galicia; and in 1804 was appointed Viceroy of Peru. He was an able and popular ruler, and accomplished much for the people of Peru. In 1812 he was made a marquis. He was recalled in 1816. D. at Madrid, June 30, 1821.

Aba'sia: See ABKASIA.

Abatement [from the Fr. *abattre*, to strike away]: a legal term of various application:

1. *Title to Real Estate*.—The intrusion or wrongful entry of a stranger upon land after its owner's death, and before the entry of an heir or devisee, and thus keeping him out of possession. The wrong-doer is termed an abator.

2. *Nuisances*.—The act of destroying or removing a nuisance, which may take place without legal process. No unnecessary damage must occur, and the act must be done without a breach of the peace.

3. *Legacies and Debts*.—In respect to legacies and creditors' claims, the word means a proportionate reduction of them where there are not sufficient assets to make full payment.

4. *Pleadings*.—The effect on an action at law of a plea showing that the writ or declaration is defective and incorrect. A defendant may assert by a "plea in abatement" that the plaintiff's action ought to cease by reason of some informality or irregularity. It is called a *dilatory* plea, because it does not meet the case upon the merits. Such pleas are not favored in modern law, and there is a tendency to confine them by statute within narrow limits. If the cause is abated on such grounds, a new action may be brought.

5. *Practice*.—The termination of a litigation by the occurrence of some event during its progress, such as the death or disability of a party. In a court of law the regular effect of the death of a party was to cause the action to abate altogether. In a suit in equity proceedings were suspended, and might be revived by established methods. Similar rules were applied to disabilities, such as the coverture of a female party to an action. The effect of this doctrine is largely modified in codes of procedure in the United States, and in Great Britain by the "Common Law Procedure" act. Under these statutory regulations an action may, after the death of a party, be continued by or against his representatives, on motion to the court in which the action is pending. The application is subject to regulations to prevent unnecessary delay. There are certain actions in which there can be no revival. An instance is that of a cause of action for a personal wrong (tort). This is said to "die with the person." In other words, it can not be prosecuted by or against the executors or administrators of a party sustaining or inflicting the wrong.

Revised by HENRY WADE ROGERS.

Abatement: in heraldry, anything added to a coat-of-arms to denote inferiority or disgrace. This is an absurdity, because a coat-of-arms is a statement of the honorable position of its bearer and not of his discredit. The only abatement in use is the BEND SINISTER (*q. v.*).

Abattis, or **Abatis** [Fr.]: in fortification, a bulwark or obstruction formed by trees felled and placed side by side, so that their tops are directed toward the enemy. Sometimes the smaller branches are lopped off and the ends of the larger branches sharpened. See FORTIFICATION.

Abattoir: a public establishment in which cattle, sheep, etc., are killed, with such sanitary arrangements as will guard the population of a city against the nuisances of private slaughter-houses. This improvement originated in Paris in 1807, and has been adopted in New York and other large cities.

A Battuta [It.]: in music, in strict or measured time.

Abat-voix [from Fr. *abattre*, to beat down, and *voix*, the voice]: a sounding-board, generally of shell-shape, placed behind, and projecting over, a rostrum or pulpit, for the purpose of throwing the speaker's voice in any desired direction. Notable instances are found in Trinity and Grace churches in New York city and in Trinity church in Boston.

Abauzit, a-bō'zee, FIRMIN: French Protestant philosopher and mathematician; b. at Uzès, Languedoc, Nov. 11, 1679; educated at Geneva; traveled in England and Holland, and wrote several works on theology, antiquities, etc. He was a friend and correspondent of Sir Isaac Newton, who esteemed him highly, and he was profoundly versed in many branches of learning and science. He died in Geneva, Mar. 20, 1767.

Abadie, ANTOINE and ARNOULD MICHEL d': two brothers and French travelers; b. in Dublin in 1810 and 1815; explored Abyssinia and Upper Egypt between 1838 and 1848; traveled up the White Nile, and even visited Darfur. Their more important works are *Nouvelles du haut fleuve Blanc*; *Note sur la route du Darfour*; *Sur les nègres Yambo*; *Géodésie d'Éthiopie*, etc. (1860-63); and *Douze ans dans la Haute-Éthiopie* (2 vols., 1868). Their collection of Ethiopic and Amharic manuscripts, numbering 234, was until recently the largest in Europe. Arnould died Nov. 13, 1893.

Abadie, JACQUES: eminent scholar and divine of the Reformed faith; b. at Nay, in Bern, about 1657. So distinguished was he for his learning that, on the completion of his course of study at Sedan, he received the degree of doctor in theology, although but seventeen years of age. After ministering in a French church at Berlin for some years, he accompanied Marshal Schomberg, in 1688, to England, where he became minister of the French church in the Savoy, London. Having received episcopal ordination, King William made him Dean of Killaloe, Ireland. He published a defense of the Revolution of 1688, but is best known by his religious treatises, the most important of which were *Traité de la Vérité de la Religion Chrétienne*, and its continuation, *Traité de la Divinité de Jésus-Christ*, and *L'Art de se connaître soi-même*. D. in London, Sept. 25, 1727.

W. S. PERRY.

Abbandonamen'te [It.]: in music, "with self-abandonment"; despondingly.

Abbas', or, more fully, **Abbas-Ibn-Abd-il-Moot'talib**: a paternal uncle of Mohammed, and the ancestor of the dynasty of Abbassides; b. at Mecca about 566 A. D. He fought against Mohammed at the battle of Bedr, but was afterward converted, and rendered important services to that prophet.

Abbâs I., or **Shâh Abbâs**, surnamed THE GREAT: King of Persia; b. in 1557; son of Mohammed Mirza. He began to reign about 1584, and distinguished himself by his ability and energy. In 1605 he defeated the Turks in a great battle, and recovered the Persian provinces which they had occupied. D. at Kaswin, Jan. 27, 1628.

Abbâs-Mîr'za: son of Fatah Ali Shah, King of Persia; b. in 1783. He commanded the Persian army which was defeated by the Russians in 1811. He was a prince of superior talents, and promoted the introduction of European culture and military tactics into Persia. He died before his father at Meshed, Dec., 1833.

Abbâs Pasha: Viceroy of Egypt (the third of the present dynasty); a grandson of Mehemet Ali; b. at Yedda, in Arabia, in 1813. He succeeded his uncle, Ibrahim Pasha, Nov. 9-10, 1848, and d. July 13, 1854. He was succeeded by his uncle, Saïd Pasha.

Abbassides, or **Abbasides** (Lat. *Abbasidæ*; called by the Arabs BENI ABBÂS, i. e. sons or descendants of Abbas): a celebrated dynasty of caliphs who reigned at Damascus,

and afterward at Bagdad, from 762 to 1258 A. D. They traced their genealogy to Abbâs, the uncle of Mohammed. To this dynasty belonged the caliphs Harun-al-Rashid and Al-Mamun.

Abbate, NICCOLO dell': historical painter; b. in Modena, 1512; d. at Fontainebleau, 1571. He is best known by his frescoes in the castle of Fontainebleau, from designs by Primaticcio. See his life by Reiset, Paris, 1859.

Abbé: an ecclesiastic, or student of theology, supported by the revenue of a monastery, though he did not always become a priest. Abbés often devoted themselves to literature or were tutors in wealthy families. Before the French Revolution the king could nominate 225 *abbés commendataires*, whose offices were sinecures. The term is still applied in French-speaking countries to all who dress as ecclesiastics. See ABBOT.

Abbe, CLEVELAND, M. A., Ph. D., LL. D.: meteorologist and writer on meteorological subjects; b. in New York city, Dec. 3, 1838; graduated in 1857 from the N. Y. City Free College; studied engineering and astronomy at Ann Arbor and was instructor there 1859-60; was aide in the coast survey longitude work under Dr. B. A. Gould at Cambridge, Mass., 1860-64; resided at the Pulkowa Observatory, Russia, 1864-66; later was assistant in the U. S. Naval Observatory; in 1868 became director of the Cincinnati Observatory, where he organized a system of daily telegraphic weather-reports and predictions for the benefit of the Chamber of Commerce of that city. He was Professor of Meteorology in the signal service and assistant to the chief signal officer 1871-91. Since July 1, 1891, senior meteorologist of the Weather Bureau. He devised and initiated the present system of standard time. He was a delegate to the International Meridian Conference, Washington, 1884, and the International Meteorological Conference at Munich, 1892. He is a member of the National Academy and other scientific societies. His scientific publications have been very numerous, and are characterized by a high order of learning and ability and by a keen appreciation of the advances of science abroad. Among his writings may be mentioned: *Dorpat and Pulkowa* (1868-70); *Weather Bulletin of Cincinnati Observatory* (1869-70); *Solar Spots and Terrestrial Temperature* (1869); *Suggestions on the Use of Weather Reports* (1871); *Observations of Coggia's Comet* (1874); *Report of Committee on Standard Time* (1879); *Annual Reports of Progress in Meteorology* (1872-89); *Report on Meteorological Observations during the Expedition to the West Coast of Africa* (1891); *A Plea for Terrestrial Physics* (1891); *Atmospheric Radiation* (1892); *A Treatise on Meteorological Apparatus* (1887); *Preparatory Studies for Deductive Methods in Meteorology* (1889). M. W. HARRINGTON.

Abbeoku'ta, or **Abeokuta** (i. e. under the rock): a large town of Western Africa; capital of the kingdom of Egba, in Yoruba; built on granite hills around a rock 250 feet high; on the left bank of the Ogun river, 120 miles N. W. of Benin (see map of Africa, ref. 5-C). The late Negro bishop Crowther established a newspaper here in the Egba language; the number of Christians is estimated at 2,000. The city was founded in 1825, has rapidly increased, and has become an important missionary station. The surrounding country, called Egbaland, comprises an area of nearly 3,000 sq. miles. Pop. of the town estimated at 150,000; of the adjacent dependent country, 50,000.

Abdess [O. Fr. *abbesse* < Late Lat. *abbatis'sa*]: the superior of a convent of women, elected for life, and solemnly admitted to office by a bishop, corresponding in rank and authority to an abbot, except that, not being capable of receiving holy orders, she can not execute the functions of the priesthood nor perform any act implying real spiritual jurisdiction. In England abbesses were permitted to attend ecclesiastical councils. At the council of Beaufield, A. D. 694, they were not only present but signed the decrees before the priests. Among the Celts they presided over religious houses occupied jointly by monks and nuns, and this custom prevailed among the Celtic monastic missions in France and Spain, and even in Rome itself. The title of abbess is applied in Hanover, Würtemberg, Brunswick, and Schleswig-Holstein to the lady superiors of Lutheran seminaries and sisterhoods to which conventual endowments and realty were transferred at the period of the Reformation.

W. S. PERRY.

Abbett, LEON: lawyer and politician; b. in Philadelphia, Oct. 5, 1836; studied law; removed in 1862 to Hoboken,

N. J.; elected corporation attorney 1863, and member of the Assembly in 1864; settled in Jersey City 1866; elected to the State Senate in 1874; elected Governor by the Democratic party in 1883, and again at the expiration of the term of his successor; associate justice of the Supreme Court of New Jersey, 1893. D. in Jersey City, Dec. 4, 1894.

Abbeville, ab'veel': fortified city of France; on the river Somme; in the department of Somme, on the Northern R. R., 36 miles by rail N. W. of Amiens (see map of France, ref. 2-E). It contains a fine cathedral and manufactories of woolen cloths, etc. Abbeville has in late years been made famous by the discovery of many interesting relics of prehistoric man in the valley of the Somme at that place. Pop. (1896) 19,669.

Abbeville C.-H., ab'be-vil: capital of Abbeville co., S. C. (for location of county, see map of South Carolina, ref. 5-C); on main line Georgia, Carolina and Northern R. R., and terminal of Abbeville branch of Columbia and Greenville R. R.; 97 miles from Columbia, S. C., and 133 miles from Atlanta, Ga.; has a 20-ton cottonseed-oil mill, 3 gineries, 1 shoe-factory, 2 banks, 2 weekly newspapers, a good hotel, 6 churches, and a public-school system. Pop. (1880) 1,543; (1890) 1,696; (1900) 3,766.
EDITOR OF "PRESS AND BANNER."

Abbeville Treaties: two treaties; one between Henry III. of England and Louis IX. of France, May 20, 1259; the other between Henry VIII. of England and Francis I. of France, Aug. 18, 1527. By the former Henry III. gave up all claim to Normandy, Anjou, Touraine, Maine, and Poitou; but he was guaranteed possession of some other provinces of France, which he was to hold as fiefs, and was to sit with the peers of France as Duke of Guienne, and was to drop the titles of Duke of Normandy and Count of Anjou.

Abbey, EDWIN AUSTIN: genre painter and illustrator; b. in Philadelphia, Pa., in 1852. Best known as an illustrator of periodicals and books. His subjects are mostly found in English songs and tales. He works equally well with pen and ink and with the brush, but as a pen-draughtsman he enjoys a world-wide reputation. Among his principal works in illustration are drawings for *Selections from the Poetry of Robert Herrick*; *Old Songs*; Goldsmith's comedy *She Sloops to Conquer*; and *As You Like It*, *The Tempest*, *All's Well that Ends Well*, and *The Merchant of Venice*. He is notably successful as a story-teller in illustration, and possesses a fine talent for composition. Member of the Society of American Artists (1881); American Water-Color Society; and Royal Institute of Water-Color Painters, London. Received a second-class medal, Munich International Exhibition, 1885; first-class medal, Universal Exposition, Paris, 1889. Principal pictures: *Slage Office* (1876); *The Evil Eye* (1877); *Lady in a Garden* (1878); *Rose in October* (1879); *The Wandering Minstrel*; *The Sisters*; *The Widower* (1883); *Reading the Bible* (1884); and *Visitors* (1890). Began his art studies at the Pennsylvania Academy of Fine Arts, Philadelphia. Has resided in England since 1883; studio in London.
WILLIAM A. COFFIN.

Abbey, HENRY E.: theatrical manager; b. in Akron, O., 1848; began his career as manager for Edwin Adams in 1870; acted as manager for Lawrence Barrett, Lotta, Sara Bernhardt, Patti, Neilson, Mrs. Langtry, Henry Irving and others with great success. D. in New York, Oct. 17, 1896.

Abbey, RICHARD: Methodist clergyman and author; b. in Genesee co., N. Y., Nov. 16, 1805; removed to Illinois in 1816, and to Natchez, Miss., in 1825. In 1844 he entered the ministry in the Methodist Church, and was afterward a member of the Mississippi Conference of the Methodist Episcopal Church South. He published *Lettters to Bishop Green on Apostolic Succession* (1853); *End of the Apostolic Succession*; *Creed of All Men* (1855); *Ecclesiastical Constitution* (1856); *Church and Ministry* (1859); *Diuturnity* (1866); *Ecce Ecclesia* (1868); *The City of God and the Church-makers* (1872); *Baptismal Demonstrations*; *Divine Assessment*; *Strictures on Church Government*; and *The Divine Call to the Ministry*. D. Oct. 23, 1891.

Abbitib'bie, or **Abbitib'be**: a lake and a trading-station in British North America, 200 miles S. of James's bay, with which they are connected by the Abbitibbie river. (For location, see map of North America, ref. 5-G.)

Abbon of Fleury (in Latin, *Ab'bo Floriacen'sis*): French monk; b. near Orleans in 945; was one of the most learned men of his age; wrote an *Epitome of the Lives of Ninety-one Popes*. D. in 1004.

Abbon the Crooked (*Ab'bo Cer'nuus*): Northman by birth; became a monk of St. Germain-des-Prés; d. about 923; described the siege of Paris by the Northmen (885-887) in a Latin poem, a French translation of which is found in Guizot's *Collection des documents relatifs à l'histoire de France*.

Ab'bot [Late Lat. *Abbas*, -is, Gr. ἀββάς, from Syriac *abbā*, father]: the superior of a convent or monastery, and an ecclesiastic of high rank in the Roman Catholic Church. Abbots are ranked, as prelates of the Church, next to bishops; and have the right to vote or speak in the general councils, if the territory to which their jurisdiction extends be not included in a diocese, or if they be heads of several associated monasteries. In England there were formerly a number of *mitred abbots*, who sat and voted in the House of Lords.

Abbot of Misrule, or **Abbot of Fools**: called in Scotland the "Abbot of Unreason"; a title given in the Middle Ages to the master of revels, and especially to the person appointed to preside over Christmas festivities.

Abbot, BENJAMIN, LL. D.: teacher; b. at Andover, Mass., Sept. 17, 1762; graduated at Harvard College in 1788. He was principal of Phillips Academy at Exeter, N. H., for fifty years (till 1838). Among his pupils were Daniel Webster, Alexander H. Everett, Edward Everett, Lewis Cass, Jared Sparks, and George Bancroft. Of fine character and courtly manners, he had great power over his pupils. D. at Exeter, N. H., Oct. 25, 1849.

Abbot, EZRA, D. D., LL. D.: b. in Jackson, Me., Apr. 29, 1819; graduated at Bowdoin College 1840; became in 1856 assistant librarian in Harvard College; in 1872 professor of New Testament criticism and interpretation in the Cambridge Divinity School; published *Literature of the Doctrine of a Future Life* (1864-71). He also served as assistant and editor of such works as Norton's *Gospels*, Hackett's revision of Smith's *Bible Dictionary*, Noyes's *New Testament*, and Hudson's *Concordance*. Wrote *The Authorship of the Fourth Gospel* (1880); prepared *The Literature of the Doctrine of a Future Life*, an exhaustive bibliography originally appended to W. R. Alger's *History of the Doctrine of a Future Life* (published in 1871; new ed. 1878); was member of the Bible Revision Committee; and shortly before his death was tendered the Doctorate in Divinity, though a layman, by the University of Edinburgh. In 1888 a large octavo volume of his critical essays was published, including *The Authorship of the Fourth Gospel*, in an expanded form. D. at Cambridge, Mass., Apr. 28, 1884.

Abbot, FRANCIS ELLINGWOOD, Ph. D.: writer on philosophical and religious subjects; b. in Boston, Mass., Nov. 6, 1836; graduated at Harvard University; had charge of Unitarian congregations at Dover, N. H., and Toledo, O.; editor of *The Index*, 1870-73; author of *Scientific Theism* (1885); *The Way out of Agnosticism, or the Philosophy of Free Religion* (1890); and numerous essays and articles in the *North American Review* and other periodicals.

Abbot, GEORGE, D. D.: b. at Guildford, Surrey, England, Oct. 19, 1562, and educated at Balliol College, Oxford, where he became Master of University College in 1597, and was thrice appointed Vice-Chancellor. His name appears second on the list of the eight Oxford divines chosen to prepare the translation of the N. T. (except the Epistles) of King James's version. His preferment was rapid. Appointed Bishop of Lichfield and Coventry in 1609, he was translated to London within a month, and became Archbishop of Canterbury in Jan., 1611. He was noted for his liberal principles, and was a rival or opponent of Laud. He refused to allow the reading of the king's declaration, permitting sports and pastimes on the Lord's day, at Croydon, where he happened to be at the time. D. at Croydon, Aug. 4, 1633. Among his numerous works his *Geography, or Brief Description of the Whole World*, is remembered on account of its reference to the earliest American colonization. His *Exposition of the Prophet Jonah*, published in 1600, was reprinted in 1845.

Abbot, HENRY LARCOM: U. S. army officer; b. Aug. 13, 1831, at Beverly, Mass.; graduated at West Point 1854; became colonel of engineers Oct. 12, 1886; served as assistant on Pacific R. R. surveys, 1854-57; and was associated with Gen. Humphreys on the hydrographic survey of the delta of the Mississippi, 1857-61, the result being set forth in an elaborate report, *Physics and Hydraulics of the Mississippi River*. Gen. Abbot served in the Manassas campaign in 1861; engaged at Blackburn's Ford and Bull Run (wounded and breveted captain); in the construction of the defenses of

Washington, 1861-62; in the Virginia Peninsula, 1862; engaged at Yorktown (brevet major) and in the Seven Days operations before Richmond; as chief topographical engineer of Banks's expedition to the Gulf of Mexico, 1862-63; as colonel of the First Connecticut Artillery Volunteers, in command of siege artillery before Richmond in 1864-65 (brevet lieutenant-colonel U. S. A., and brevet brigadier-general U. S. V.); engaged in various actions; as chief of artillery at the capture of Fort Fisher, 1865; and in command of a brigade in the defenses of Washington in 1863. Brevet colonel and brigadier-general U. S. A. Mar. 13, 1865, and brevet major-general U. S. V. Since the war he has superintended defenses, commanded the engineer battalion, devised the adopted system of defending the coasts with submarine mines, and inaugurated the Engineer School of Application at Willets Point. He was an observer in the solar eclipse expedition to Sicily, 1870; a member of commission to devise plan for protecting alluvial basin of the Mississippi against overflow, of board to reorganize pontoon equipage of the army, of the Gun-Foundry Board, of the Fortification Board of 1885, of the Board of Ordnance and Fortification, and of many others; president of the permanent Board of Engineers, and Engineer of the Northeast Division, since 1888; member of the National Academy of Sciences; of the American Philosophical Society; of the American Academy of Arts and Sciences, and of other societies. Author of various works on professional subjects. Degree of LL. D. conferred by Harvard University in 1886. Retired for age Aug. 13, 1895. Revised by JAS. MERCUR.

Abbot, JOSEPH HALE: b. at Wilton, N. H., Sept. 26, 1802; graduated at Bowdoin College 1822; was tutor there 1825-27; Professor of Mathematics and of Modern Languages at Phillips Academy, Exeter, N. H., 1827-33; principal for several years of a ladies' seminary at Boston, and subsequently of the Beverly High School; was long the recording secretary of the American Academy of Arts and Sciences, to whose *Transactions* he contributed papers on pneumatics and hydraulics; wrote in favor of Dr. Charles T. Jackson in the "ether controversy"; and was an assistant of Dr. J. E. Worcester in the preparation of his *Dictionary*. D. at Cambridge, Apr. 7, 1873.

Abbot, SAMUEL: a merchant of Boston; b. at Andover, Mass., Feb. 25, 1732, was one of the founders of the theological seminary at Andover, toward the building of which he gave \$20,000 during his lifetime and \$100,000 at his death. He also contributed large sums for various other charitable purposes. D. at Andover, Apr. 30, 1812.

Abbotsford: the seat of Sir Walter Scott; on the right bank of the Tweed, about three miles from Melrose Abbey. It is surrounded by beautiful scenery. This estate was purchased in 1811 by Sir Walter, who expended a large sum of money in the erection of a picturesque and irregular pile of buildings. It has remained in the family to the fourth generation. See SCOTT, SIR WALTER.

Ab'cott, AUSTIN, LL. D.: son of Jacob; b. at Boston, Mass., Dec. 18, 1831; educated in New York city; admitted to the bar about 1852; practiced his profession in partnership with his brother, Benjamin Vaughan; was dean of New York University Law School; published two novels, *Conecut Corners* and *Matthew Caraby*; and aided Benjamin in the preparation of his legal publications. D. in New York, Apr. 19, 1896.

Abbott, BENJAMIN: Methodist preacher; b. in Pennsylvania in 1732. He traveled and preached extensively in his native State, in New Jersey, Delaware, and Maryland, and was one of the chief founders of his denomination in those States. His native eloquence was extraordinary. His autobiographical records, embodied in Firth's *Life of Abbott*, are among the most remarkable of the early writings of Methodism. D. at Salem, N. J., Aug. 14, 1796.

Abbott, BENJAMIN VAUGHAN: law writer; b. in Boston, Mass., June 4, 1830; graduated from the University of the City of New York in 1850, after which he studied law, and was admitted to the bar. He applied himself to law writing, his works and compilations amounting to nearly 100 volumes of digests, reports, and treatises. In 1870 he was appointed by President Grant one of the three commissioners to revise the statutes of the United States. As secretary of the New York Code Commissioners, he prepared in 1865 the draft of a penal code for New York, the same being done under the direction of the commissioners. D. in Brooklyn, N. Y., Feb. 17, 1890. HENRY WADE ROGERS.

Abbott, EDWARD, D. D.: son of Jacob; b. in Farmington, Me., July 15, 1841; educated in New York city; studied theology at Andover; was a pastor in Boston, 1865-69; associate editor of *The Congregationalist* from 1869 to 1878, when he entered the Episcopal Church. He wrote several religious books for children, a *Paragraph History of the United States* (1876), and other historical treatises, and edited *The Young Christian*, by Jacob Abbott, with a life of the author. Revised by GEORGE P. FISHER.

Abbott, EDWIN, D. D.: teacher and author; b. in London, 1838; educated in the City of London School and at Cambridge University (B. A. 1861, M. A. 1864); engaged in teaching, 1862; head master of the City of London School, 1865-1889; Hulsean lecturer in Cambridge, 1876; select preacher at Oxford, 1877; author of *Bible Lessons* (1872); *Through Nature to Christ* (1877); *How to Write Clearly* (1872); *Francis Bacon* (1885); and numerous theological publications.

Abbott, EMMA A.: popular soprano singer; daughter of a music teacher; b. in Chicago, Dec. 9, 1849; early attracted the attention of Clara Louise Kellogg, through whose influence she became soprano in the Church of the Divine Paternity, New York. This congregation having raised a fund for her musical education, she went to Paris, where she studied singing under Madame Marchesi, and acting under Charles Feehter. In Paris she married E. J. Wetherell, of Massachusetts, Feb. 26, 1874. She began her professional career with Gye in London, but soon returned to the U. S., where she organized the "Emma Abbott Opera Company," traveling extensively, and presenting large works on a small scale at popular prices. She amassed a large fortune. D. Jan. 5, 1891, in Salt Lake City, Utah, where she was on a professional tour. Her husband had died two years earlier. Personally Miss Abbott was much beloved.

Abbott, GORHAM DUMMER, LL. D.: a younger brother of Jacob Abbott; b. at Hallowell, Me., Sept. 3, 1808; graduated at Bowdoin College in 1826; and took a part of the theological course at Andover in the class which graduated in 1831. He was pastor for three years at New Rochelle, N. Y., and for thirteen years principal of the Spingler Institute in New York city. He published *The Family at Home*; *Nathan Dickerman*; *Mexico and the United States* (1869); and other works. D. at South Natick, Mass., July 31, 1874.

Abbott, JACOB: a prolific and popular writer; b. at Hallowell, Me., Nov. 14, 1803; graduated at Bowdoin College in 1820; studied theology at Andover, Mass., from 1822 to 1824; was tutor in Amherst College from 1824-25, and Professor of Mathematics in the same institution from 1825 to 1829; was principal of the Mount Vernon School (for young ladies) in Boston from 1829 to 1834, when he was ordained and took charge of the Eliot church in Roxbury (till 1836). For several years he made his home in New York city, though frequently absent in foreign countries. His reputation as an author was established by the *Young Christian Series*. But he is best known as the author of *The Rollo Books* (28 vols.); *The Franconia Stories* (10 vols.); *Harper's Story-Books* (36 vols.); and other juvenile works. D. at Farmington, Me., Oct. 31, 1879.

Abbott, JOSEPH C.: b. in Concord, N. H., July 15, 1825; became a lawyer and journalist; commanded a regiment during the civil war, and was breveted brigadier-general. He removed to North Carolina in 1865, and was U. S. Senator from North Carolina, 1865-71. D. Oct. 8, 1882.

Abbott, Sir JOHN JOSEPH CALDWELL, D. C. L.: Canadian statesman; b. at St. Andrew's, P. Q., Mar. 12, 1821; educated there and at McGill College; admitted to the bar in 1847; represented Argenteuil in the Canadian Assembly 1857-67, and the same constituency in the Dominion Parliament almost continuously from 1867 till called to the Senate in 1887. He was a member of the executive council of Lower Canada, 1862-63; Conservative leader of the Government in the Senate; and upon the death of Sir John A. Macdonald in the spring of 1891 succeeded him as Premier, but resigned on account of ill health, Nov. 25, 1892. He became a member of the Cabinet formed by his successor, Sir John Thomson, but without portfolio. He was associated with Sir Hector Langevin in the Letellier mission to England in 1879; was appointed a member of the Queen's privy council in 1887; was for some years solicitor for the Canadian Pacific R. R. Co.; was dean of the faculty of law in McGill College for ten years; and a director of the Bank of Mon-

treal. He was author of the *Insolvent Act of 1864, with Notes, etc.* (Quebec, 1864). He was knighted in 1892. D. in Montreal, Oct. 30, 1893.
NEIL MACDONALD.

Abbott, JOHN STEVENS CABOT: brother of Jacob; b. at Brunswick, Me., Sept. 18, 1805; graduated at Bowdoin College in 1825; at Andover Theological Seminary in 1829; and was settled as minister in Worcester, Roxbury, Nantucket, and New Haven. Among his works are *The Mother at Home*; *History of Napoleon Bonaparte*; *History of the Civil War*; his American histories, and his *History of Napoleon III.* D. at Fair Haven, Conn., June 17, 1877.

Abbott, JOSIAH GARDNER: jurist; b. in Chelmsford, Mass., Nov. 1, 1815; graduated at Harvard in 1832; and was admitted to the bar in 1835. He was a member of the Constitutional Convention of Massachusetts in 1853, and of the Electoral Commission of 1877 to which was referred the disputed presidential election. He was a judge of the Superior Court of Massachusetts, for Suffolk County, from 1855 to 1859. In 1878 he was nominated by the Democratic party for Governor of Massachusetts, but was defeated. In 1874 he was elected a member of Congress, having previously served in the Legislature of his State as a Representative and as Senator. D. at Wellesley Hills, Mass., June 2, 1891.
HENRY WADE ROGERS.

Abbott, LYMAN, D. D.: Congregationalist minister, editor, and author; b. at Roxbury, Mass., Dec. 18, 1835; graduated at New York University, 1853. After having studied law, he studied theology; was pastor at Terre Haute, Ind., 1860-65; pastor of the New England church in New York, 1866-69; editor of *The Illustrated Christian Weekly*, 1871-76; and, from 1876, of *The Christian Union* (now *The Outlook*). He succeeded H. W. Beecher as pastor of Plymouth church, Brooklyn, in 1888, and resigned in Nov., 1898. Among his numerous writings are *Commentaries upon Matthew and Mark* (1875), *Luke* (1877), *John* (1879), *Acts* (1876), and *Romans* (1888), and a sketch of the *Life of Henry Ward Beecher* (1883). In association with T. J. Conant, he prepared *A Dictionary of Religious Knowledge*. A course of Lowell lectures by him on the *Evolution of Christianity* was published in 1892.
GEORGE P. FISHER.

Abbrevia'tio Placito'rum (abbreviation of pleadings): in legal history, an abstract of ancient pleadings made prior to the Year-Books. See YEAR-BOOKS.

Abbreviations [Lat. *abbreviationes*, from *abbre'vio*, *abbrevia'tum*, to shorten, from *bre'vis*, short]: customary shortenings of words and phrases used in writing, in order to save time and space. They are formed by the omission of some letters or words, or by the substitution of arbitrary signs. In mediæval manuscripts abbreviations are so numerous that special study and training are required to decipher them. For denoting moneys, weights, and measures, characters which are not properly abbreviations are used as such: for instance, ° ' " for degrees, minutes, and seconds; \$ for dollar; £, pound (money), etc.

The following are the more important abbreviations in common use:

āā, *ana*, of each.
@, *ad*, at.
A. A. G., Acting Assistant Adjutant-General.
A. A. G., Assistant Adjutant-General.
A. B., *Artium Baccalaureus*, Bachelor of Arts; also Able-bodied Seaman.
A. B. C. F. M., American Board of Commissioners for Foreign Missions.
Abp., Archbishop.
A. C., *Ante Christum*, before Christ.
Acct., account.
A. D., *Anno Domini*, in the year of our Lord.
Ad. or Adv., adverb.
A/d, after date.
Adj., adjective.
Adj't., adjutant.
Ad lib., *ad libitum*, at pleasure.
Admr., administrator.
Admx., administratrix.
Æt. or ætat. = *ætatis* [anno]; i. e. in the year of his (or her) age.
A. G., Adjutant-General.
A. H., *Anno Hegira*, in the year of the Hegira (flight of Mohammed).
Ala., Alabama.
A. M., *Anno Mundi*, in the year of the world.
A. M., *Ante Meridiem*, before noon.
A. M., *Artium Magister*, Master of Arts.
Anon., anonymous.
Ans., answer.
A/o, account of.
Apr., April.
A. Q. M., Assistant Quartermaster.
A. R. A., Associate of the Royal Academy (London).
Ari., Arizona.
Ark., Arkansas.
A/s, account sales.
Atty., attorney.
A. U. C., *Ab Urbe Condita*, from the Founding of the City (i. e. Rome).
Aug., August.
A. V., Authorized Version.
A. Y. M., Ancient York Masonry.
b., born.
B. A. or A. B., Bachelor of Arts.
Bart. or Bt., Baronet.
Bbl., barrel.
B. C., before Christ; British Columbia.
B. C. L., Bachelor of Civil Law.
B. D., Bachelor of Divinity.
B/E, Bill of Exchange.
B. I., British India.
B. L., Bachelor of Laws, *legum baccalaureus*.
B/L, Bill of Lading.
Bp., Bishop.

Brig.-Gen., Brigadier-General.
Bro., brother.
B. S., or B. Sc., Bachelor of Science.
B/S, Bill of Sale.
Bush., bushel.
B. V., Blessed Virgin, Lat. *Beata Virgo*.
C., *centum*, a hundred; also centigrade and central.
C., Cousul; also chapter.
Ca., *circa*, about.
C. A., Chartered Accountant.
Cal., California.
Cal. or Kal., Calends or Kalends.
Cautab., *Cantabrigiensis*, of Cambridge.
Cap., *capitulum*, chapter.
Capt., Captain.
C. B., Companion of the Bath; also Cape Breton.
C. C., Caius College.
c. c., cubic centimeter.
C. C. P., Court of Common Pleas.
C. E., Civil Engineer.
Cent or c., *centum*, hundred.
Cf., *confer*, compare.
C. F. I., Cost, freight and insurance.
C. G. H., Cape of Good Hope.
C. G. S., centimeter-gramme-second.
C.-H., court-house.
Chap. or ch., chapter.
Chrou., Chronicles.
C. J., Chief Justice.
C. M., common meter.
c. m., centimeter.
Co., company; also county.
C. O. D., cash on delivery.
Col., Colonel; also Colorado.
Coll., college.
Colo., Colorado.
Com., Commodore, Commissiour.
con., *contra*, against.
Conn. or Ct., Connecticut.
Cor., Corinthians.
Cor. Sec., Corresponding Secretary.
Cos., cosine.
Coss., *Consules* or *Consulibus*, consuls (of Rome).
Cr., creditor.
Crim. Con., criminal connection or conversation.
C. S. A., Confederate States of America.
Ct., Connecticut.
Cum Div., with dividend.
Cwt., a hundredweight.
Cyc., cyclopædia.
d., *denarius*, penny, pence; also died.
D., five hundred; also Denarius, Dutch.
D. A. G., Deputy Adjutant-General.
Dak., Dakota.
Dan., Daniel, Danish.
D. C., District of Columbia; also *da capo*, from the beginning.
D. C. L., Doctor of Civil Law.
D. D., Doctor of Divinity.
D. D. S., Doctor of Dental Surgery.
Dea., Deacon.
Dec., December.
Deg., degree.
Del., Delaware; also *delineavit*, he designed (on engravings).
Dept., department.
Deut., Deuteronomy.
D. F., *Fidei defensor*, Defender of the faith.
Dft., defendant; draft.
D. G., *Dei gratiâ*, by the grace (or favor) of God.
Dis., discount.
Dist., district.
Div., dividend.
Do., ditto, the same.
Doz., dozen.
Dr., Doctor; also debtor.
D/s, days' sight.
D. Sc., Doctor of Science.
Dub., Dublin.
D. V., *Deo volente*, God willing.
Dwt., pennyweight.
E., east.
E. & O. E., errors and omissions excepted.
Ebor., *Eboracum*, York.
Eccl., Ecclesiastes.
Eccles., ecclesiastical.
Eccelus., Ecclesiasticus.
E. C., East Central (postal district of London).
Ed., editor, edition.
Edin., Edinburgh.
E. E., Errors excepted; Electrical Engineer.
e. g., *exempli gratiâ*, for example.

E. I., East Indies.
E. I. C., East India Company.
E. M. F., Electro-motive Force.
Encyc., encyclopædia.
E. N. E., east-northeast.
Eng., English; Engineers.
Eph., Ephes., Ephesians.
E. S. E., east-southeast.
Esth., Esther.
Esq., Esquire.
et al., *et alii*, and others.
etc., *et cætera*, and the rest; i. e. other such things; and so forth.
Et seq., *et sequens*, and the following.
Ex d. or ex div., *ex dividendo*, without the dividend.
EXR., executor.
Exod. or Ex., Exodus.
Exon., *Exonia*, Exeter.
Exx., executrix.
Ez., Ezra.
Ezek., Ezekiel.
F. or f., *frauc*, florin, farthing, foot.
F. and A. M., Free and Accepted Masons.
F. or Fahr., Fahrenheit.
F. A. A., Free of all Average.
F. A. I. A., Fellow of the American Institute of Architects.
F. A. S., Fellow of the Antiquarian Society; Fellow of the Society of Arts.
F. B. S., Fellow of the Botanical Society.
F. D., *Fidei defensor*, Defender of the faith.
Feb., February.
F. F. V., first families of Virginia.
F. G. S., Fellow of the Geological Society.
fl., florin.
Fla., Florida.
F. L. S., Fellow of the Linnæan Society.
F. O. B., Free on board.
F. P. A., Free of Particular Average.
F. R. A. S., Fellow of the Royal Astronomical Society.
F. R. C. P., Fellow of the Royal College of Physicians.
F. R. C. S., Fellow of the Royal College of Surgeons.
Fri., Friday.
F. R. G. S., Fellow of the Royal Geographical Society.
F. R. S., Fellow of the Royal Society.
F. R. S. E., Fellow of the Royal Society of Edinburgh.
F. R. S. L., Fellow of the Royal Society, London; also Fellow of the Royal Society of Literature.
F. S. A., Fellow of the Society of Antiquaries.
F. S. S., Fellow of the Statistical Society.
ft., foot.
fur., furlong.
F. Z. S., Fellow of the Zoölogical Society.
g., gramme.
Ga., Georgia.
Gal., Galatians.
gal., gallon.
G. B., Great Britain.
G. C. B., Grand Cross of the Bath.
G. C. M. G., Knight Grand Cross of St. Michael and St. George.
G. C. S. I., Knight Grand Commander of the Star of India.
G. M., Grand Master.
Gen., General; Genesis.
Ger., German.
Gov., Governor.
Gr., Greek.
gr., grain.
G. T., Good Templars; Grand Tiler.
Gtt., *gutte*, drops.
Hab., Habakkuk.
Hag., Haggai.
H. B. C., Hudson's Bay Company.
H. B. M., His (or Her) Britannic Majesty.
Hdkf., Handkerchief.
h. e., *hoc est*, this is.
H. E., His Eminence; His Excellency.
Heb., Hebrews.
hhd., hogshead.
Hist., history.
H. I. H., His (or Her) Imperial Highness.
H. M. S., His (or Her) Majesty's Ship.
Hon., Honorable.
Hos., Hosea.
H. P., Horse-power.
H. R., House of Representatives.

H. R. H., His (or Her) Royal Highness.	M. A., Master of Arts.	Parl., Parliament.	Sc. or Ss., <i>scilicet</i> , to wit; also <i>sculpsit</i> , he engraved it (on engravings).
H. S. H., His (or Her) Serene Highness.	Macc., Maccabees.	P. C., Privy Councillor.	S. Dak. or S. D., South Dakota.
H. S. S., <i>Historiæ Societatis Socius</i> , Fellow of the Historical Society.	Mad. or Mme., Madame.	P. E. I., Prince Edward Island.	S. E., southeast.
I., Is., or Isl., island.	Mag., magazine.	P. E., Protestant Episcopal.	Sec., Secretary; also second.
Ia., Iowa.	Maj.-Gen., Major-General.	Per Ann., Pr. An., <i>Per Annum</i> , by the year.	Sept., September.
Ibid. or Ib., <i>ibidem</i> , in the same place.	Mal., Malachi.	Per Cent., <i>Per Centum</i> , by the hundred.	sin., sine.
Id., <i>idem</i> , the same.	Mar., March.	Per pro., <i>Per procurationem</i> , by procuration; on behalf of.	S. J., Society of Jesus.
Id., Idaho.	Masc., Masculine.	Pet., Peter.	S. J. C., Supreme Judicial Court.
i. e., <i>id est</i> , that is.	Mass., Massachusetts.	Ph. D., <i>Philosophiæ Doctor</i> , Doctor of Philosophy.	Skr., Sanskrit.
I. H. S., <i>Iesus Hominum Salvator</i> , Jesus Saviour of men.	Matt., Matthew.	Phil., Philippians, Philip.	S. M., <i>Sa Majesté</i> , His (or Her) Majesty.
Ill., Illinois.	M. B., Bachelor of Medicine.	Phila., Philadelphia.	Sp. or Span., Spanish.
in., inch.	M. C., Member of Congress.	Philem., Philemon.	S. P. Q. R., <i>Senatus Populusque Romanus</i> , the Roman senate and people.
incog., <i>incognito</i> , unknown.	Md., Maryland.	Philom., <i>Philomathes</i> , a lover of learning.	Sq. or Seq., <i>sequens</i> , the following; pl., <i>Sqq.</i> , <i>sequentes</i> .
Ind., Indiana.	M. D., <i>Medicinæ Doctor</i> , Doctor of Medicine.	Pinxt. or pxt., <i>pinxit</i> , he painted.	Sq., square.
Ind. Ter., Indian Territory.	Me., Maine.	pl., plu. or plur., plural.	SS., saints; also esses, a collar worn by knights and others in heraldry.
Inf. or inf., <i>infra</i> , below.	M. E., Methodist Episcopal, or Mechanical Engineer.	plff., plaintiff.	Ss. or Sc., <i>scilicet</i> , to wit; namely.
In lim., <i>in limine</i> , at the outset.	Mex., Mexico or Mexican.	plupf., pluperfect.	Ss., <i>semis</i> , half.
In loc., <i>in loco</i> , in the place.	M. H. S., Massachusetts Historical Society.	P. M., <i>Post Meridiem</i> , after noon.	S. S. C., Solicitor before the Supreme Courts (of Scotland).
I. N. R. I., <i>Iesus Nazareus Rex Judæorum</i> , Jesus of Nazareth, King of the Jews.	Messrs. or MM., Messieurs, gentlemen.	P. M., Postmaster.	S. S., Sunday-school.
Inst., institute.	Mic., Micah.	P. O., Post-office.	S. S. E., south-southeast.
inst., <i>instante (mense)</i> , in the present month.	Mich., Michigan.	P. O. O., Post-office order.	S. S. W., south-southwest.
Int., interest.	Minn., Minnesota.	P. of H., Pat. of Husbandry.	St., saint; street.
Inv., invoice.	Miss., Mississippi.	Pop., population.	S. T. D., <i>Sacrosanctæ Theologiæ Doctor</i> , Doctor of Theology.
I. O. O. F., Independent Order of Odd Fellows.	Mlle., Mademoiselle.	Port., Portuguese.	S. of T., Sons of Temperance.
I. O. S. M., Independent Order of the Sons of Malta.	mm., millimeter.	PP., <i>Patres</i> , fathers.	S. T. P., <i>Sacrosanctæ Theologiæ Professor</i> , Professor of Theology.
I. O. U., I owe you.	Mme., Madame.	P. P., Parish Priest.	s. v., <i>sub voce</i> , under the word (or heading).
i. q., <i>idem quod</i> , the same as.	M. N. A. S., Member of the National Academy of Sciences.	pp., pages.	S. W., southwest.
Is. or Isa., Isaiah.	Mo., Missouri.	P. P. C., <i>pour prendre congé</i> , to take leave.	Syr., Syriac.
It., Italian.	mo., month.	p. p., <i>per pro</i> , on behalf of.	T. E., Topographical Engineers.
J., Judge or Justice.	Mons., <i>monsieur</i> , Mr.	P. Q., Province of Quebec.	Tenn., Tennessee.
J. A., Judge Advocate.	Mont., Montana.	P. R., Porto Rico.	Tex., Texas.
Jam., Jamaica.	M. P., Member of Parliament.	Pres., President.	Text. Rec., <i>Textus Receptus</i> .
Jan., January.	M. P. P., Member of Provincial Parliament.	Priv., private.	Thess., Thessalonians.
Jas., James.	Mr., Master or Mister.	Prob., problem.	Tit., Titus.
J. C., Jurisconsult.	Mrs., Mistress or Missis.	Prof., Professor.	U. K., United Kingdom.
J. C. D., <i>Juris Civilis Doctor</i> , Doctor of Civil Law.	M. R. A. S., Member Royal Academy of Sciences; Member of the Royal Asiatic Society.	Pro tem., <i>Pro tempore</i> , for the time temporary.	Ult., <i>Ultimo, ultimo mense</i> , in the last month.
J. D., <i>Juris Doctor</i> , Doctor of Law.	M. R. C. S., Member of the Royal College of Surgeons.	Prov., Proverbs.	U. P., United Presbyterian.
Jer., Jeremiah.	M. R. I. A., Member of the Royal Irish Academy.	Prox., <i>Proximo or Proximo mense</i> , in the next month.	U. S., United States.
Jno., John.	MS., manuscript; pl., MSS.	Ps., Psalm.	U. S. A., United States of America; United States Army.
Jona., Jonathan.	M. S., Master of Science.	P. S., postscript; privy seal.	U. S. N., United States Navy.
J. P., Justice of the Peace.	Mt., mount.	Pt., part; pint.	U. S. P., United States Pharmacopœia.
Jr. or Jun., Junior.	Mus. D., Doctor of Music.	P. T. O., please turn over.	U. S. S., United States Ship or Steamer.
Jud., Judith.	N., north, or noon; also, new.	Pub. Doc., public document.	U. T., Utah Territory.
J. U. D. or J. V. D., <i>Juris utriusque Doctor</i> , Doctor of both Canon and Civil Law.	N. A., North America.	Pxt., <i>pinxit</i> , painted it.	V. or vs., <i>versus</i> , against.
Judg., Judges.	N. A. S., National Academy of Science.	q., <i>quadrans</i> , farthing.	V., volt or volts.
K., King.	N. B., <i>Nota Bene</i> , mark well; also New Brunswick.	Q., Queen; question; Quintus.	Va., Virginia.
Kal. or Cal., Calends.	N. C., North Carolina.	Q. C., Queen's Counsel.	V. C., Vice-Chancellor; Victoria Cross.
Kan., Kansas.	N. Dak. or N. D., North Dakota.	Q. d., <i>Quasi dicat</i> , As if he should say.	V. D. M., <i>Verbi Dei Minister</i> , minister of the word of God.
K. B., Knight of the Bath.	N. E., northeast; New England.	Q. E. D., <i>Quod Erat Demonstrandum</i> , which was to be demonstrated.	Ven., Venerable.
K. C., King's Counsel.	Neb., Nebraska.	Q. E. F., <i>Quod Erat Faciendum</i> , which was to be done.	V.-G., Vicar-General.
K. C. B., Knight Commander of the Bath.	Neh., Nehemiah.	Q. M., Quartermaster.	Viz., <i>Videlicet</i> , namely.
K. C. S. I., Knight Commander of the Star of India.	Nem. Con., <i>Nemine contradicente</i> , or Nem. Diss., <i>Nemine dissidente</i> , no one contradicting or opposing.	Qr., quarter; farthing.	V.-P., Vice-President.
K. G. C. B., Knight Grand Cross of the Bath.	Nev., Nevada.	Q. S., <i>Quantum Sufficit</i> , a sufficient quantity.	V. R., <i>Victoria Regina</i> , Victoria the Queen.
K. G., Knight of the Garter.	N. F., Newfoundland.	qt., quart.	V. S., Veterinary Surgeon.
Kilo., km., kilometer.	N. G., New Granada; North German.	Qu., query; question.	vs., <i>versus</i> , against.
Kilog., kilogramme.	N. H., New Hampshire.	Q. V. or q. v., <i>quod vide</i> , which see (in the plural <i>qq. v.</i>), or <i>quantum vis</i> , as much as you please.	Vt., Vermont.
K. P., Knight of St. Patrick.	N. J., New Jersey.	R., Rex, King, or <i>Regina</i> , Queen.	W., west.
K. T., Knight of the Thistle.	N. M., New Mexico.	B., <i>Recipe</i> , take.	W. Watt or Watts (in electricity).
Kt., Knight.	N. N. E., north-northeast.	R. A., Royal Academician, or Royal Artillery.	Wash., Washington.
Ky., Kentucky.	N. N. W., north-northwest.	R. C., Roman Catholic.	W. I., West Indies.
La., Louisiana.	No., <i>Numero</i> , Number.	R. E., Royal Engineers.	Wis., Wisconsin.
Lam., Lamentations.	N. O., New Orleans.	Rec. Sec., Recording Secretary.	W. N. W., west-northwest.
Lat., latitude.	Nov., November.	Ref. Ch., Reformed Church.	W. S., Writer to the Signet (Scotland).
Lat. or L., Latin.	N. P., Notary Public; also New Providence Island.	Reg. Prof., Regius Professor.	W. S. W., west-southwest.
lb., <i>libra</i> , pound.	N. S., Nova Scotia; New Style.	Rev., reverend, Revelation.	W. Va., West Virginia.
l. c., <i>loco citato</i> , in the place cited; also (in printing) lower case, that is, small letters.	N. T., New Testament.	R. I., Rhode Island.	Wy. or Wyo., Wyoming.
L. D., Lady Day.	Num., Numbers.	R. M., Royal Marines.	X. Gr., <i>Xristós</i> , Christ.
Lev., Leviticus.	N. W., northwest.	R. M. S., Royal Mail Steamer.	Xmas., Christmas; Xtian., Christian, etc.
L. H. D., <i>Literarum Humaniorum Doctor</i> , Doctor of Literature.	N. W. P., Northwest Province.	R. N., Royal Navy.	yd., yard.
L. I., Long Island.	N. W. T., Northwest Terr.	R. N. R., Royal Naval Reserve.	Yr., year; your.
Lib., <i>liber</i> , book.	N. Y., New York.	Ro. or Robt., Robert.	Zech., Zechariah.
Lib., lb., l., <i>libra</i> , a pound.	N. Z., New Zealand.	Rom., Romans.	Zeph., Zephaniah.
Lieut., Lieutenant.	O., Ohio.	R. R., Railroad.	& and.
Lit. D., Doctor of Literature.	Ob., <i>obit</i> , died.	Rs., rupees.	&c., <i>et cætera</i> , and so forth.
LL. B., Bachelor of Laws.	Obad., Obadiah.	R. S. D., Royal Society of Dublin.	Ye, Yt. The, That. (This use of Y originated in the Anglo-Saxon character þ, which was equivalent to the modern <i>th</i> . In manuscripts this character degenerates into a form like a black-letter <i>y</i> (p), which was retained after its origin and real sound had been lost sight of.)
LL. D., <i>Legum Doctor</i> , Doctor of Laws.	Obdt., obedient.	R. S. E., Royal Society of Edinburgh.	
Lon., longitude.	Obs., obsolete.	R. S. V. P., <i>répondez. s'il vous plait</i> , Reply, if you please.	
L. R. C. P., Licentiate of the Royal College of Physicians.	Oct., October.	Rt. Hon., Right Honorable.	
L. R. C. S., Licentiate of the Royal College of Surgeons.	Okla., Oklahoma.	Rt. Rev., Right Reverend.	
L. S., <i>Locus sigilli</i> , the place of the seal.	Ol., <i>oleum</i> , oil.	Ry., Railway.	
L. S. D., <i>Libri, Solidi, Denarii</i> , pounds, shillings, [and] pence.	Ol. or Olym., Olympiad.	S., south; saint; shilling.	
LXX., The Septuagint (version of the Old Testament).	%, per cent.	S. A., South America; South Africa.	
M., Monsieur, <i>mille</i> (a thousand), a mile; noon.	‰, per thousand.	Sam., Samuel.	
m., meter; mile.	Or., Oregon.	Sans., Sanskrit.	
	O. S., Old Style; also Ordinary Seaman.	S. C., South Carolina.	
	O. T., Old Testament.		
	Oxon., <i>Oxoniensis</i> , Oxonian or of Oxford.		
	Oz., ounce.		
	p., page.		
	P., <i>Père</i> , father.		
	Pa. or Penn., Pennsylvania.		
	p. a., Participial adjective.		

Abbre'viator: a notary of the papal court and of the church councils, whose business is to prepare briefs and perform various important services as secretary. The number of these notaries was formerly about seventy-two.

Abbt, THOMAS: German author; b. at Ulm in 1738. He became Professor of Mathematics at Rinteln in 1761, and contributed to the improvement of the German language. His chief works are *Vom Verdienste* (On Merit, 1765) and *Vom Tod fürs Vaterland* (On dying for the Fatherland, 1761). D. at Bückeberg, Nov. 3, 1766.

Abd: an Arabic word which signifies servant or slave, and forms the prefix of many Oriental names, as Abd-Allah, "servant of Allah," Abd-er-Rahman, "servant of the Merciful" (i. e. of God).

Abd-el-Hamid: the adopted Arabic name of one DU COURRET, a French traveler (b. in 1812), who set out in 1834 for the East; visited Egypt, traveled up the Nile; through Abyssinia; to the shores of the Red Sea; and returned along the Red Sea to Cairo. He embraced Mohammedanism, and assumed the name of Abd-el-Hamid. After having been imprisoned in Persia for political reasons, he was released through the intervention of France, and returned to his native country in 1847. In 1848 he was dispatched by the Government to Timbuctoo. He published the result of this exploration in *Mémoire à Napoléon III.* (1855); he also published *Médine et la Mekke* (3 vols., 1855). D. at Cairo, Egypt, Apr. 1, 1867.

Abd-el-Ka'der (Arabic, servant of the Powerful, i. e. of God): a distinguished Arab chieftain; b. near Mascara, in Algeria, in 1807. His father, Mehi-ud-Din, was a marabout, or religious noble, of no little influence. Algeria having been invaded by the French in 1830, Abd-el-Kader was chosen emir (prince) by the Arabs of that country. He defeated the French at Maäta in 1835. A treaty of peace was concluded in 1837. In 1839 hostilities were again renewed, and in the war which followed, against a power so much superior to his own, Abd-el-Kader displayed extraordinary energy, combined with a marvelous fertility of resources, but he was at length, in 1847, obliged to yield to overwhelming odds: he laid down his arms on condition that he should be sent to Alexandria or St. John d'Acre. But, in direct violation of the terms of capitulation, he was taken to France, where he was detained as a prisoner until 1852. In 1860, when the Christians of Syria were threatened with massacre by the fanatical Mohammedans of that country, Abd-el-Kader, with extraordinary diligence and at the risk of his own life, protected many thousands of those defenseless people so long as the danger lasted. In 1864 he paid a visit to Egypt, where he was well received by the viceroy, and received from M. de Lesseps a piece of land. He also joined the order of Freemasons. In 1865 he visited Constantinople, where he was received with great honors. In 1867 he attended the Universal Exhibition at Paris. Abd-el-Kader wrote in the Arabic language a work which he sent to the French Academy, and which was translated into French by Dugat under the title *Rappel à l'Intelligent, avis à l'Indifférent* (1858). He also contributed important notes and commentaries to Daumas's *Les Chevaux du Sahara*. See *Life* by Churchill (Lon. 1867). D. at Damascus, May 26, 1883.

Abd-el-Latif: an Arabian historian and physician; b. at Bagdad in 1162. He wrote a valuable work on the history, antiquities, and geography of Egypt, of which De Sacy published a French version. D. in 1231.

Abd-el-Wahâb: founder of the sect of Wahabites or Wahâbees; b. in Nejed, Arabia, 1691. He recognized the Koran, and endeavored to reform the Mohammedan religion, which he affirmed had become corrupted. D. in 1787. See WAHÂBEEES.

Abde'ra (Gr. Ἀβδηρα): an ancient city of Thrace, noted as the birthplace of the philosopher Democritus. The stupidity and ignorance of the people of Abdera was proverbial.

Abd-er-Rahman III.: surnamed AN-NÂSIR-LIDIN-IL-LAH, or AL-NASSER-LIDÎNILLAH; a celebrated caliph; b. about 888 A. D. He began to reign at Cordova in 912. He was distinguished as a patron of learning and the arts. During his long reign the Moslem empire in Spain was raised to the highest pitch of prosperity. D. in 961.

Abdication: the renunciation of an office, generally an office of supreme importance. The legal right of abdication has been disputed on several grounds, and it is at least questionable. It is asserted by the opponents of kingly power that a king has not a right to abdicate, because he has not a right to reign. Advocates of constitutional monarchy often take the ground that inasmuch as kings can reign only

with the formal consent of the nation, therefore the right to reign is a compact which can be dissolved only with the consent of both parties. From the point of view of divine right, abdication is generally regarded as unlawful, for the reason that the monarch is invested with power not by his own will, and therefore can not of his own choice divest himself of this power. In answer to this position it has been argued that if monarchy is a divine institution, it follows that it is the monarch's duty to leave nothing undone to accomplish his mission, even to withdrawing from the throne, whenever it seems to him that the public interest demands that sacrifice from him. According to English law, the king may not abdicate except with the consent of Parliament. Subtle legal distinctions, however, are seldom of great importance, inasmuch as it will not often occur that a nation will desire to keep a monarch upon the throne after he wishes to renounce it. There is probably no example in history of a successful attempt on the part of the people to resist a determined purpose to abdicate on the part of a monarch. The following are the most noteworthy instances of the abdication of monarchical power. In A. D. 305 the imperial authority was abdicated by the Emperors Diocletian and Maximian. In Savoy, Amadeus abdicated the throne in 1494; Victor Amadeus in 1730; Charles Emmanuel in 1802; Victor Emmanuel in 1820; and Charles Albert in 1849. In Poland, Henry III. abdicated in 1574; Augustus in 1707; Augustus Stanislas in 1735; and Poniatowski in 1795. Charles V. of Spain and Germany gave up the royal and imperial crowns in 1555. Philip V. in Spain abdicated in 1724, and Charles IV. in 1808. Queen Christina of Sweden abdicated in 1654; Louis of Holland in 1810; and Louis of Bavaria in 1848. In France, Napoleon I. renounced the throne in 1814 and in 1815; Charles X. in 1830; and Louis Philippe in 1848. In every instance in France, however, abdication has followed revolution or forcible expulsion from the seat of authority. In English history there have been two cases only, and these have not been very clearly defined. Richard II. abdicated in 1399; and James II., in 1685, though he did not formally abdicate, was declared by Parliament to "have withdrawn himself out of the kingdom," and to have "abdicated the government." C. K. A.

Abdo'men [Lat. *abdo'men* (gen. *abdom'inis*), from *abdere*, to hide]: the part of the human body which lies below the diaphragm. The important secretory and excretory organs—the liver, pancreas, stomach and intestines, spleen and kidneys—occupy the abdominal cavity. The abdomen is closed in by a muscular anterior wall (the belly muscles); by a posterior bony wall (the spinal column); by the diaphragm above, and by the pelvic bones and organs below. The interior is lined with a smooth serous membrane, which covers the walls and is reflected over the organs, which are thus completely inclosed in folds of the membrane, which is called the *peritoneum*. The reflections of the peritoneum serve also as ligaments to hold the organs in place without allowing them considerable freedom of motion. The usual position of the organs is as follows: The stomach lies to the left and immediately beneath the lower ribs, and not rarely it is completely hidden beneath the ribs. The spleen is situated laterally at the left extremity of the stomach; the liver occupies a position on the right side similar to that occupied by the stomach and spleen on the left. The kidneys lie to either side of the spinal column on the posterior wall of the abdomen and about the level of the lowest ribs. The small intestines take up the central part of the abdominal wall; the large bowel passes from the right groin upward toward the liver, then transversely across the abdomen, and finally descends along the left side into the pelvis. See also PERITONEUM. W. P.

Abdomen: in entomology, the hindmost of the three regions into which the body of an insect is divided. It is composed, typically, of eleven rings or segments, more or less distinct from each other, but the number is often less. It contains a portion of the intestines and the sexual organs. In the perfect insect its segments have attached to them no well-developed legs or wings. In many insects its last segments bear appendages of various uses and forms, as pin-cers, stings, ovipositors, etc. In some insects the abdomen is not well differentiated from the thorax. D. S. J.

Abdominales [Lat. *abdominalis*, pertaining to the *abdo'men*]: a term formerly used for a large group of fishes containing numerous families, such as the *Esocidæ*, pikes, *Cyprinidæ*, carp, *Clupeidæ*, herrings, *Salmonidæ*, trout, etc., now placed in several orders. The order Abdominales of

Linnæus contained all the true or bony fishes in which the ventral fins are placed beneath the abdomen, well back of the pectorals. Cuvier used it for a sub-order of soft-rayed fishes with abdominal ventrals, not connected with the shoulder girdle. Johannes Muller restricted this sub-order by removing those species in which there is no communication between the air-bladder and intestine. F. A. LUCAS.

Abduc'tion [Lat. *ab*, away + *ducere*, lead]: in law, the forcible or fraudulent carrying away of a person. It is usually confined to the removal of females with a view to their marriage or seduction. It is allied to the word *kidnapping*, which would include the case of males. Abduction is an offense severely punished by statute law both in Great Britain and in the U. S.

Abd-ul-Aziz' (written in French *Abdoul-Aziz*, and in German *Abd-ul-Asis*): a son of Mahmud II.; b. Feb. 9, 1830; succeeded his brother, Abd-ul-Medjid, as Sultan of Turkey, June 25, 1861. He reduced the imperial civil list from 75,000,000 piasters to 12,000,000; abolished among other barbarous practices that of assassinating the sons of the princesses, favored the introduction of Western manners and customs, and did much to destroy the old and cherished traditions of the Turks. Deposed May 29, 1876, and is supposed to have been assassinated June 4, 1876. See TURKEY.

Abd-ul-Hamid II.: Padishah or Sultan of the Turkish Empire; thirty-fourth of the dynasty of Othman; b. in Constantinople, Sept. 5, 1842; second son and fourth child of Abd-ul-Medjid (*q. v.*); adopted by his father's second wife, who was childless. He was brought up with his brother Murad in the harem, and received but little education. In 1867 his uncle, Abd-ul-Aziz, then Sultan, took him with him to Paris to the exposition of that year, and what he saw there developed in him a love of study, which greatly improved his mind. On the deposition of Abd-ul-Aziz (May 29, 1876), Murad, eldest son of Abd-ul-Medjid, succeeded, but proving incompetent from insanity he was deposed Aug. 31, and Abd-ul-Hamid was invested with the sword of Othman Sept. 7, 1876, as Abd-ul-Hamid II. He is said to belong to the "Old Turkish" party, and has thus far carried on the government with doubtful success.

Abd-ul-Medjid' (written in French *Abdoul-Medjid*, and in German *Abd-ul-Medschid*): Sultan of Turkey; eldest son of Mahmud II.; b. in 1823. He succeeded his father July 1, 1839, when his capital was menaced by the victorious army of Mehemet Ali, Viceroy of Egypt. This danger was averted by the intervention of England and other great powers in July, 1840. He favored religious liberty and the reforms which his father had initiated, but his good will was partially frustrated by the resistance of his fanatical subjects. He died June 25, 1861, and was succeeded by his brother, Abd-ul-Aziz. See TURKEY.

Abeceda'rians: a sect founded in the sixteenth century by a person named Storck, who professed that learning was not necessary, not even the knowledge of the alphabet (A B C, hence their name), for the proper understanding of the Scriptures.

A'Becket, THOMAS: See BECKET.

A'Beck'ett, GILBERT ABBOTT: a humorous English writer and lawyer; b. in London, Jan. 9, 1811. He contributed to the *London Times* and *Punch*. Among his works is *The Comic Blackstone* (1844-46). D. at Boulogne-sur-Mer, Aug. 30, 1856.

Abeel', DAVID, D. D.: missionary to the Chinese; b. at New Brunswick, N. J., June 12, 1804. He published *A Journal of a Residence in China* (1829-33); *A Missionary Convention in Jerusalem* (1838); and *The Claims of the World to the Gospel*. D. at Albany, Sept. 4, 1846. See memoir by Williamson (N. Y., 1848).

A'bel: the second son of Adam and Eve; killed by his brother Cain. He is regarded as a type of faith and as the first martyr. See Genesis iv. and Hebrews xi. 4.

Abel, CARL, Ph. D.: philologist; b. at Berlin, Nov. 25, 1837; educated in the universities of Berlin, Munich, and Tübingen; has traveled extensively in Europe and America in the interests of linguistic research; has acted as Ilchester lecturer at Oxford University; has lectured before philological societies in England and Berlin; Professor of Linguistics in the Berlin Humboldt Academy of Science. Author of numerous contributions to philological and other periodicals; and of *Linguistic Essays* (1880); *Koptische Untersuchungen* (1878); and *Russland und die Lage* (1888).

Abel, NIELS HENRIK: mathematician; b. at Findö, Norway, Aug. 5, 1802. He gained distinction by his discoveries in the theory of elliptic functions, and was highly eulogized by Legendre. D. at Christiania, Apr. 6, 1829.

Abelard, or **Abailard**, PIERRE: French philosopher and dialectician; b. near Nantes, in 1079. He studied under the Nominalist Roscellinus and the Realist William de Champeaux. About 1115 he succeeded William in the school of Notre Dame, and there gathered about him pupils from all parts of Europe. Though he sought to avoid the extremes of both Nominalism and Realism, his doctrines may be called Nominalistic. He became the tutor of Eloise, the young niece of the Canon Fulbert, and fell in love with her, and his affection was returned. Upon the interference of the uncle they fled together into Brittany, where Eloise bore a son. They were married, but afterward Eloise denied this marriage and returned to her uncle's house that she might not interfere with Abelard's advancement in the Church. She was brutally treated by her uncle and fled to Abelard, who placed her at her own request in the nunnery of Argenteuil. Fulbert, for revenge, waylaid and terribly mutilated Abelard. Repentant and in deep humiliation, Abelard retired to the Abbey of St. Denis. Afterward, solicited eagerly as a teacher, he founded the monastic school at Nogent-sur-Seine, known as Paraclete, which, when he became Abbot of St.-Gildas-de-Rhuys, he gave to Eloise and a sisterhood under her care. He died Apr. 21, 1142, at St. Marcel priory, Chalons, while on the way to Rome to defend himself against a charge of heresy. His body was given into the keeping of Eloise, who, twenty years later, was buried at his side. From Paraclete, their remains were removed to Paris (1800), and in 1817 they were laid in a single sepulchre in Père la Chaise. Abelard was the most prominent of the founders of Scholasticism, and exerted a powerful influence upon the intellectual activity of his time. See Charles de Rémusat's *Abelard* (Paris, 1845); Cousin's *Introduction to the Works of Abelard*; Berlington's *History of Abelard and Heloise*; and Wight's *Abelard and Eloise* (New York, 1853).

A'belites, or **Abe'lians**: a sect of Christians who lived in Northern Africa in the fourth century. They enjoined marriage without carnal intercourse in order not to propagate original sin, claiming in support of their practice the example of the patriarch Abel. They adopted children, who were brought up to the same kind of marriage. They were extinct before the time of Augustine (fifth century).

Aben, **Ebn**, or **Ibn**: a prefix to many Arabic proper names, denoting "son of."

Abenaquis: same as ABNAKIS. See ALGONQUIAN INDIANS.

A'ben Ez'ra: b. at Toledo about 1100; d. on the island of Rhodes about 1175; wrote commentaries which show great progress in the department of biblical exegesis. Those on Isaiah (1873-77, 4 vols.), Canticles (1874), and Proverbs (1880) have been translated into English. See *The Isaiah* for Friedländer's essay on him.

A'bensberg: a town of Bavaria; 18 miles S. W. of Ratisbon; has a castle and a mineral spring (see map of the German Empire, ref. 7-F). Here Napoleon defeated the Austrians Apr. 20, 1809. Pop. 2,300.

A'ber: a Cymric term signifying "meeting-place of waters," occurs as a prefix to names of places in Great Britain—e. g. Aberdeen. It is probably etymologically related to the Persian *ab*, water. The corresponding Gaelic term is *Iuiver*—e. g. Inverness.

Aberbrothwick: See ARBROATH.

Abercorn, JAMES HAMILTON, First Duke of: b. Jan. 21, 1811; succeeded his grandfather as Marquis of Hamilton in 1818; and became Lord-Lieutenant of Ireland in 1866, which position he held until 1868, when he was created Duke of Abercorn, and when the Derby Ministry returned to power he was restored in 1874 Lord-Lieutenant of Ireland; held the office till 1876. D. at Baronscourt, Tyrone, Oct. 31, 1885.

Ab'ercrombie, JAMES: British general; b. in 1706; in 1758 took command of 50,000 men in New York, in order to recover the fort which the French had taken. On the 8th of July he attacked Ticonderoga, but was repulsed by the French with great loss, and was soon removed from the command. D. Apr. 28, 1781.

Abercrombie, JAMES, D. D.: Episcopalian clergyman and scholar; b. in Philadelphia, Jan. 26, 1758; preached there,

and there died June 26, 1841. His sermon preached on the death of Alexander Hamilton produced no little excitement in consequence of his condemnation of the practice of dueling. Dr. Abercrombie's *Lectures on the Catechism* was for years a standard authority.

Abercrombie, JOHN, M. D.: Scottish physician; b. at Aberdeen, Oct. 10, 1780. He graduated as M. D. in 1803, practiced in Edinburgh, and attained the reputation of being the first consulting physician in Scotland. He published *Inquiries Concerning the Intellectual Powers of Man* (1830) and *The Philosophy of the Moral Feelings* (1833), which were highly esteemed. D. at Edinburgh, Nov. 14, 1844.

Abercrombie, JOHN JOSEPH: soldier; b. in 1798 in Tennessee; graduated at West Point in 1822; colonel Seventh Infantry Feb. 25, 1861; and Aug. 31, 1861, brigadier-general U. S. volunteers. He served chiefly on the Western frontier (1822-61); as adjutant First Infantry (1825-33); in the Black Hawk war in 1832; in the Florida war 1837-40; engaged at Okee-cho-bee (brevet major); in the war with Mexico 1846-48; engaged at Monterey (wounded and breveted lieutenant-colonel), Vera Cruz, Cerro Gordo, and aide-de-camp to Maj.-Gen. Patterson 1846-47; as superintendent of recruiting service 1853-55. In the civil war served in the Shenandoah campaign 1861-62; engaged at Falling Waters; in the Virginia Peninsula 1862; engaged at Fair Oaks (wounded) and Malvern Hill; and till 1864 in command of troops before Washington, D. C. Brevetted brigadier-general U. S. A. for long and faithful services, and retired from active service June 12, 1865. D. at Roslyn, N. Y., Jan. 3, 1877.

Abercromby, Sir RALPH: British general; b. at Menstry, near Tullibody, Clackmannanshire, Oct., 1734; entered the army in 1756. After the peace of 1783 he passed ten years at home in retirement. He distinguished himself in the disastrous campaigns in Holland in 1794 and 1795. In 1795 he took command of an expedition sent to the West Indies, where he captured several islands from the French. He was the second in command of the army which the Duke of York led to Holland in 1799, and was appointed in 1800 commander-in-chief of the expedition to Egypt, which was then occupied by the French under Bonaparte. The British army, which landed early in Mar., 1801, was attacked by Menou, near Alexandria, on the 21st of that month. In this action the French were defeated, but Sir Ralph was mortally wounded, and died Mar. 28, 1801. He was distinguished for superior talents, bravery, and humanity. See his life by his son James (1861).

Aberdare: a town in Glamorganshire, Wales, which has rapidly increased from a small village to a place of importance (see map of England, ref. 11-E). It has extensive collieries, iron and tin works. Pop. (1891) 35,533.

Aberdeen' (i. e. mouth of the Dee): a city and seaport of Scotland; the capital of the county of Aberdeen; on the North Sea, 93 miles N. N. E. of Edinburgh (see map of Scotland, ref. 8-J). It is a handsome city, with spacious streets and granite houses, and is celebrated as a seat of learning. Among the principal public buildings are the town-house, several churches, and Marischal (pronounced mar'shal) College, founded in 1593. Aberdeen has a good harbor and an extensive trade, the chief articles of export being fine cotton and woolen fabrics, granite, grain, cattle, and fish. Here are flourishing manufactories of cotton and woolen goods, combs, machinery, etc. Old Aberdeen, about a mile N. of the new city, is the seat of King's College and University, founded in 1494, united with Marischal College in 1860 as the University of Aberdeen. The Free Church Divinity College was built in 1850. Pop. (1891) 121,905. The parliamentary borough sends two members to Parliament.

Aberdeen', or Aberdeen'shire: maritime county in N. E. of Scotland; bounded N. and E. by the North Sea, S. by Kincardine, Forfar, and Perth, and W. by Inverness and Banff; area, 1,970 sq. miles. The Grampian range of mountains extends along the southern boundary of this county, which contains several high peaks. Among these are Ben-Macdhui, 4,296 feet, and Cairngorm, 4,090 feet high. It is drained by the Dee and the Don. The principal rocks are granite and mica-slate. More cattle are raised in Aberdeen than in any other county in Scotland. Pop. (1871) 244,607; (1881) 267,990; (1891) 281,331. The United Diocese (in the Scottish Episcopal Church) of Aberdeen and Orkney is composed of the county of Aberdeen (less Huntley), parts of Banff and Kincardine, and the Orkney and

Shetland islands. The see of Aberdeen was founded A. D. 1100, that of Orkney A. D. 1120; the two were united in 1857.

Aberdeen, EARLS, Viscounts Formantine, Barons Haddo, Methlie, Tarves, and Kellie (in the Scottish peerage since 1682), Viscounts Gordon (in the peerage of the United Kingdom since 1814), and baronets (in the Scottish peerage since 1642), one of the most prominent noble families of Great Britain, an offshoot of the ancient Scotch family of the Gordons.—Sir John Gordon of Haddo was in 1642 created a baronet by Charles I. for services rendered to that monarch in the battle of Turriff.—Sir George Gordon of Haddo was Lord High Chancellor of Scotland when in 1642 he was created an earl. He was an uncompromising opponent of William of Orange. D. in 1720.

Aberdeen: capital of Monroe co., Miss. (for location of county, see map of Mississippi, ref. 5-H); on the west side of the Tombigbee river. It buys and ships about 20,000 bales of cotton yearly, and has fine Federal and State court-houses; the finest public-school buildings in the State; one of the best river bridges in the South; and considerable trade. It has 5 grist-mills, saw and planing mill, steam brick-factory, ice-factory, large steam spoke-factory, foundry and machine-shop, and 4 steam cotton-gins. It is the junction of branches of the Mobile and Ohio, Illinois Central, and Kansas City, Memphis and Birmingham R. Rs. Pop. (1880) 2,339; (1890) 3,449; (1900) 3,434. EDITORS OF "EXAMINER."

Aberdeen: railroad center and capital of Brown co., S. Dak. (for location of county, see map of South Dakota, ref. 5-F); on Chicago, Milwaukee and St. Paul, Chicago and Northwestern, Great Northern and Northern Pacific R. Rs. Pop. (1890) 3,182; (1900) 4,087. EDITOR OF "NEWS."

Aberdeen, GEORGE HAMILTON GORDON, Fourth Earl of: British statesman; b. in Edinburgh, Jan. 28, 1784; graduated at Cambridge in 1804. He began his public life as a Tory, was sent as ambassador to Vienna in 1813, and was raised to the British peerage as Viscount Gordon in 1814. In 1828 he became Secretary of State for Foreign Affairs in the Cabinet of the Duke of Wellington, with whom he resigned in Nov., 1830. He was reappointed to that office by Sir Robert Peel in 1841, gradually abandoned the high Tory principles, and favored a pacific foreign policy. In 1846 he resigned office with Sir Robert Peel, after whose death (1850) he was regarded as the chief of the Peelite party. He became, in Jan., 1853, Prime Minister in a Cabinet formed by a coalition of parties. In 1854 England was involved in a war against Russia, to which measure Lord Aberdeen gave a reluctant support. Either from this cause or because the war was conducted with ill success the ministers became very unpopular. Lord Aberdeen resigned Jan. 30, 1855, and was succeeded by Lord Palmerston. D. in London, Dec. 14, 1860.

Aberdeen, GEORGE JOHN JAMES, Fifth Earl of: oldest son of the preceding; b. Sept. 28, 1816; was for a number of years, as Lord Haddo, a member of the House of Commons, where he voted with the Liberals; succeeded his father in the peerage in 1860. D. Mar. 22, 1864.

Aberdeen, JOHN CAMPBELL HAMILTON GORDON, Seventh Earl of: a British statesman; b. Aug. 3, 1847; succeeded to his title Jan. 27, 1870; graduated at Oxford as M. A. in 1871. He began political life as a Conservative; was in 1875 a member and later the chairman of a royal commission to investigate the subject of railway accidents; and in 1877-78 a member of the Committee of the House of Lords on Intemperance. In 1880, having become a Liberal, he was appointed Lord-Lieutenant of Aberdeenshire; and for the years 1881-85 he was High Commissioner to the General Assembly of the Church of Scotland. Appointed Lord-Lieutenant of Ireland by Mr. Gladstone in 1886, he became extremely popular with the Irish people in his mission of carrying out the Home-Rule policy of that time. He was appointed Governor-General of Canada in 1893, and served until Nov., 1898.

Abergavenny (commonly pronounced ab-er-gā'ne): market-town of England; in Monmouthshire, on the Usk, which is here joined by the Gavenny, and crossed by a fine bridge, 13 miles W. of Monmouth. Pop. about 8,000.

Abergavenny, EARLS OF, and Viscounts Nevill (in the peerage of Great Britain, 1784), Barons of Abergavenny since the time of Henry III.: a prominent noble family in the peerage of Great Britain.—WILLIAM NEVILL, Fifth Earl of, was born Sept. 16, 1826, and succeeded his father in 1868. His oldest son and heir is REGINALD WILLIAM BRANSBY, Viscount Nevill, b. Mar. 4, 1853.

Ab'ernethy, JAMES, F. R. S. E., Commander of the Order of Leopold: civil engineer; past pres. Inst. C. E.; b. at Aberdeen, Scotland, in 1815; educated at various schools. At the age of fifteen he became assistant to his father on the extension of the London docks, and later served under Telford. In 1841 he was resident engineer of Aberdeen harbor works, and later, as engineer-in-chief, designed and built the lock and dock there, which were opened in 1848. From 1842 to 1852, as surveying officer to the Admiralty, he examined and reported upon many important works, harbors, docks, and river improvements, designed or under construction. Hydraulic power for working lock-gates was first applied by him to the gates of a lock and dock which he built at Swansea. In 1850, as chief engineer, he completed the Birkenhead docks, and at the same time designed and built Laird's ship-building yards, with various graving-docks and other appliances. In 1860-66 Mr. Abernethy built the Turin-Savona R. R. and the Cavour Canal, in Italy. His design for the improvement of the Danube through Vienna, submitted in competition with several eminent engineers, was selected by the Government Commission. In 1868-70 he designed and constructed the dock at Newport, with extensive coal-shipping machinery, and in 1879 the Prince of Wales dock at Swansea. As consulting engineer to the Marquis of Bute, he supervised the modern docks at Cardiff. The Hull docks, 46 acres of water, 2 miles of quay walls, were built in the bed of the Humber, reclaiming 200 acres of land. In 1877 works for the reclamation of Lake Aboukir, Egypt, were directed by him, reclaiming 20,000 acres. In 1882 he advised the construction of the Manchester ship-canal, and became its consulting engineer; became associate of the Inst. Civil Engineers in 1844, member in 1856, and president in 1881. D. Mar. 8, 1896.

Abernethy, JOHN: an eminent English surgeon; b. in London, Apr. 3, 1764; grandson of John Abernethy (a noted Dissenting minister, b. at Coleraine, Ireland, in 1680), and a pupil of John Hunter. He was chosen assistant surgeon of St. Bartholomew's Hospital, London, in 1787, and in 1815 chief surgeon of the same. As a lecturer on anatomy and surgery he gained immense popularity. He published in 1809 an important work *On the Constitutional Origin and Treatment of Local Diseases*, the doctrines of which have greatly contributed to improve the science of surgery. Many anecdotes are related of his eccentric manners and of his witty or petulant speeches to his patients. D. at Enfield, Apr. 28, 1831.

Aberra'tion [Lat. *ab*, away + *erra're*, wander]: a term variously employed; in optics it denotes a failure in the rays of light to come to the same focus when refracted by a lens or reflected from a concave mirror. There are two kinds of optical aberration—viz., chromatic (from the Greek *χρῶμα*, color) aberration, or aberration of refrangibility, and spherical aberration, or aberration of sphericity. In astronomy also there is the aberration of the celestial bodies, sometimes (but less correctly) termed the aberration of LIGHT (*q. v.*).

1. *Chromatic Aberration, or Aberration of Refrangibility.*—A convex lens brings rays of light which fall upon it to a focus by virtue of its refracting power. But since the variously colored rays which form white light are differently refracted, it follows that when light is converged by a convex lens it is refracted to different foci. The violet rays, being the most refrangible, form a focus nearest to the lens; while the red rays, being the least refrangible, form a focus farthest from the lens. Thus in place of one focus there are, in reality, an almost infinite number—viz., one for each of the differently refracted rays (the rays even of the same general color being not all refracted equally), and in the order of violet, indigo, blue, green, yellow, orange, red. Hence the rays do not meet at the same focus of the lens; and this deviation of the foci is called the *chromatic aberration* of a lens.

2. *Spherical Aberration, or Aberration of Sphericity.*—Lenses and mirrors are usually ground with spherical surfaces, and so long as the aperture does not exceed eight or ten degrees the rays of homogeneous light refracted or reflected by different parts of them meet very nearly at the same focus of the lens or mirror. But as the aperture of a spherical mirror increases, the rays reflected from the edges cross each other at a point on the axis nearer to the mirror than those which are reflected from portions of the mirror near its center. Thus the rays are deviated from the true focus of the mirror. Again, with regard to spherical lenses of large aperture, the rays which pass through the lens near

its circumference are refracted to a point nearer to the lens than those which pass through its central portion. In the case of mirrors this deviation of light from the focus is called *spherical aberration by reflection*, while in the case of lenses it is called *spherical aberration by refraction*. It may be remedied by giving lenses and mirrors parabolic surfaces, a plan which is almost invariably followed in the construction of specula for astronomical purposes.

3. *Aberration of the Celestial Bodies*, often (but less correctly) termed the *aberration of light*, in astronomy, an apparent displacement of a celestial object, due to the progressive motion of light. This aberration is caused—1, by the motion of the earth in its orbit; and, 2, by the motion of the observed celestial objects. It was discovered by Bradley in 1727. This astronomer reasoned that, if the earth's motion bears only an appreciable relation to the velocity of light, we ought to expect that the rays from a star would seem to come from a point nearer than is actually the case to that point in the heavens toward which the earth's course is directed. The phenomenon he had observed corresponded exactly with this explanation. The change of place due to the velocity of light, estimated from the eclipses of Jupiter's satellites, corresponded (within the limits of observational error) with the observed changes in the apparent positions of the fixed stars. It follows, from a consideration of the earth's path, that each star appears to describe a small ellipse about its true place. This fact is of great importance in its direct bearing on observational astronomy, but it is perhaps no less important on account of the evidence it supplies as to the motion of the earth.

The correction of the observed position of a celestial object for aberration gives the true position for the moment when the light which makes it visible left it; but this is not the true position for the moment of observation, except on supposition that the observed object is at rest. If the body itself is in motion, then, in addition to the correction of position for aberration, there must be a correction for the amount of proper motion which has taken place in the interval since the light which makes it visible left it. In order to make this correction we must know the rate of proper motion and the distance of the body. If the absolute proper motion of the body is given in miles, or length measure, and not the apparent in angular measure, and is parallel to the motion of the earth, then the whole correction may be treated as aberration, by taking the sum or the difference of the velocities per second of the two bodies, according as they are in the opposite or in the same direction, and comparing this with the velocity of light. If the velocities of the two bodies are in the same direction and equal, their difference is zero, and the correction is *nil*. Hence a body moving in the same direction as the earth, and with the same velocity, is unaffected in apparent position by aberration. The same will be true of a body not moving in the same direction as the earth, provided that when its velocity is decomposed into rectangular components, one of which is parallel to the earth's motion, this latter component velocity is equal to the earth's velocity and in the same direction.

It follows from the foregoing that the bodies of a group or system, as observed the one from the other, are unaffected by aberration in consequence of any common motion in which all participate alike, but that they suffer displacement from this cause only in consequence of their relative motions. The moon partakes of the annual motion of the earth round the sun, but suffers no aberration on that account; and so the sun, though it may have a proper motion in space, is unaffected by this cause in its apparent position, as viewed from the earth or from any other member of the solar system, since this motion is one in which all the bodies of the system equally participate.

Revised by S. NEWCOMB.

A'bert, JOHN JAMES: soldier; b. at Shepherdstown, Va., Sept. 17, 1788; graduated at the U. S. Military Academy in 1811; immediately resigning, he became a lawyer in the District of Columbia; and in the war with Great Britain, 1812-15, served as private in the militia at the battle of Bladensburg, Aug., 1814. Appointed brevet major of U. S. Topographical Engineers Nov. 22, 1814, he was placed in charge of the bureau Mar. 19, 1829, and on the organization of an independent corps of that title was made, with rank of colonel, its chief, July 7, 1838. Retired from active service Sept. 9, 1861. D. at Washington, D. C., Sept. 27, 1863. As an officer, and as chief of Topographical Engineers, Col.

Abert exercised an important agency in the development of the earlier national works of civil engineering in the U. S. —e. g. the canal around the falls of the Ohio at Louisville, the Chesapeake and Ohio Canal, the Potomac aqueduct, etc. His exhaustive report on water-supply, in connection with the Chesapeake and Ohio Canal (1838), is a standard of reference. He was a member of the Geographical Society of France and of other learned societies.

Abey'ance [O. Fr. *abeance*; à, at + *beer* < Late Lat. *bada're*, gapc]: a legal term signifying expectation or suspense. It is used to indicate the condition of property where there is no person in whom its ownership is vested. In the law of real estate it is generally applied to a fee, which is said to be in *abeyance* when there is no particular owner of the inheritance. It has been laid down that a fee can be in abeyance only while there is a freehold estate (or life-interest) in the land vested in some person. It is denied by writers of high authority that a fee can be in abeyance. The tendency of modern law certainly is to discountenance this theory, and to reduce the cases of abeyance to the narrowest possible limits. The term has been applied in some instances to personal property, as in case of captures at sea in time of war, as to the title after capture and before condemnation in the prize court.

Ab'gar, or Ab'garus (Gr. Ἀβγαρος), written also **Abagarus, Agbarus, and Augarus**: a name common to several kings of Edessa, in Mesopotamia. The fourteenth of these kings, Abgar Uchomo, is said to have been in correspondence with Christ. The genuineness of this correspondence has found defenders even in the nineteenth century.

Abgil'us, JOHN: son of the King of the Frisii; became a Christian, and accompanied Charlemagne in several of his expeditions. He received the title of prester, or priest, on account of the excessive severity of his life. He is not to be confounded with the Mongolian Prester John of the eleventh century.

Abhorrrers: name given to the court party or supporters of Charles II. in his disapproval of petitions for the reassembling of Parliament (1680), because in their addresses they expressed *abhorrence* of the petitions of the Whigs, who were termed *petitioners* or *addressers*.

Ab'bib (after the Babylonian captivity called NISAN: see Neh. ii. 1): the first month of the Hebrew sacred year and the seventh of the civil year, beginning with the new moon of March.

Ab'ich, WILHELM HERMANN: b. in Berlin, Dec. 11, 1806; studied natural science at the university of his native city; traveled in Italy and Sicily; and published *Erläuternde Abbildungen von geologischen Erscheinungen, beobachtet am Vesuv und Aetna 1833 und 1834* (1837), and *Ueber die Natur und den Zusammenhang der vulkanischen Bildungen* (1841); was appointed Professor of Mineralogy at Dorpat in 1842; and undertook extensive explorations in the Caucasus, Armenia, and Northern Persia, the results of which he communicated partly in the annals of the Academy of St. Petersburg, partly in independent works, the principal of which are—*Ueber die geologische Natur des armenischen Hochlandes* (1843); *Vergleichende geologische Grundzüge der kaukas.-armenischen und nord-persischen Gebirge* (1858); *Sur la Structure et la Géologie du Daghestan* (1862). D. at Graz, July 2, 1886.

Ab'bies (Lat. fir-trec): a genus of coniferous trees which have leaves growing singly on the stem, and the scales of whose erect cones are deciduous. Formerly the genus included the firs, spruces, and hemlocks, but it is now restricted to the firs alone, of which there are eighteen species, all in the Northern Hemisphere. Nine are North American. *A. balsamea* is the balsam-fir of the Eastern U. S.; *A. subalpina* and *A. concolor* occur in the Rocky Mountains; *A. alba* is the silver fir of Europe. All afford valuable timber, and the balsam-fir yields Canada balsam. See PICEA, TSUGA, and PSEUDOTSUGA. CHARLES E. BESSEY.

Ab'ila: capital of the tetrarchy of Abilene; identified with Sûk, on the right bank of the Barada, near the point where it breaks through the Antilibanus range of mountains toward the plain of Damascus. It was on the great road between Heliopolis and Damascus, 32 miles from the former city and 18 miles from the latter. There was another Abila E. of the Jordan, a few miles S. of the Yarmuk (or Hicromax), the northern boundary of Gilead.

Ab'ildgaard, NIKOLAI ABRAHAM: one of the founders of the Danish school of painting; b. in Copenhagen in 1743; d. at Frederiksdal, June 4, 1809. He took a deep interest in the education of Thorwaldsen, and Eckersberg was one of his pupils. His influence on Danish art was very great. R. B. ANDERSON.

Abilene, ab-i-lee'née: an ancient tetrarchy, whose capital was ABILA (*q. v.*). It is impossible to fix its limits. Luke (iii. 1) speaks of it as the tetrarchy of Lysanias, who was apparently a son of the Lysanias mentioned by Josephus. See Kraft's *Topographie Jerusalems* (1847).

Abilene, ab'i-leen: city; capital of Dickinson co., Kan. (for location of county, see map of Kansas, ref. 5-G); on the Smoky Hill river, and the Atch., Top. and S. Fé, the Chi., Rock Is. and Pac., and the Union Pac. railways; 96 miles W. of Topeka, 162 miles W. of Kansas City, Mo. It contains 12 churches, 4 school buildings, a Roman Catholic academy, a national bank with capital of \$50,000, 2 private banks, and a daily and 3 weekly periodicals; and has several elevators, flour-mills, electric-light plant, and excellent water. Pop. (1890) 3,547; (1900) 3,507.

EDITOR OF "REFLECTOR."

Abilene: capital of Taylor co., Tex. (for location of county, see map of Texas, ref. 3-F); on Texas and Pacific R. R.; 161 miles W. by S. of Fort Worth; is connected by stage with Anson, Haskell, and Ballinger; has 7 churches, 3 public schools, 1 roller flour-mill, 2 roller corn-mills, 2 cotton-gins, electric lights, etc. Pop. (1890) 3,194; (1900) 3,411.

EDITOR OF "REPORTER."

Abim'elech (the royal father): I. A king of Gerar, a city of the Philistines, in the time of Abraham (Gen. xx. 1, sq.). II. Another king of Gerar in Isaac's time (Gen. xxvi.), perhaps a son of the foregoing. III. Another Philistine king (Ps. xxxiv. title). IV. A son of Gideon (Judges ix.), who was during three years a self-constituted king over a great part of Israel. Revised by W. J. BEECHER.

Ab'ingdon: a market-town of Berkshire, England; on the Ock, where it joins the Isis; 51 miles W. N. W. of London (see map of England, ref. 11-H). It contains a fine memorial of Prince Albert, erected in 1864, and surmounted by his statue. It has a free grammar-school. Pop. (1891) 6,557.

Abingdon: city of Knox co., Ill. (for location of county, see map of Illinois, ref. 4-C); at the crossing of the C., B. and Q. and Iowa Central R. Rs., 10 miles S. of Galesburg and 85 miles N. E. of Quincy. It is surrounded by a rich agricultural district, and is the seat of Hedding College (controlled by the Methodist Episcopal Church), and of the Abingdon Normal College; has 3 churches and several flourishing manufacturing establishments. Pop. (1890) 1,321; (1900) 2,022. PUBLISHERS OF "ENTERPRISE."

Abingdon: capital of Washington co., Va. (for location of county, see map of Virginia, ref. 7-B); in a township of same name, on two railroads, 315 miles W. S. W. of Richmond. It has three female colleges of high grade, excellent public free schools for white and colored children, post-office and court-house, an extensive iron-foundry, cigar and pipe factories, brickworks, woolen factory, canning and other factories. The county was organized in 1776, and is the first spot of earth named in honor of George Washington. Emory and Henry College is in this county, and a large male academy, both flourishing institutions. Immense deposits of salt, gypsum, and iron ore are found here, and a large part of the salt used in the Southern States during the civil war was obtained from salt-wells bored in this vicinity. Pop. (1880) 1,064; (1890) 1,674; (1900) 1,306. EDITOR OF "VIRGINIAN."

Abiogen'esis [Gr. ἄβιος, lifeless + γένεσις, origin]: a name proposed as a substitute for *spontaneous* or *equivocal generation*, i. e. the doctrine that certain animals or plants have spontaneously originated, and without birth from previous living beings. As yet, there is no direct evidence that such generation ever takes place. See GENERATION, SPONTANEOUS. Revised by D. S. JORDAN.

Abipo'nes: a tribe of Indians living in the Gran Chaco, in the Argentine Confederation. They lived formerly W. of the Paraná, between lat. 28° and 30° S., between Santa Fé and Santiago del Estero, but at present have removed toward Corrientes. The Abipones are of high stature, good swimmers, and tattoo themselves. Long lances and arrows with iron points are their weapons. In 1783 their number was estimated at 5,000, but they have been reduced to 100 at the present day. They are related to the Tobas.

Abka'sia, or **Aba'sia**: a narrow territory in Western Asia, belonging to Russia; between the Caucasus Mountains and the Black Sea, which bounds it on the S. W. It is now under the government of Kutais. The inhabitants, under the Emperor Justinian, became Christians, but subsequently embraced Mohammedanism. They are kindred to the Circassians, and, like the latter, have emigrated in large numbers.

Ablaut: a German term which has fairly established itself internationally in the technical language of scientific grammar. Its best English equivalent is *vowel-gradation*. It applies to that variation of vowel among words of the same Indo-European root, as in English *sing, sang, sung*, and Greek *λείπω, λέλοιπα, ἔλιπον*, which depends upon causes no longer active or discernible in the separate languages of the family. Ablaut is an Indo-European phenomenon produced under conditions existing in the parent Indo-European speech. Umlaut, or mutation, is a distinctively Teutonic phenomenon produced under conditions existing in the separate life of the Teutonic languages, thus: in *foot, feet; cow, kine; louse, lice; Frank, French*, where the cause of the vowel change is the influence of a following *i* sound upon the pronunciation of the root vowel. The Indo-European *mūs* (nom. sing.), *mūses* (nom. plur.), appeared in Greek as *μῦς, μύες*; in Latin as *mūs, mures*; and in primitive Teutonic—i. e. before the division into dialects—as **mūs, *mūsiz*. The Teutonic vowel *i* in the second syllable of **mūsiz*, which represented thus the original vowel *e* of the Indo-European nom. plur. ending *-es* (cf. *πῶδ-ες*), was the cause of the change of *ū* to *ī* in the plural of our *mouse, mice* = Old English *mūs, mȳs*. See UMLAUT.

Sharply distinguished from these vowel changes are the phenomena of ablaut. The latter, as they appear in the Teutonic or other Indo-European languages, are simply inheritances from the parent speech. They may be *utilized*, as they are notably in the Germanic family, owing to the decay of the endings, for the distinguishing of meanings, but they no longer exist in any relation to the conditions that produced them. These can be discerned only by reference through the methods of comparative philology to the parent Indo-European speech. The relation, for instance, of

- (1) *ziehen, zog, gezogen, to*
- (2) *binden, band, gebunden,*

is clearer in the Gothic

- (1) *tiuhan, tauh, tōhans,*
- (2) *bindan, band, bundans,*

but not evident, until the systems are reduced to the Indo-European form:

- (1) *deuk, douk, duk,*
- (2) *bhendh, bhondh, bhndh.*

These two systems are illustrated in Greek by

- (1) *ἐ-λεύ(θ)-σομαι, εἰλή-λουθ-α, ἦ-λυθ-ον,*
- (2) *ἐ-γέν-ετο, γέ-γον-α, γί-γν-ομαι.*

The ablaut of German *giessen, goss, gegossen*, corresponds to Gothic *giutan, gaut, gutum*, and Greek *χέτω, χοφή, κέχυνται*.

The original cause for the phenomena of ablaut is to be found in the peculiar conditions of word and sentence accent in the Indo-European parent speech. Thus by the withdrawal of the accent the original root-elements *ei, eu, el, er, en, es*, etc., were reduced to *i, u, l, r, n, s*, etc. Thus Greek, *εἶμι, ἴμεν* (orig. **imēn*), cf. Skr. *ἔμι, ἴμας*. So *χεῖμα, χυτός; φεύγω, φυγεῖν; πείθω, πειθέσθαι; Φείδομαι, Φιδεῖν; δέρεται, δρακεῖν (r > ρα); αἶθω, ἰθαρός*, etc. The cause of differentiation between the *e* grade and the *o* grade is not so definitely determined (*λέγω, λόγος; νέμω, νόμος; λείπω, λέλοιπα; δέρομαι, δέδορκα*; Gothic, *steigan, staig*; English, *sing, sang*, etc.), but it most probably had its origin in a variety of musical pitch—i. e. the *e* grade occurs with stress and high pitch, the *o* grade with stress and lowered pitch. The chief systems of Indo-European ablaut may be grouped as follows:

1. *ē : ō*: zero, as *πέτομαι, ποτή, πτέσθαι; πα-τέρ-ες, εὐπά-τορες, πα-τήρ, εὐπά-τωρ, πα-τρ-ά-σι*.
2. *ǣ : (ō?)*: zero, *ἀγός, στρατ-ἄγ-ός*. Skr. *j-mán* (path).
3. *ō*: zero, *ὀδμή, ὀδ-ωδ-α; πρωί, πρό, πρ-ί-ν*.
4. *ē : ō : ə* ("obscure" vowel): *τίθημι, θωμός, θετός*.
5. *ā : ō : ə*: *φάμι, φωνή, φάμέν*.
6. *ō : ō : ə*: *δίδομι, δόσις*.

BENJ. IDE WHEELER.

Ablu'tion [Lat. *ab*, away + *lu'ere*, wash]: a religious ceremony of the Roman Catholic Church, signifies the washing of the sacramental cup and of the hands of the priest. The various editions of the *Directorium Anglicanum* give minute directions as to the ablutions recommended for use

in the ritual of the Church of England. In the American Episcopal Church ceremonial ablutions are disallowed, on the recommendation of the House of Bishops, in the public worship.

Abnakis: See ALGONQUIAN INDIANS.

Ab'ner (the enlightener): uncle of Saul, the first King of Israel. Abner became commander-in-chief of Saul's army, and for some time after the death of the king he was the chief support of Ishbosheth, his successor; but subsequently went over to the side of David, then King of Judah. With David he found such favor that Joab was jealous and slew Abner, cir. 1048 B. C., according to Ussher.

Revised by W. J. BEECHER.

Åbo (Sw. pronunciation, *ō'boo*): Russian city and seaport, on the Aurajoki near its entrance into the Gulf of Bothnia; lat. 60° 26' 58" N., lon. 22° 17' E. (see map of Russia, ref. 5-B). It was built by Eric IX. of Sweden in 1157, was subsequently taken by the Russians, and in 1809 was, with the whole of Finland, ceded to Russia. It was the capital of Finland until 1819, and is now the see of a Lutheran archbishop. It has a cathedral, a town-hall, and a custom-house. The University of Åbo, having been destroyed by fire in 1827, was rebuilt at Helsingfors. Pop. (1897) 32,184.

Åbo-Björneborg: a government of Finland; bounded by the governments of Vasa and Tavastehus, and by the Gulfs of Finland and of Bothnia. Area, 9,332 sq. miles. The chief occupation of the inhabitants is commerce and ship-building. The government has also some factories. Pop. (1897) 413,351, nearly all Lutherans. Chief town, Åbo.

Åbo, Peace of: a peace concluded Aug. 17, 1743, between Sweden and Russia. It put an end to the war begun by Sweden at the instigation of France in 1741. During this contest, and through the misconduct of the Swedish generals, the Russians gained entire possession of Finland. The greater part of this territory they offered to restore on condition that Sweden should elect the Prince of Holstein-Gottorp successor to the throne. This condition the Swedes complied with, and the treaty of peace was accordingly signed at Åbo.

Abolition of Slavery: See SLAVERY.

Aboli'tionists: a name applied to those persons—more particularly in the U. S.—who were distinguished for their zeal against the institution of slavery.

Abomey, *ab-ō-mā'*: an African town; capital of the kingdom of Dahomey; lat. 7° 30' N., lon. 2° E. (see map of Africa, ref. 5-C). It contains several royal palaces. Captured by the French under Gen. Dodds, Nov. 21, 1892. Pop. estimated at from 50,000 to 60,000.

Aborig'i-nes [Lat. derivative from phrase *ab ori'gine*, from the beginning]: the earliest original inhabitants of a country—that is, those who occupied it at the period when it began to be known, and who either were (according to a once prevalent opinion) indigenous to the soil or had emigrated thither before the dawn of history. Some of the ancients supposed they had always inhabited the same soil, and sprang from it, as the Athenians, who thence called themselves *autoch'tones* (from *αὐτός*, itself + *χθών*, earth, soil, land); i. e. sprung from the land or soil itself. But the Romans and modern nations use the word *aborigines* to designate those inhabitants of a country of whose origin nothing certain is known. Thus the Indians of America are properly called *aborigines* because they were found there at its discovery, and as to their origin we have only their own tradition (which is not uniform), that their ancestors came from a distant region in the northwest.

Abortion [Lat. *abortio*, from *abori'ri*, miscarry; *ab* + *ori'ri*, appear]: the premature delivery of the human fœtus, or its expulsion before it is capable of sustaining life. The term is popularly understood as applying to the expulsion of the fœtus before the sixth month of gestation. A child born as early as the seventh month of pregnancy not infrequently lives, the case being referred to as simply one of premature birth. And a child born after the seventh month, but before the natural period of parturition, which dies at once and in consequence of the premature delivery, is a case of abortion. A premature delivery may be either natural or artificial. A natural abortion may be caused by various accidental or pathological conditions. Artificial abortion is usually caused by drugs, which excite uterine contractions, and thereby cause the expulsion of the fœtus, although not

infrequently produced by mechanical means. A resort to either method is extremely dangerous to the woman's life. Artificial abortion may or may not be criminal, according to circumstances. Premature labor produced for the purpose of saving the life of either the mother or the child is justifiable. But premature labor produced with the malicious intent of prematurely getting rid of the product of conception, and thus preventing the birth of a living child, is criminal. The Roman law did not regard an unborn child as a human being, and a woman procuring her own miscarriage was not liable under the Lex Julia against homicides, but she was liable as for an *extraordinarium crimen*. Among the Anglo-Saxons abortion is said to have been regarded as an ecclesiastical offense only. In England and in the U. S. the law governing abortion is at the present time statutory. These statutes vary greatly in different States, both as to the nature of the crime and as to the penalty imposed. In some it is not an indictable offense to produce an abortion unless the woman was "quick" with child, while in others the act of criminal homicide is possible from the earliest stage of gestation. See OBSTETRICS. HENRY WADE ROGERS.

Aboukir: See ABUKIR.

Aboulia: See WILL.

About, aã'boo', EDMOND: French novelist and political writer; b. at Dieuze (Meurthe), Feb. 14, 1828. In 1868 he wrote, as one of the contributors to the *Gaulois*, a series of witty and satirical letters, in consequence of which that paper was suppressed by the authorities; but he was nevertheless assisted by the imperial Government, which in 1870 appointed him councilor of state. At the beginning of the war he was for a short time war correspondent for the *Soir*. Sept. 14, 1872, he was arrested by the Germans, but was released Sept. 21. He published in 1855 a work on modern Greece, *La Grèce contemporaine*, which was much admired. He had been sent to the French school of art in Athens by his Government. Among his works are novels entitled *Tolla* (1855); *Germaine* (1857); a political treatise on *The Roman Question* (1860); *Madelon* (1863); *Le Progrès* (1864); *La vieille roche* (3 vols., 1865-66); *L'infame* (1867); *Les mariages de province* (1868). His *Le Roi des Montagnes* (1856) is one of his best works. D. Jan. 17, 1885.

Aboville, FRANÇOIS MARIA, Count: French general; b. at Brest, Jan. 23, 1730. He directed the artillery at Yorktown, Va., in 1781, and was inspector-general of artillery under Napoleon I. D. Nov. 1, 1819.

Abrahamel', or **Abarbanel'**: b. in Lisbon, 1437; d. in Venice, 1508; traced his pedigree back to King David; was a minister of state to Ferdinand and Isabella of Spain, but was in 1492 exiled as a Jew; lived mostly in Italy, whence he made short journeys to other countries, and wrote, besides some commentaries, his *Herald of Salvation*, an elaborate exposition of the Jewish doctrine of the Messiah, first printed at Saloniki in 1526.

Abracadabra': a cabalistic word, probably of Persian origin (and connected with *abraxas*), occurring first in writings of Qu. Severus Sammonicus (c. 200 A. D.), and highly prized in former times as a magical formula. Written in the form shown in the annexed figure, and worn as an amulet, it was supposed to be efficacious in the cure of fevers and other ailments.

A B R A C A D A B R A
 A B R A C A D A B R
 A B R A C A D A B
 A B R A C A D A
 A B R A C A D
 A B R A C A
 A B R A C
 A B R A
 A B R
 A B
 A

Abraham, originally **Abram**: the founder of the Israelitish race; b. at Ur in Chaldæa. The date is unknown. Bunsen makes it about 2850 B. C., Hales 2153 B. C., and Ussher 1996 B. C., and others later still. He migrated to Canaan with a numerous tribe (Gen. xii. 5; xiv. 14, etc.), and lived there in tents. His faith was tried by long waiting, and he is known as the "father of the faithful" and the "friend of God." But the thing mainly emphasized in the Bible accounts is the promise that God made to him. Subordinately, the promise is that he shall have a numerous posterity, including "kings," and "a nation" made up of "an assembly of nations" or "of peoples," which shall inherit the land of Canaan forever (Gen. xii. 2; xvii. 6-19; cf. xxviii. 3; xxxv. 11; xlvi. 4, etc.). Chiefly, the promise is that in him and his posterity all mankind shall be blessed (Gen. xii. 3, etc.); and in view of this his name was changed

to Abraham, "father of multitude" (Gen. xvii. 4-5; Rom. iv. 17). Here "multitude of nations" is a different phrase from "assembly of nations" in the texts cited above. See Gen. xi.-xxv.; Acts vii.; Gal. iii.; Heb. xi. 8-19.

W. J. BEECHER.

A'braham-a-Sanc'ta-Cla'ra: a popular German preacher and Augustine friar, whose name was ULRICH MEGERLE; b. in Baden, June 4, 1642. He was appointed preacher to the imperial court at Vienna in 1669, and published many religious works. His sermons were seasoned with witty, humorous, or whimsical expressions. D. Dec. 1, 1709.

A'brahamites: a sect of Bohemian deists, who are said to have rejected all parts of the Bible except the Ten Commandments and the Lord's Prayer. They were suppressed in 1783.

Abrantes, DUKE OF: See JUNOT.

Abraxas: a kind of gem found in Syria, Egypt, and Spain, and used by the Gnostics as an amulet. These abraxas stones were of various forms, but all had the word abraxas, or abrasax, engraved on them in connection with certain mystical symbols, mostly consisting of fantastical figures, composed of the body of a serpent, the head of a bird, and other incongruous parts. The word abraxas was first used by the Egyptian Gnostic Basilides (*q. v.*), and denoted not the supreme being, but the assemblage of the 365 world-spirits; the letters composing the word expressing, according to the Greek numeration, the number of 365. His disciples, who used gems of this kind as amulets or talismans, and after whom they are often called Basilidian stones, spread them all over Egypt and Syria, and in the fourth century the disciples of Priscillianus carried them to Spain.

Abridg'ment [Fr. *abrégé* < Lat. *abbrevia're*, shorten]: a condensation or compendium of a book or literary work. In the law of copyright an abridgment, when fairly made, is regarded as a new work, and accordingly its publication is not an infringement of the copyright. A distinction is taken in the legal decisions between an abridgment and a compilation. The latter is more readily regarded as an infringement, as the words of an author are reproduced, while in a true abridgment the thoughts are expressed in other words and in a condensed form.

Abro'lhos (i. e. open your eyes): a group of small rocky islands which belong to the State of Bahia, Brazil. The largest of these, Santa Barbara, 40 miles from the coast, has a lighthouse in lat. 17° 58' S., lon. 38° 42' W.

Abrun'zi and **Molise**: a political division of Italy, comprising the provinces of Abruzzo ulteriore I., Abruzzo ulteriore II., Abruzzo citeriore, and Molise, or Campobasso. It extends from the Apennines to the Adriatic, between the parallels of 42° and 43° (see map of Italy, ref. 6-E). Though it has a coast line of about 100 miles, it has no good harbor. It is very mountainous, and was formerly much infested by brigands. Lake Fucino is within it. The principal towns are Teramo, Aquila, Chieti, Solmona, Isernia, and Campobasso. Area, 6,487 sq. miles. Pop. (1891) 1,360,378.

Ab'salom: third son of King David, by Maacah, a Syrian princess, was remarkable for his personal beauty. Having, by his popular arts and fair speeches, gained the favor of the people, he rebelled against his father and raised a large army, which was defeated by the army of the king. Retreating from this battle, Absalom was killed by Joab, although David had given orders that his life should be spared. See 2 Samuel xiii.-xix.

Ab'salon, called also **Axel**: an eminent prelate and general; b. in Iceland in 1128; was a liberal patron of learning, and was distinguished for his wisdom in council. He was one of the ministers of the Danish King Waldemar I., and became Archbishop of Lund in 1178. D. in 1201.

Ab'scess [Lat. *absces'sus*, from *abs*, away + *ce'dere*, go, because the pus separates itself from the rest of the body]: in surgery, a circumscribed collection of pus in any part of the animal organism, as distinguished from "purulent infiltration," which designates such a collection not circumscribed. The term "diffuse abscess" is, however, applied, though improperly, to purulent infiltration. An "acute abscess" is one which is the result of active inflammation. "Cold abscess" is the result of chronic inflammation, and is commonly of tubercular origin. The tendency of an acute abscess is to "point" or "come to a head"; that is, from the outward pressure of the accumulating pus, the walls yield mechanically in the direction of least resistance. In favor-

able cases the evacuation of the pus, natural or artificial, is the initiation of recovery; but if the abscess be of the "cold" variety, or be deep-seated and extensive, or be associated with dissemination or septicæmia, the question of recovery becomes a much more complicated one. In general, abscess is detected by observation of the general and local symptoms. The general symptoms are fever and subsequent rigors; the local are "pain, heat, redness, and swelling," followed by softness and fluctuation of the fluid contents. See Pus.

Revised by WILLIAM PEPPER.

Abscis'sa [Lat. *absci'ndere*, p. partic. *abscissus*, cut off, se. *linea*, line]: in geometry, that one of a pair of cartesian co-ordinates which is measured on the fundamental axis. See Co-ORDINATES.

Absenteeism: habitual absence from one's post of duty or the like; specifically habitual absence from the country or district from which one's revenues are received, as owners of large estates who spend their incomes in other countries. This practice is very prevalent among the Irish nobility and gentry, and to it some political economists ascribe the poverty of Ireland in part. "A petition on Irish absenteeism was presented to Parliament as early as 1380, during the reign of Richard II., . . . and in the reign of Henry VIII. the estates of several non-resident landlords were seized." Feb. 17, 1634, the Irish Parliament passed a law fining the nobility of the kingdom of Ireland dwelling within England or elsewhere out of the realm, and from 1715 to 1753 a tax of four shillings on the pound was levied on all profits, fees, pensions, etc., derived from Ireland in cases where the recipients did not reside in Ireland at least six months of the year. See Townsend's *Manual of Dates*.

Absinthe [Fr., wormwood, from Lat. *absin'thium*]: a liqueur much used in France, prepared from alcohol mixed with volatile oil of wormwood, oil of anise, and other ingredients. It has peculiarly intoxicating effects, which are due to the oil of wormwood, the state resulting from its use being very different from the result of alcohol poisoning. Trembling, vertigo, fearful dreams, and epileptiform convulsions are among its severer consequences. Absinthe drinking is one of the most dangerous forms of stimulation yet invented—the more so because its immediate consequences are usually more agreeable than those of alcohol. The best absinthe is made in Switzerland.

Absolute [Lat. *ab*, from + *solu'tus*, loosed]: originally, loosed or freed from all conditions; entirely independent; hence positive, unconditional, unlimited. As a scientific term it is the reverse of relative, as *absolute velocity*. In metaphysics it represents the unconditioned infinite and self-existent. Absolute monarchy is that which is not limited or restricted by constitutional checks.

Absolute Alcohol: See ALCOHOL.

Absolu'tion, CANONICAL: the act of freeing from censure.

Absolution, SACRAMENTAL: the remission of sin which a duly authorized priest in the Roman Catholic Church grants to a penitent rightly disposed. The Lutheran Church (*Augsburg Confession*, arts. xi., xxv.; Luther's *Small Catechism*) retained absolution as the individualization of the general promise of the Gospel declared to the penitent and believing.

Absorokas: See SIOUAN INDIANS.

Absorp'tion [Lat. *ab*, from + *sorbe're*, suck]: the function by which nutritive matter is absorbed into an animal or plant. The active agent in absorption is the living protoplasm of the cells. Root-cells absorb water and solutions; leaf-cells, gases. Cells absorb from one another, and thus cause a movement of the water and other matters in the plant.

CHARLES E. BESSEY.

Absorption, ELECTRIC: a phenomenon occurring when a dielectric, not perfectly homogeneous, is charged and discharged. When, for example, a plate of glass serves as the dielectric of a condenser, it is found that the coatings of the latter after discharge soon begin to show difference of potential again, the charge continuing to rise for an appreciable interval of time, and reaching a value which is a considerable fraction of the original charge. This "residual" charge, as it is called, is due to electric absorption. Clausius, and independently Maxwell, early attributed this phenomenon to non-homogeneity of the insulating medium. It has since been shown (Rowland and Nichols, *Phil. Mag.*, series 5, vol. xi. p. 414) that a homogeneous substance, such as crystallized calcite, when used as a dielectric, develops no residual charge.

E. L. NICHOLS.

Ab'stinance [Lat. *abs*, from + *tene're*, keep]: the act or state of abstaining, as from food, drink, etc. The days of abstinence or fasting noted in the Prayer-Book of the Church of England and in that of the disestablished Church of Ireland under this head are: (1) The forty days of Lent; (2) the Ember days at the four seasons, being the Wednesday, Friday, and Saturday after the first Sunday in Lent, the Feast of Pentecost, Sept. 14, Dec. 13; (3) the three Rogation days, being the Monday, Tuesday, and Wednesday before Holy Thursday, or the Ascension of our Lord; (4) all the Fridays in the year, except Christmas day. In the American Prayer-Book, Ash-Wednesday and Good Friday are specifically noted as "fasts," and the occasions above given are spoken of as "other days of fasting, on which the Church requires such a measure of abstinence as is more especially suited to extraordinary acts and exercises of devotion."

W. S. PERRY.

Abstinence, TOTAL: abstention from the use of intoxicating beverages. Total abstinence was practiced in early ages by the Nazarites and Rechabites, mentioned in Scripture. Some of the Hebrew prophets vigorously inveigh against the prevalence of drunkenness, yet hardly indicate total abstinence as the proper remedy. The *ESSENES* (*q. v.*)—a Jewish sect contemporary with the Messiah—were distinguished for temperance in eating and drinking, eschewing generally the use of flesh and wine. Mohammed peremptorily forbade the use of wine as a beverage by his followers. In the feudal ages, societies designed to shield their members and others from the evils of drunkenness were often formed, but not on the basis of absolute disuse of stimulants. The discovery of alcohol by an Arabian chemist about 1000 A. D. had, through the art of distillation, greatly expanded and intensified the evils of intemperance, especially in Northern Europe, where beer had generally been the most potent stimulant attainable by the masses. The discovery and settlement of America, largely increasing the average rewards of manual labor, especially on this continent, rendered intemperance more common, by increasing the ability of the common people to purchase alcoholic stimulants; and the U. S., especially throughout the half century succeeding its Declaration of Independence, was hardly equaled in the prevalence of intoxication even by the British and Scandinavian kingdoms, and was unapproached by any other nation.

The earliest known organization of a total abstinence society in the U. S. was "The Temperate Society of Milton and Northumberland" (Saratoga co., N. Y.), founded by Dr. Billy J. Clarke in 1808, which at its commencement had forty-three members. Distilled liquors and wines were absolutely prohibited by its rules, but not the moderate use of beer. In 1813 was formed the "Massachusetts Society" for the suppression of intemperance. In 1826 the American Temperance Society was organized. The evils resulting from the free use of ardent spirits were so general and glaring that kindred societies were soon formed in many cities, villages, and rural townships, the movement being strongly aided, especially among zealous Christians, by Dr. Lyman Beecher's *Six Sermons on Intemperance*. Dr. Eliphalet Nott, president of Union College, was also early and honorably distinguished as a pioneer in the temperance cause. It was not till 1833 that, at a national meeting of the friends of temperance, held in Philadelphia, the principle of "total abstinence from all that may intoxicate" was propounded, only to be voted down; but it was again proposed, and adopted, at a national convention held at Saratoga Springs in Aug., 1836, and became henceforth the basis of the temperance movement, to which a great impulse was given by the "Washingtonians" (in good part reformed drunkards), who began their work in 1841, and for a time seemed destined to sweep all before them. The Washingtonian effort gradually spent its strength and faded out, being succeeded by new organizations, whereof the "Sons of Temperance," "Good Templars," "Rechabites," "Good Samaritans," and "Cadets of Temperance" are still active and flourishing.

The total abstinence movement in Great Britain first attracted public attention in 1831. The "pledge" to drink no intoxicating liquors was first adopted by a national gathering at Manchester in 1834. It has never yet become so influential in that as in this country, and its upholders have only ventured to ask of Parliament a "permissive" act—that is, one allowing any locality to forbid and outlaw the liquor traffic by a majority vote—and this has never been conceded.

In Ireland total abstinence was first effectively commended by Father Mathew, who persuaded great numbers of his countrymen to take the pledge. See PROHIBITION.

Revised by C. K. ADAMS.

Abstinent: a Christian sect of Gaul and Spain in the latter part of the third century A. D., who condemned marriage and the use of flesh-meats and wine, declaring that they were made by the devil and not by God.

Abstract of Title: See the Appendix.

Abstraction [Lat. *abstractio*, from *abs*, from, and *trahere*, draw]: the process whereby the mind reaches the abstract notion or conception, that is, one which has reference to a quality or property of an object without further definition of the object itself. For example, color, virtue, government are abstract ideas. They apply equally to a number of cases, and so are opposed to *concrete* ideas, which denote particular objects only. See THOUGHT.

Any abstract or theoretical consideration, which seems to have no immediate application to facts is also an abstraction.

The sciences which deal mainly with symbolic quantities and general formulas, rather than with particular concrete facts, are called *abstract sciences*—notably mathematics, logic, and metaphysics. They use the deductive method, and are often called “deductive” as opposed to the “inductive” or “natural” sciences. See INDUCTION.

Abt, FRANZ: musician; the most popular song composer Germany ever produced; b. in Eilenburg, Prussian Saxony, Dec. 22, 1819. He was at first intended for the Church, but his father dying while Franz was at the University of Leipzig, the support of himself and his widowed mother devolved on him, and he became a teacher, but continued to study music. His first compositions—a set of dances and some songs—were published in Leipzig, in April, 1838, and soon after he was appointed conductor of the Leipzig Philharmonic Society, and he subsequently held similar positions elsewhere. He married in Sept., 1841. His famous song *When the Swallows Homeward Fly* was first published in Stuttgart, and made his fame. He wrote many songs, and was especially successful in writing for male voices. In 1872 he visited the U. S., and conducted many concerts in Boston, New York, Newark, and other cities. He also conducted a performance of Wagner's *Tannhäuser* in New York. He died on Mar. 31, 1885. His published works run up into the thousands. He had a remarkable gift of melody, and almost every singing society in Germany and in the U. S. has sung some of his songs. D. E. HERVEY.

Abu: an Arabic word, signifying father, occurs as a prefix to many Oriental names, as Abû-Bekr, “father of the virgin.” It corresponds to Hebr. *Ab*, as in Abraham, “father of a multitude,” Absalom, “father of peace.”

Abu: a mountain of India, in Rajputana, connected with the Aravali range; about 5,000 feet above the level of the sea. It is a celebrated place of pilgrimage for the Jains, who have four temples at Dilwara, near the middle of the mountain. One of these is said to be the most superb of all the temples of India.

Abubekr', or Aboo-Bekr: a caliph, the first of Mohammed's successors; b. in Arabia about 570 A. D. His original name was Abd-el-Kaaba, which was exchanged for Abu-Bekr (i. e. father of the virgin), because his virgin daughter Ayesha was married to the prophet. He began to reign in 632 A. D., and died in 634, leaving a high reputation as a man and a ruler.

Abukir', or Aboukir: a fort and village of Egypt, on the site of the ancient Canopus, and on the seacoast at the west side of Abukir bay, 15 miles N. E. of Alexandria. In Abukir bay Admiral Nelson gained a decisive victory over the French fleet, Aug. 1, 1798. Here the Turks were defeated by the French under Napoleon I., July 25, 1799, and the French by the British, Mar. 21, 1801.

Abulca'sis, or Abulka'sis (written also **Abul-Kasem**), KHALAF EBN ABBAS: Arab physician and surgical writer; b. near Córdoba, in Spain. His principal work was published in 1778 under the title of *Abulcasis de Chirurgia* (Arab, “Al-tassrif”). The part devoted to surgery is regarded as the most valuable treatise of the kind that has come down to us from early times. D. about 1117.

Abulfa'raj, GREGORIUS: learned historical writer; b. in Armenia in 1226; became maphrian or primate of the eastern division of the Jacobite Christians in 1266. He wrote in Syriac and Arabic several valuable works, among which

is a *History of the Dynasties*. D. in 1286.—There was also a famous Oriental poet, Ali Abulfaraj (897–997).

Ab'ul-Fazl: eminent Oriental historian, who in 1574 became vizier or prime minister of the great Mogul Emperor Akbar. He was a wise and liberal statesman. He was assassinated in 1608. Among his important works are a history of Akbar, called *Akbar Nameh*, and *Institutes of Akbar* (Ayeen Akbari).

Abul'feda: a Moslem prince and author; b. at Damascus about 1273. He fought with distinction for the Sultan of Syria against the Tartars or Mongols, and was rewarded with the title of Prince of Hamah. He wrote an important work entitled *An Abridgment of the History of Mankind*, and another, *The Description of the Countries*, which is regarded as the best Arabic work on geography that is extant. D. in 1331.

Abu'na (our father): a title given to the head or patriarch of the Abyssinian Christians.

Abu Simbel: a place in Nubia, on the west bank of the Nile, 1,014 miles above Cairo and 8 miles above the Second Cataract. It contains two of the best-preserved specimens of the great rock-hewn temples of ancient Egypt; one of which has four sitting colossal statues, which are almost the largest stone figures existing. The sculptures of both temples are of very great value. See IPSAMBUL.

Abu'tilon: a genus of mostly shrubby plants of the mallow family, including about seventy species, which are widely distributed in warm climates. Many are cultivated in green-houses—e. g. *A. insigne*, *A. striatum*, *A. vitifolium*, etc. *A. avicennae*, from India, is a common roadside weed in many parts of the U. S., where it is called velvet-leaf.

C. E. B.

Abutment: the stone structure which receives the horizontal thrust of an arch, or the pier of a bridge built on the shore and connecting it with the street. The mass of masonry to which the cables of a suspension-bridge are anchored is also sometimes called an abutment. See ARCH, BRIDGES, FOUNDATION, and MASONRY. M. M.

Aby'dos: an ancient city of Upper Egypt; on the left bank of the Nile; 5 or 6 miles from the river, and about 100 miles below Thebes. Here are the ruins of a temple of Osiris and a temple of Memnon, in which Mr. Bankes discovered in 1818 the celebrated tablet of Abydos, now in the British Museum. A second tablet of Abydos, containing seventy-six shields, was discovered by Mariette in 1865. Bankes's tablet contained only twenty-six shields.

Aby'dus, or Aby'dos (Gr. Ἀβυδός): an ancient city on the Hellespont opposite Sestos, where Xerxes crossed over to Europe on a bridge of boats, 480 B. C. It was also celebrated for its connection with the story of Hero and Leander.

Ab'yla and Cal'pe: the pillars of Hercules, standing on both sides of the Straits of Gibraltar, Abyla in Africa.

Abyssin'ia (Ar. *Habash*, mixed): an African empire, formerly Ethiopia, now *Abyssinia and Shoa*, by the addition of the large kingdom of Shoa on the S. E. It lies E. of the Nile and nearly opposite the Straits of Bab-el-Mandeb, with Nubia on the N., Eritrea between it and the Red Sea, the Somali and Galla lands on the S., and Nubia on the W. On the S. W. the boundary is ill defined. It is of a long, elliptical form, with its greatest length N. and S., and extends from 7° N. to 17° N., and from lon. 36° to 42° E. It is entirely cut off from the Red Sea by Eritrea, but approaches it within a few miles near Massowah. The area is about 190,000 sq. miles, and the latest estimates of the population place it at 4,500,000. The principal subdivisions are Tigré on the N. and N. E., Amhara and Gojam in the center, Shoa in the S. E. and the smaller dependencies of the Shan-kalla in the W., and Galla and Kaffa lands in the S. and S. W. The Afar or Danakil and the Adal countries on the lowlands adjoining the Red Sea are now parts of Eritrea.

Topography.—In its present form Abyssinia occupies the highlands of Ethiopia which rise abruptly from the lowlands to the E., and consist of extensive table-lands from 6,000 to 10,000 feet above the sea, diversified by mountains and river gorges. The chief range of mountains forms a crescent about the large central Lake Tana, concave toward the E. They are highest in the N., where they reach 15,000 feet, and the higher peaks are always covered with snow. The principal rivers are tributary to the Nile. The Abai or Blue Nile leaves Lake Tana at its S. E. angle, and, first taking a southeasterly course, sweeps around the moun-

tainous province of Gojam, falling into the Nile proper at Khartum. The Atbara, also a branch of the Nile, drains the most of the country to the N. of Tana, while the waters of the S. flow southward into Lake Rudolf, about lat. 5° N. There is little drainage into the Red Sea. Lake Tana (Tzana or Dembea) is divided into nearly equal portions by the parallel 12° N. and the meridian 37° 2' E. It is 5,658 feet above the sea; is nearly circular, and about 40 miles in diameter; has an area of about 3,000 sq. miles, and is in places very deep. The rocks are usually granite, gneiss, or schists, but trap and basalt are common, and fossiliferous rocks of the Jurassic age have been observed. Denudation has gone on extensively, leaving narrow valleys and cañons, which are sometimes 3,000 or 4,000 feet deep. The country is very picturesque, and seems as if broken up and tossed about; the mountains are abrupt and precipitous, the passes few and difficult, and the scenery wild and fantastic.

Climate.—This is generally temperate and salubrious, both because of the great elevation and because the hot season is terminated early by the midsummer rains. The rainfall is light in the N., but increases southward.

Productions.—The vegetation of the table-lands and mountains is that of the temperate zone, with little forest growth; that of the ravines is more tropical. The large tropical animals are not rare at the lower elevations in the S. The spotted hyæna is everywhere so common as to be a pest. Honey forms an important part of the food of the people. The ravages of locusts are often very serious.

The people are essentially pastoral, and tillage is comparatively little practiced. The cattle are small; the sheep are of the fat-tailed kind. Goats are raised in large herds. Horses are common and excellent. Abundant crops of maize, wheat, barley, pease, beans, and tobacco can be raised; coffee, cotton, the sugar-cane, and the date-palm will thrive in many places, as also will the orange, lemon, pomegranate, and banana in lower altitudes. A fine-grained millet called *teff* is used for making bread. Myrrh, balsam, and several valuable medicinal plants are found here.

Inhabitants.—The population is made up of a heterogeneous collection of races—Coptic, Arabian, Jewish, and Negro. The political ascendancy has long belonged to a race which calls itself Ethiopian, and is of Arabian descent. This people speaks a dialect of the old Ethiopic language which is of the Semitic linguistic family. (See AMHARIC.) The Abyssinians were converted to Christianity in the fourth century by Frumentius, who was consecrated bishop by St. Athanasius. They are still members of the Alexandrian Church, and consequently Monophysites. The head of the Church, or *abuna*, is always a Copt, appointed by the Patriarch of Alexandria, but his power is shared by a native dignitary who controls the monastic orders. Jews are common, and date from very early times. They are called Falashas. There are also many Mohammedans and heathens.

The manners of the Abyssinians are rude and warlike, and their civilization is of the early feudal type. The literature is entirely religious. Teaching is restricted to the clergy, and consists in instruction in grammar, choral singing, and the recitation of sacred texts. It is gratuitous, but given to a selected few only, and these form a somewhat influential class of *literati*.

History.—There have been many changes of family in the rulers during the historic period, but until recently they have all belonged to a royal line said to have descended from the Queen of Sheba. During the captivity many Jews settled here, and brought with them a knowledge of the Jewish religion. Under the Ptolemies the Greeks established colonies in Ethiopia, and brought their arts with them. The ancient kingdom of Anxume, of the first and second centuries, was at one time nearly coextensive with modern Abyssinia. At Axum, the site of the ancient capital, many vestiges exist which show its former greatness. Christianity was introduced between 330 and 360 A. D., and about 470 a great company of monks seems to have established itself in the country. In the sixth century Abyssinia conquered Yemen in Arabia, and held it sixty-seven years. This was the greatest period in their history, but it was soon ended by the destructive zeal of the early followers of Mohammed. In 960 the Jewish Princess Judith gained the throne, and it remained in the hands of her descendants until 1268, when it passed again to the old royal line. The Portuguese missions began about the end of the fifteenth century, and were due to the old search for Prester John. Between 1528 and 1540 the country was overrun by Mohammedan armies, and the Portuguese were called on for succor. There followed a period of Jesuit

ascendency, until 1633, when they were expelled. The best-known figure in the history of Abyssinia in recent times is King Theodore. He was b. in 1818, and crowned King of Ethiopia in 1855. He was an able and energetic man, and extended greatly the boundaries of the kingdom. He took the English into his favor, until the disrespect shown a letter which he addressed to the Queen of England caused his feelings to change. This finally resulted in sending a large English force into Abyssinia, the storming and capture of Magdala, and the suicide of Theodore on the 13th April, 1868. His death was followed by a period of anarchy, until Prince Kassai was crowned as Johannes II. in 1872. After his death in 1889, Menelek II., King of Shoa, succeeded in gaining the crown.

In return for the assistance which he had received from Italy, whose colony of Eritrea bounds Abyssinia on the north, Menelek surrendered to Italy the province of Hamasen and concluded a treaty (May 2, 1889) and a convention for "mutual protection," which Italy construed as giving her a protectorate over the country. Menelek having denounced this interpretation friction resulted, and hostilities were begun in the course of which the Italians captured Adowa (*q. v.*) and several important points in the interior, from which, however, they were driven one by one, and on Mar. 1, 1896, met with a crushing defeat near Adowa, in which they lost 10,000 men in killed and wounded (including 5,600 Italians), and 1,550 who were carried off as prisoners. Italy now sued for peace, and on Oct. 26, 1896, a treaty was signed in which the independence of Abyssinia was recognized, and a new boundary between Eritrea and Abyssinia was fixed.

The chief exports are skins, ivory, butter, gums, and mules, forwarded mainly through Massowah. British imports amounted in 1887 to \$70,000; in 1888 to \$16,000; in 1889 to \$6,000. The falling off is due to internal wars and the replacement of British goods by Italian. The Maria Theresa silver dollar piece, an Austrian coin still struck off by the Austrian mint for the African trade exactly as it was in 1780, is the favorite money, but bales of cloth and bags of salt are used for the same purpose. Towns are numerous, but small. The most important, politically and commercially, are: Gondar, capital of Amhara, 5,000; Adua or Adowa, capital of Tigré, 3,000; Aksum or Axum, ancient capital, 5,000; Antalo, former capital of Tigré, 1,000; Ankober, former capital of Shoa, 7,000; Licheh, present capital of Shoa, 3,000; Amba-Mariam, 4,000; Mahdera-Mariam, 4,000; Besso and Sokoto, important trading-centers, each 1,500.

The literature on Abyssinia is extensive. The travels of Bruce, Rohlf, Wilkins, Heuglin, Rüppell, Lefebvre, Harris, Antinori, Stern (about the Jews), and Lejean may be consulted. D'Abbadie's *Memoirs*; Blanford's *Geology and Zoölogy of Abyssinia*; Raffray's *Abyssinie*; Hartmann's *Abyssinien und die uebrigen Gebiete der Ostkueste Afrikas*; Réclus's *Universal Geography*, vol. x.; Massaja's *Mission in Ethiopia* (Italian); d'Abbadie's *Géographie de l'Éthiopie* (1890); and Münzenberger's *Abessinien und seine Bedeutung für unsere Zeit* (1892) may be mentioned. Levasseur has published a study of the area and population of Ethiopia in the *Bulletin of the International Statistical Institute*. Modern Italian geographical literature has much information about this country. Cora has published special maps of Eritrea, etc. (Turin, 1881 to 1890). MARK W. HARRINGTON.

Acacia [Gr. ἀκασία, first mentioned by Dioscorides (c. 100 A. D.); of doubtful origin, possibly connected with ἀκή, point]; a genus of *Leguminosæ*, found in Asia, Africa, America, and Australia, comprising many beautiful trees, among which is *A. arabica*, which produces some of the gum-arabic of commerce, but the most and best is yielded by *A. verec.* (See GUMS.) Catechu is an extract from the wood of *A. catechu* of India and Burma; this and other species are much valued for timber, etc. The species with willow-like foliage, cultivated in conservatories, are nearly all Australian.



Acacia arabica.

Acacians: followers of Acacius, Bishop of Cæsarea, 340–365. The Acacians are generally classed as moderate Arians (*q. v.*), but differed from them in not holding the doctrine that Christ was a created being, and from the Semi-Arians in not holding (as they did) that Christ was of a like substance or essence with the Father. The Acacians simply

held that Christ was *like* the Father. The doctrines of Acacius were condemned at the Council of Sardica, 347, and at the Council of Seleucia, 359.

Acad'emy [Gr. Ἀκαδημία; properly Ἀκαδήμεια; Lat. *academia*; Fr. *académie*]: originally a garden or grove in a suburb of Athens, or the school of philosophy which Plato founded in that place. The name is supposed to have been derived from Academus or Hecademus, a mythical person who, according to Greek tradition, presented the garden to the people of Athens. The modified systems or schools of philosophy which the successors of Plato adopted were designated by the titles of the Middle and the New Academy. Academy in the U. S., as in the United Kingdom, is used to designate a superior school, or institution of learning, intermediate in grade between a college or university and a common school. An "academy" and a "high school" have substantially equivalent courses, but in use "academy" more frequently refers to a private school and "high school" to a public school. An academy is also a school for instruction in a special art or science, as the West Point Military Academy. The word academy is also applied to a society of authors, savants, or artists, founded for the improvement of literature, science, or art. The first institution of which we read at all corresponding to this idea was the Museum, a society of scholars established at Alexandria by Ptolemy Soter in the third century B. C., which concentrated in that city all that was most eminent in science, philosophy, poetry, or criticism. The Jews in different cities, the Constantinopolitan emperors, and the Arabian caliphs founded societies of the same description. Charlemagne, among his various efforts for the propagation of literature, collected an association of learned men, who read and compared the works of antiquity, and gave themselves in their academic intercourse the assumed names of different ancient authors. But this institution was dissolved at the death of Alcuin; nor do we find any memorial of a similar society, except a few among artists, chiefly in France, until after the taking of Constantinople by the Turks, when the Greek scholars driven into Italy held literary meetings, which gradually assumed a more regular form. In 1560 a society called the *Academia Secretorum Naturæ* was founded at Naples in the house of Baptista Porta, but was abolished by a papal interdict. It was, however, succeeded by the *Academia Lyncei* at Rome, of which Galileo was a member, the objects of which, like those of the former, were chiefly connected with the pursuit of natural history. From the beginning of the seventeenth century academies multiplied in Italy. Among the most eminent of those bearing a philosophical character was the *Academy del Cimento* at Florence in that century; and in more recent times the *Academy of Sciences* at Bologna deserves to be mentioned with honor. But Italy has been most prolific in academies of literature and philology, which form by far the greatest number in the catalogue of 550 such institutions which have been enumerated as existing or having existed in that country. A general and somewhat ridiculous fashion prevailed in the seventeenth and eighteenth centuries among literary men of that country of forming themselves into societies for the promotion of literary objects, to which they gave fanciful symbolic names, every member assuming in his own person some analogous appellation. Among the most celebrated was the *Academy* (It. *Accademia*) degli Arcadi at Rome, of which the meetings were held in a meadow, and the members enacted shepherds and shepherdesses. It was founded about 1690, and still subsists, having various affiliated societies in other places. The *Accademia degli Umidi*, one of the oldest of these associations, became afterward the Florentine Academy. The *Accademia degli Intronati* ("of the deafened"), degli Umoristi ("of the humorists"), and others with similar quaint appellations, have acquired celebrity in Italy. Of her philological academies the most illustrious is the *Accademia della Crusca* (i. e. "academy of the bran" *), founded at Florence in 1582, which by its famous dictionary established the Tuscan dialect as the standard of the national language. It is now incorporated with the *Accademia Fiorentina*.

The first institution of this kind in France, the *Académie Française*, was founded in 1635 by Cardinal Richelieu. It was formed for the purpose of refining the French language and style, and, although in its first period it was chiefly remarkable for the adulation which it bestowed on its vain

* In allusion to its office of winnowing or purifying the national language.

though able founder, it became in process of time by far the most celebrated and influential of all European literary societies. It consisted of forty members, and a place among them was eagerly sought after for a long period as one of the highest honors which could be attained by an author. Like that of La Crusca, it published a dictionary of the national language in 1694. The Royal Academy of Sciences was founded by Louis XIV. in 1666, and published 130 volumes of memoirs up to the year 1793, when it was abolished by the Convention. The Academy of Painting and Sculpture and that of Inscriptions and Belles-Lettres were the other two principal academies of Paris. The latter was founded by Colbert in 1663, and remodeled in 1701. At the Revolution all four were abolished, and in 1795, at the suggestion of Condorcet, the National Institute of France was established in their stead. It consisted of four classes, arising out of the four academies of which it was composed. According to its reorganization by Napoleon in 1806, these classes were remodeled, and each of them consisted of a certain number of sections, each furnished with a specified number of acting and corresponding members. The first class, or that of sciences, had 63 members and 100 correspondents; that of languages, 40, and 60 correspondents; that of history and antiquities, 40, and 60 correspondents; that of the arts, 28, and 36 correspondents. The first, third, and fourth each named 8 foreign associates. In 1816 the Institute was again remodeled by Louis XVIII. The four classes again took the name of academies, and became more independent of one another, their joint property being managed by a commission of 8 members, 2 from each, under the superintendence of the Minister of the Interior. The first academy (that of sciences) retained the same number of members; the second and third were reduced to 38 and 37, respectively; the fourth was increased to 40. To the Academy of Inscriptions and Belles-Lettres and that of Sciences was added a class of free academicians, of the number of 10, with no privilege except that of attendance. The Academy of Arts had the right to choose its own number of free members.

Of similar institutions in Germany, the oldest was the *Academia Naturæ Curiosæ*, a scientific association, founded in 1662 in Franconia, afterward taken under imperial protection, when it received the name of the *Academia Cæsaro-Leopoldina*. The Royal Academy of Sciences at Berlin was founded in 1700 by Frederick I. of Prussia; Leibnitz was its first director. Other German academies of sciences are those of Göttingen, established in 1750; the Bavarian Academy at Munich, established in 1759, chiefly for history, and in 1829 divided into three sections; and the Saxon Association of Science, founded in 1846, and divided into two classes. The Imperial Royal Academy of Sciences at Vienna originated in 1846. Turkey established a similar institution in 1851, and Egypt in 1859. The Imperial Academy of Sciences at St. Petersburg was founded by Catherine I., and endowed by Catherine II. with great munificence, but established on the French model. She separated from it the Academy of Arts.

In Great Britain the name academy has been chiefly confined to associations for promoting the arts. The Royal Academy of Arts was founded in 1768, and consists of forty members. It has separate professors of painting, architecture, anatomy, and perspective, and a council of nine is elected annually. The Academy of Ancient Music was founded by private association in 1710; the Royal Academy of Music, under the patronage of George III., but dissolved shortly after. The present Academy of Music was founded in 1822. The principal literary and philosophical societies, answering in character to the branches of the French Institute, are: 1. The Royal Society of London, which is confined to objects of a scientific character. It had its origin as early as 1645, but was established by royal charter in 1662. Its acts have been published under the name of *Philosophical Transactions* from 1665 to the present day. 2. The Antiquarian Society, which was established in 1751, and whose acts are published under the title of *Archæologia*. 3. The Society of Arts, which originated in 1718. 4. That of Literature, which was founded in 1823. Besides these, there are numerous societies which bear the name of the peculiar branch of science to which their exertions are confined. The Royal Society of Edinburgh obtained a charter in 1783, and another with more liberal provisions in 1811.

Among the most valuable published transactions of academies and similar societies, besides those already mentioned,

are those of Colbert's *Académie des Inscriptions et Belles-Lettres* (50 vols. 4to, from 1701 to 1793); those of the Institute being continuations of the memoirs of the former academies of which it was composed; those of the Royal Academy of the Sciences and Belles-Lettres at Berlin—at first in Latin, then in French (from its remodeling in 1744 by Frederick the Great), now in German; the *Acta* of the Imperial Academy of St. Petersburg; the *Commentarii* of the Academy of Bologna; and the *Antichità d'Ercolano*, published by the Herculanean Academy of Naples. The Vetenskapsakademiens Sällskap at Stockholm has published over 100 vols. of its valuable *Transactions*.

The American Academy of Sciences and Arts was founded in 1780 by the Council and House of Representatives of Massachusetts. The National Academy of Sciences of the U. S. (*q. v.*) was incorporated by the Thirty-seventh Congress in 1863. The Academy of Natural Sciences of Philadelphia was founded in 1812. Besides a valuable scientific library it contains one of the best natural history collections in the world, especially rich in birds. The American Academy of Political and Social Science was organized in Philadelphia in 1889. It has a membership of several thousand, holds regular meetings in Philadelphia, and publishes the *Annals of the A. A. P. S. S.*, which contain papers of scientific value in the field covered by the organization.

Revised by C. H. THURBER.

Acadia (Fr. *Acadie*): the French settlements S. of the Gulf of St. Lawrence, dating from 1603, called Nova Scotia. Acadia originally included New Brunswick and a part of Maine. It was the subject of frequent quarrels between the French and English on account of the valuable fisheries near its coast, and was finally ceded to Great Britain in 1713. The inhabitants having refused to take the oath of allegiance to the British king and to bear arms against the French, the governor and his council resolved to remove them to the other British provinces. The French settlers, 8,000 in number, were forced to give up their property, and in 1755 about 2,000 were sent off in such haste that many families were separated. This event has furnished the subject of *Evangeline*, one of Longfellow's most admired poems.

Acajut'la: a town and seaport in the Central American republic of Salvador; situated on the Pacific Ocean, 12 miles S. of Sonsonate (see map of Central America, ref. 5-E). It consists, besides the custom-house and the dwelling of the captain of the port, of a large warehouse, almost entirely in ruins at present, and a few huts and sheds. Under the Spanish rule it was for a long time the only port on the west coast between Acapulco and Realejo; at present it is second in importance in Salvador, and has over one-third of the foreign trade of this republic. The chief article of export here is Peruvian balsam, of which 20,000 lb. are annually exported.

Acaleph'æ, or **Acalephs** [Gr. ἀκαλήφη, a nettle]: a group of the *Cœlenterata*, equivalent to the sub-class *Scyphomeduse*; containing the marine animals commonly known as jellyfishes or sea-nettles. They are umbrella-shaped animals with radiate structure, and are composed of soft, transparent, gelatinous material, containing only a very small proportion of solid matter. On bright days they are found in great numbers floating near the surface along nearly all shores, propelling themselves slowly through the water by contractions of their umbrellas. Suspended from the center of the disk is the peduncle or manubrium, the lower margin of which is commonly produced into four large arms, which serve pre-eminently for the capture of food. These are often lobed and fringed, and produced into long, trailing streamers. The mouth is typically at the end of the manubrium, and communicates by an œsophagus with the stomach, placed centrally near the lower surface of the disk. Prolongations of the stomach, often forming a fine network of tubes, extend outward to the margin of the umbrella, to which they carry nourishment. The gastric cavity contains contractile tentacles, which secrete a digestive fluid. In common with the oral arms and other tentacles of the body, these are richly provided with stinging or nettle cells, which enable these animals, in spite of their soft, delicate texture, to capture living prey. A nettle-cell consists of a small capsule filled with a poisonous or irritating fluid, and contains a spirally coiled filament provided with retrorse barbs. On touching a foreign body the filaments are forcibly ejected, and pierce the outer tissues of the prey, carrying with them some of the fluid contents of the capsule. The margin of the disk is divided into a number of lobes, in the

recesses between which are the marginal sense bodies, the *rhopalia*. Each of these consists of a shortened modified tentacle, covered over by a lobe of the disk, and has developed in connection with it the organs of special sense. Eye specks, auditory sacs, and olfactory grooves have been described. At the base of the marginal bodies are nerve-ganglia, representing the central nervous system. These are connected, on the one hand, with the sense organs; on the other, with a network of nerve-fibers which ramify over the sheet of muscular tissue covering the lower surface of the umbrella. The four genital glands occupy special cavities in the umbrella near the base of the manubrium. Their contents can usually be detected by their brighter coloration. The sexes are usually separate. The development is complicated through the alternation of sexual with asexual forms. (See ALTERNATION OF GENERATIONS.) The egg develops into a small ciliated larva, which, after swimming about freely for a time, attaches itself by one end and assumes a polyp-like form. It is then known as the *Scyphistoma*. This reproduces asexually by a process of repeated transverse division, giving rise to a series of saucer-shaped individuals, which remain connected to form a cone attached by its smaller end, and called the *Strobila*. The individuals thus formed separate later, become free swimming, and assume gradually the characters of the sexually mature jellyfish. In exceptional cases only is the development direct from the egg to the mature jellyfish. The acalephs are all more or less phosphorescent. The term acaleph has been variously used by different zoölogists, sometimes in a wider or narrower sense, and has now been generally abandoned as the scientific name of any group of animals. See SCYPHOZOA.



An aculeph.

CHAS. H. GILBERT.

Acantha'ceæ: the ACANTHUS FAMILY (*q. v.*).

Acanthas'pis [Gr. ἄκανθα, thorn + ἄσπις, shield]: a genus of buckler-headed fishes found fossil in the corniferous limestone of Ohio. It somewhat resembles *Cephalaspis*, the buckler or carapace bearing similar denticulated spines, but the plates on the head are covered with a peculiar vermicular ornamentation, and are not soldered together.

Acan'thophis [Gr. ἄκανθα, thorn + ὄφης, a serpent]: a genus of venomous serpents allied to the viper, found in Australia. They have a horny spine at the end of the tail. The genus includes the dreaded death-adder, *Acanthophis antarctica*, one of the most venomous of known reptiles.

Acanthopteryg'ians, or **Acanthopterygii** [Gr. ἄκανθα, thorn + πτέρων, wing]: the order of spiny-rayed bony fishes in the system of Cuvier. This order includes those fishes in which the anterior rays of the dorsal and anal fins are normally formed by bony spines. There is usually a spine in each ventral fin. The perch, bass, mackerel, etc., are examples. This is the largest order of fishes, comprising in general the most specialized forms.

Acanthur'idæ [literally the thorn-tailed family; from Gr. ἄκανθα, thorn + οὐρά, tail]: the lancet-fishes or surgeon-fishes; a family of spiny-rayed fishes abounding in the tropical seas, and especially noted for the presence of a spine on each side of the tail at the base of the fin. In the typical species this spine is very sharp, movable, and shuts forward into a groove when not in use. It is sharp as a knife, and has suggested for these fishes various names, recalling a surgeon's lancet. See TEUTHIDIDÆ.

Acan'thus (Gr. *ἄκανθος*): a genus of herbaceous plants, natives of Southern Europe, belonging to the family *Acanthaceae*. The most remarkable species of this genus are the *Acanthus mollis* and the *Acanthus spinosus*, which have large white flowers and shining leaves of a beautiful form. The leafage of the Corinthian and Com-



Natural form of the leaf.



Leaves artistically modified.

posite Orders (*q. v.*), and of a great deal of Byzantine and other mediæval architecture, is generally considered a study of the acanthus.

Acanthus Family (*Acanthaceae*): mostly herbaceous flowering plants, with gamopetalous corollas and superior compound ovaries. They are related to the bignonias, bladderworts, figworts, etc. There are 1,350 species, mostly in warm climates.

A Cappella, in music, in chapel (or church) style. This is frequently understood by modern musicians as signifying a vocal composition *without accompaniment*, as the early church compositions were unaccompanied. When accompaniment is employed with a *cappella* pieces, the word denotes that the instruments are simply to play in unison with the voices, not a separate part of their own. The phrase is Italian, and is sometimes written *alla cappella*. DUDLEY BUCK.

Acapul'co: a seaport-town of Mexico; on the Pacific Ocean, and in the state of Guerrero, 190 miles S. S. W. of Mexico; lat. 16° 50' N., lon. 99° 53' W. (see map of Mexico, ref. 9-G). The harbor is nearly landlocked, and is one of the best in the world. The climate is hot and unhealthful. It formerly commanded the whole trade between the Spanish dominions in America and those in the East Indies. Since the discovery of the California gold mines it has again become one of the most important ports of Mexico. The harbor is so deep that large ships can anchor close to the granite rocks. The steamers which ply between Panama and San Francisco touch here regularly. The greater part of the town was destroyed by an earthquake in 1852. Pop. about 3,000.

Acari'na: the mites, an order of small insects belonging to the class *Arachnida*, and containing the mites, ticks, etc. Some of them feed on animal, others on vegetable substances, and many of the latter are very injurious to vegetation. Some of them are free and lead a wandering life, while others are parasitic, living on other animals. Those of the former class have their mouths furnished with distinct mandibles, and are often found in great numbers in old cheese, brown sugar, and dried fruit, and in the cabinets of entomologists. One of the most destructive of these is the *Acarus destructor*. Those of the latter class possess a sucker, by which they adhere to the skins of animals, where they are supplied with nourishment. A few species of the *Acaridae* are aquatic, and have their legs furnished with hairs, by means of which they swim with facility. The *Acaridae* are propagated by eggs, and are extremely prolific. When mature they have eight legs, the young or imperfectly developed animals having only six.

Revised by DAVID S. JORDAN.

Acarna'nia: a district of ancient Greece; bounded N. by the Ambracian Gulf, E. by the river Achelous, and S. and W. by the Ionian Sea. According to tradition, it was named from Acarnan, the son of Alemæon. It is mostly occupied by well-wooded hills or mountains. Acarnania and Ætolia constitute a nomarchy or province of modern Greece, with an area of 3,013 sq. miles. Pop. (1889) 162,020.

Ac'arus [a modern latinization of Gr. *ἄκαρι*, mite; *ἀ-*, not + *καίρω*, cut]: a genus of minute animals, including the common mite found in figs and other dry provisions (the *Acarus domesticus*), and many other species. (See ACARINA.) The itch is caused by a small mite which burrows into the skin (the *Sarcoptes scabiei*).

Accad (or *Akkad*): according to the Old Testament, the name of one of the four cities which formed the beginning of the kingdom of Niurod, in the land of Shinar (Gen. x. 10). The cuneiform literature of the Mesopotamian valley is the source of all further information regarding it. From this source we learn that Accad was the royal residence of Sargon I., the oldest King of Babylonia yet known to history. According to Nabonidus, the last Semitic King of Babylon (555-537 B. C.), Sargon ruled 3,250 years before his time—i. e. about 3800 B. C. The literary character of this ancient king gave to the city its great fame. Its chief deity was the goddess Anunit or Ishtar, to whom an old Babylonian king, Sagaraktijash, built the principal temple within its walls. It is mentioned all the way down through Babylonian history, even as late as the time of Cyrus, under the name *Agade*. Its present site has been a matter of much conjecture, but was apparently identified by the Wolfe expedition to Babylonia in 1884-85 (*Report*, pp. 24, 25) in the mound *Anbar*, on the Euphrates, almost due W. of Bagdad and N. W. of the ruins of Babylonia.

Accad also designated a particular section of the country of Babylonia. The oldest kings of Babylonia, and the kings of Assyria who conquered and ruled this territory, almost uniformly attached to their names "King of Sumer and Accad" or "King of the land of Sumer and of Accad." These two names were the venerated ancestral designations of the territory which was later termed "Babylonia."

Sumer indicated lower Babylonia, stretching from its extreme southern limits as far N. at least as Mugheir, the ancient Ur of the Chaldees. Accad was the name of upper Babylonia, reaching from its northern boundary near the lower Zab river southward as far as and including at least Erech (Warka). It probably derived its name from its chief city, Accad, and included within its territory the four great cities of Gen. x. 10. At present there are no data for determining its exact southern boundary, the boundary line between Accad and Sumer. Upon these two names are built the designations Accadian and Sumerian, which are applied by some scholars to hypothetical dialects discovered in the original (Semitic) language of Babylonia. IRA M. PRICE.

Ac'ca Lauren'tia: a woman to whose grave the ancient Romans brought sacrifices on the occasion of a festival, on the tenth day before the calends of January. According to a Roman legend, she married the rich Tarrutius, and upon her death left her whole property to the Roman people; while, according to another legend, she was the nurse and foster-mother of Romulus and Remus.

Accelerando: in music, with gradually increasing velocity of movement.

Accelera'tion [Lat. *accelera'tio*; *ad*, to, more + *celera're*, hasten]: the rate of change of the velocity of a moving-body, such as takes place when the body is falling under the influence of gravity. It is measured by the increment of the velocity in a unit of time.

Acceleration of gravity is the amount of acceleration which is produced by the action of gravity on a body falling in a vacuum. It is independent of the nature or chemical constitution of the body. It is approximately 32 feet per second; that is to say, if a body be allowed to drop from a state of rest in a vacuum for the period of exactly one second, it will, at the end of the second, be falling with a velocity of 32 feet per second. The acceleration, however, increases from the equator toward the poles. At the sea-level it is expressed in meters by the formula

$$g = 9.80606 - 0.02503 \cos 2\phi,$$

ϕ being the latitude of the place. See FALLING BODIES.

Acceleration of the Moon's Mean Motion.—It is found, by the comparison of ancient eclipses with modern observations, that the moon now moves around the earth somewhat faster than it did two thousand years ago. This acceleration was found by Laplace to arise from the secular diminution of the eccentricity of the earth's orbit. Its amount is such that at the end of a century the moon is about eight seconds farther advanced in her orbit than she would have been had she continued with the uniform motion which she had at the beginning of the century. S. N.

Accelerator: (1) in anatomy, a certain muscle that expedites the discharge of urine. (2) In photography, anything, as a chemical substance, used to shorten the necessary time of exposure of a sensitized plate or paper; also, any chemical added to the developing fluid to hasten its action. (3) A cannon, often called accelerating-gun, having supplementary powder-chambers the charges of which are intended

to explode in succession after the firing of the main charge, to accelerate the velocity of the projectile.

Ac'cent: The Latin *accen'tus* (*ad*, to + *can'ere*, sing) from which this is derived is merely a translation, like most other Latin grammatical terms, of the Greek term *προσφῶδια* (*πρός*, *ἀεῖδω*), which was used by the Greek grammarians to include all the written signs added to the letters to guide pronunciation—thus the marks of long and short quantity, the rough and smooth breathings, the apostrophe, hyphen, and hypodiatole, as well as the three accents proper. The modern use of the term includes a variety of distinct meanings: (a) The accent marks for acute (´), grave (`), circumflex (ˆ), as used, e. g., in Greek and French. In the former they denoted a variety of musical pitch accompanied, as can now be proved, by a distinction also of stress; in the latter they indicate only a variety of vowel quality, and that now often only of historical value. Sometimes these marks have a merely diacritical value, as in English *learn'ed*. (b) A peculiar coloring of the pronunciation in the dialect of an individual or locality; brogue. (c) The increased stress of voice upon certain syllables either of words in ordinary pronunciation, or of a verse in metrical rendering, or of the measures in music.

The word-accent is that element of enunciation which gives individuality to the separate word. When a word loses its individuality and merges itself under the accent of another word we call it an enclitic or proclitic; thus in English *don't*, Greek *λόγος τις*. The Greek word-accent reflects in its general outlines the "free" accent of the parent Indo-European speech, and though it is restricted to the last three syllables of the word, as in Latin, it may in different words fall upon any one of these, as in the nouns *κίνδυνος*, *ἐχίνος*, *παρθένος*, *ἐκυρός*. The essential antiquity of these variations is guaranteed, however, by the many striking correspondences with the Sanskrit accent; thus, *πούς*, *ποδός*, *πόδα*: *pād*, *padás*, *pádam*; *πέντε*, *πάντα*; *ἀστὴ*, *ἀστῆ*; *ἐγών*, *ἀνάμ*; *γένος*, *γένος*; *βατός*, *γατά-s*; *δώδεκα*, *δωδεκά*, etc. This word-accent persists in modern Greek as a peculiarly strong stress accent in general upon the same syllable where it was written in ancient Greek. In the Romance languages the stress is generally upon the syllable which had it in the parent Latin, though in French the distribution of the stress throughout whole breath-groups of words and complication with the musical or pitch accent often make it very difficult to locate the stress. The pro-ethnic Germanic speech developed the special law of accenting the initial syllable, except in compound verbs, where the prefix was unaccented. Traces of this exception survive in the vocalism as well as accent in modern German; cf. *ur'theil*, *erthei'len*, *an'wort*, *entsprech'en*. Loan-words often show a foreign accent; thus, *Offizier'*, *Saison'*, *Concert'*, *Quatitäl'*; so loan-elements, *studier'en*, *Druckerei'*. The English accent, while tending to confirm the Germanic rule, still shows in its variety, and sometimes also in its uncertainty, how imperfectly the language has as yet assimilated the diverse materials it has employed. Thus French accents survive in *cavalier'*, *engineer'*, *devotee'*, *battoon'*, *violin'*, *gazette'*, *picturesque'*, *distress'*, *affair'*, *complete'*, *excess'*, etc. Early English writers used also *prison'*, *forest'*, *tabour'*, *battaite'*, *tangage'*, etc. Other Romance accentuations survive in *sona'ta*, *mula'tto*, *tobac'co*, *volca'no*, etc. Latin accentuation persists in *diplo'ma*, *diagno'sis*, *dicta'tor*, *specta'tor*, *lyce'um*, *Septem'ber*, etc. The accent often serves to distinguish words: *tor'ment* (noun), *tor'ment* (verb); cf. *minute*, *frequent*, *compact*, *expert*. Derivatives are often influenced by their primitives; as, *agree'able* (*agree'*), *divi'ner* (*divine'*), *withdraw'al* (*with-draw'*), *reli'able* (*rely'*), etc.

BENJ. IDE WHEELER.

Accent: in music, a stress or emphasis given to certain notes or parts of a bar in a composition. It is analogous to the accent upon certain syllables of words in pronunciation or the reading of verse. It is divided into two kinds—grammatical, and æsthetic or oratorical. The first kind of accent is nearly always regular in its occurrence, falling upon the first note of the bar. When this is not the case, it should be clearly indicated. Long measures of time have in addition a secondary accent, just as in the case of a long word. As a general rule, the grammatical accent should not be unduly emphasized, but marked only so as to harmonize with the rhythm. The æsthetic accent is irregular, and, as the name implies, depends upon taste and feeling, just as do the accent and emphasis made use of by the orator. In vocal music, it should correspond with the accented syllables of words.

Accen'tor [Lat. the warbler]: a genus of warblers, including the hedge-warbler (*Accentor modularis*), a familiar



Accentor.

and abundant European bird, brown above, steel colored beneath. Its song is fine, but short. The *Accentor alpinus* of the Alps is a larger bird.

Accentua'tion: in ecclesiastical music, the pitch and modulation of the voice. A threefold division is usual—(1) simple, (2) moderate, or (3) strong. Some writers in applying the term to chanting reckon seven forms of modulation in the portions of the service sung by the officiating priest and his assistants, viz.: the *immutable*, *medium*, *grave*, *acute*, *moderate*, *interrogative*, *final*.

Accep'tance: an engagement to pay a bill of exchange at maturity, or the bill itself after it has been "accepted," by writing the word "accepted" across its face, with the date on which it is payable and the name of the acceptor. See BILL OF EXCHANGE.

Accep'tants, or **Constitu'tionists**: a name given in 1713 to the Jesuits in France who accepted the constitution or bull Unigenitus issued by Pope Clement XI. The Jansenists, who rejected the pope's bull, were called Appellants or Recusants, and appealed to a general council. They were imprisoned and persecuted, but after the death of Louis XIV., the Regent, the Duke of Orleans, prevailed on the greater part of the recusant bishops to accept the bull, with certain modifications. The Appellants continued their resistance after the Unigenitus became national law (1730).

Ac'cessary or **Ac'cessory** [Late Lat. *accessor'ius*, adj. The form in *-ory* is properly adjec., that in *-ary* subst., the latter being formed after the type of nouns like *adversary*, *emissary*, Lat. *-arius*]: in criminal law a participant in a felony who is not the chief actor, and is not present at its commission, but yet in some way is connected with it, either before or after the fact (or act committed). An accessory before the fact is one who, though not present, procures, counsels, or commands another to commit it. An accessory after the fact is one who, knowing a felony to have been committed, receives, relieves, comforts, or assists the felon.

In offenses below the grade of felony there are no accessories. All implicated are regarded as principals. By the common law of England the same rule is applied to the case of treason. In manslaughter, as defined by common law, there can be no accessory before the fact.

Acces'sion [Lat. *accessio*, a going to; *ad*, to + *ce'dere*, go]: in law, a species of title to property borrowed from the civil (or Roman) law, and defined to be the right to all which one's own property produces, whether that property be movable or immovable, and the right to that which is united to it by accession, either naturally or artificially. By this principle the increase of an animal belongs to its owner, or a building becomes the property of the man on whose soil it is erected. An important instance of the application of this doctrine is found in the manufacture by one person of materials belonging to another. The property in its manufactured state belongs, in general, to the owner of the materials. A leading exception to the principle is that if the manufacturer, acting in good faith, without the consent of the

owner, changes the identity of the materials, as if he converts grapes into wine, or grain into whisky, he will become the owner of the manufactured article. This rule would not be applied in favor of a willful wrongdoer. The word "accession" is also used to indicate the fact of succession in government, such as the "accession" of a new dynasty in monarchies, as in the case of the House of Hanover in England.

T. W. DWIGHT.

Accessory, or Accessary: in painting, anything introduced into a picture that is not an essential part. In an historical painting the human or animated figures are the principal objects, and all the others are accessories.

Ac'cidens, or Per Accidens (i. e. by accident): a Latin phrase used by the older philosophers to denote an effect not following from the nature or essence of the thing, but from some accidental quality. It is opposed to *per se*: thus, fire burns *per se*; heated iron burns *per accidens*.

Ac'cident [Lat. *accidens*, happening; ad. to + *ca'dere*, fall]: in logic, one of the predicables; in its strictest logical sense it is that which may be absent from or present in the subject, the essence of the species to which the subject belongs remaining the same. Thus if it be predicated of a man that he is "walking," or that he is "a native of Paris," the first expresses what is termed a separable accident, the latter an inseparable; i. e. the individual may cease to walk, but can not cease to be a native of Paris, but neither of these alters the species, man, to which the individual belongs. It is to be observed with regard to the accident, as well as the other predicables, that they exist only relatively to each other, so that the same quality may be accidental when predicated of the species which is a property when predicated of the individual. Thus "malleability" is an accident of the subject "metal," because many metals are not malleable. But it is one of the properties of gold and iron, etc., as distinguishing these from the non-malleable metals.

Accident: in equity jurisprudence, such an unforeseen event, misfortune, loss, act, or omission as is not the result of any negligence or misconduct in a party. It is, however, difficult to bring all the cases in which the court assumes jurisdiction within the bounds of a definition. Some of the leading cases of interference by the court are—1. Where negotiable or other instruments have been lost, and there is no adequate remedy in a court of law. 2. Where a clause has been inadvertently omitted from or inserted in an instrument. The court in such a case makes the instrument conform to the intent of the parties. 3. Penalties and forfeitures. In this class of cases the court relieves against the penalty or forfeiture where the injury occasioned by the breach of duty is susceptible of complete compensation, as in the case of an omission to pay rent on an appointed day. There would be no relief in case of a willful wrong, nor where the forfeiture is in the nature of a statutory remedy for a breach of duty. 4. Cases of omission, through inadvertence or want of knowledge of facts, to defend an action. The court has power to allow the necessary steps still to be taken. It is a general rule that the court will not interfere in favor of a mere volunteer, such as a donee or devisee in a will. Thus if a seal were accidentally omitted from a conveyance made without consideration, or a clause were omitted from a will, there would be no relief. It is a further rule that relief will not be granted as against a purchaser who has acquired legal rights in good faith and for a valuable consideration. Revised by HENRY WADE ROGERS.

Accidental Colors: See COLORS, ACCIDENTAL.

Accident-Insurance: that form of insurance that provides indemnity for bodily injuries effected through external, violent, and accidental means, the amount payable being determined by the results of injuries, death, disability, or dismemberment.

Insurance against accident seeks to provide indemnity not for any injury occasioned by an accident, but simply and solely for loss of time or productive power resulting wholly from external, violent, and accidental means. Bodily injuries, broken bones, falls, and bruises are insured against only as they cause disability to carry on the usual business of the insured, or as they occasion loss of limb, sight, or life, thereby reducing or entirely destroying productive capacity. Life-insurance is based on a certainty; accident-insurance on a mathematical possibility. The former is inclusive insurance, the latter supplementary.

Statistics of accidents furnish a basis for insurance against accidents as mathematically certain as the table of mortality

for life insurance. Of 100,000 people, whose exposure to accident is substantially the same, a certain number will be killed, a certain number will break their limbs, and a certain number lose the sight of an eye, etc.

EARLY HISTORY.—Mention is made of the practice of ship-owners insuring the lives of their masters against the perils of the sea in the ancient sea-laws of Wisby, as early as 1541. In 1665 the Dutch Republic, then at war with England, issued a proclamation announcing the amount of recompense that would be awarded to soldiers wounded in the service of the country, and establishing a fixed value for loss of limbs, feet, hands, or eyes. It promised for loss of both eyes, 1,500 livres; both arms, 1,500 livres; right arm, 450 livres; both hands, 1,200 livres, etc.

Accident-insurance proper is of very recent origin, dating practically from 1848, when *The Railway Passengers Assurance Company* in Great Britain was organized, and actually began the business of furnishing insurance against railway accidents. The credit of inaugurating the modern system of accident-insurance in its widest scope, however, must be given to Edward Riley, Actuary of *The Accidental Death Insurance Company*, which, in 1850, issued the first policy providing "compensation for bodily injuries occurring to any person or persons from any accidental or violent cause or causes not occasioning death."

In the next six years several new companies were organized, some to afford general accident insurance on the same lines as *The Accidental Death Insurance Company*, others to insure only special classes or against special hazards. Among these companies wide variations existed as to classification of risks and rates: for though the fact that individuals of various occupations are exposed to varying hazards had been recognized by all, and an attempt had been made to fix the rates for each class, yet the statistics necessary for classifying risks in determining rates were not in existence, and it was only in 1857 that a careful classification was made, based upon a large number of risks of several years' experience, and such restrictions and safeguards as experience had shown to be necessary were added to the policy.

IN THE UNITED STATES.—The first company to successfully undertake accident insurance in the United States, *The Travelers Insurance Company*, of Hartford, was organized in 1863 by James G. Batterson, who had made a careful study of the business as conducted in Great Britain. He found it necessary, however, to formulate a classification of risks differing in many respects from the English classification on account of the different industrial and transportation conditions in the United States. The rates and the form of policy were essentially the same as those in use in England, and provided for \$5,000 in case of accidental death, and \$25 a week up to twenty-six weeks during disability from accident.

The project was treated with ridicule at first, but a series of great railroad disasters during 1864 and 1865 brought it prominently to the public notice. A host of small companies soon entered the field, but all ultimately either retired from business or were absorbed by *The Travelers*.

PRESENT FORM OF ACCIDENT POLICY.—The common form of accident policy, both in the United States and Great Britain gives \$1,000 for death, loss of hand and foot, or both hands, or both feet, or total loss of sight; \$500 for loss of either leg at or above the knee, or right hand; \$200 for loss of one foot or left hand, etc. The amounts vary in detail in the different companies. A weekly indemnity of \$5 is paid for total disability, limited to 200 weeks, and \$2 per week for partial disability, whereby the insured is rendered incapable of performing one or more important duties of his trade or profession. As a protection against the possibility of fraudulent claims, the weekly indemnity is generally limited to a sum not to exceed the weekly earnings of the insured.

The cost of such a policy in non-hazardous occupations varies from \$4 to \$5 for each principal sum of \$1,000. There are many variations in use, such as policies paying double benefits for accidents of travel, paying for death or indemnity only, insuring against accidents of travel only, etc.

CLASSES OF RISK.—Professional and business men, whose occupations expose them to very little hazard, are classed as Select or Preferred, and are insured at the lowest rates. Of this class each year one in every fifteen meet with such injuries as to entitle them to indemnity.

Men who are exposed to an additional risk incident to their occupation, not particularly hazardous, are divided

into ordinary or medium classes, paying 50 to 100 per cent. more for their insurance than the preferred class. In these two classes the ratio of injured is about one in eight or ten. Other occupations are further grouped in classes, hazardous, extra hazardous, special, etc., according to hazard of occupation. The ratio of injured in these classes is very large, the average of all classes being one in seven. In determining the class to which those engaged in a given occupation should be assigned, it is necessary to consider not only liability to accident, but also how far a trifling accident is likely to disable. A slight cut or bruise of the forefinger would not incapacitate a salesman from attending to his duties, but might prevent a watchmaker from pursuing his ordinary occupation. Again, a sprained ankle or a sore foot might totally disable a machinist, but would only partially disable a man of sedentary occupation. Policies have been greatly liberalized since the early years of the business: benefits have been largely increased and extended; rates have been lowered; restrictions largely removed; and partial disability and change of occupation provided for.

TWO CLASSES OF COMPANIES.—In the United States accident insurance is carried on by two classes of companies: stock companies, and assessment companies. The former include a number of large and powerful corporations, many of which also conduct other branches of insurance—life, health, employers' liability, or surety. The assessment associations have been as a rule successful only as they confine themselves to insuring a certain class or occupation.

STATISTICS OF BUSINESS.—Owing to different systems of computing in the various companies and associations, it is impossible to arrive at the exact figures of the business at the close of a year. The amount of insurance in force December 31, 1900, was approximately \$2,420,000,000, and the amount paid out in benefits about \$4,600,000, distributed among some 16 stock companies and 45 mutual assessment companies, the former doing a little over 70 per cent. of the business.

In Great Britain the business is carried on by 47 companies and associations, exclusive of a large number of small local associations. The large stock companies carry on accident insurance as one of a number of branches of the business. In France there are 14 companies; in Germany, where a system of compulsory social insurance is now in force, 26 companies; Austria, 9; Norway and Sweden, 8; Russia, 6; Switzerland, 5; Belgium and Holland, 7; Balkan States, 3.
GEO. W. ELLIS, Editor *Traveler's Record*.

Accidents (that is, *casualties*): See **Block System**, for accidents to railway trains; **Bridges**, for failures of bridge structures; and **Reservoirs**, for disasters caused by the breaking of embankments.

Accipitres, ak-sip'i-treez [plur. of Lat. *accipiter*, a hawk; of doubtful etymology, but probably compounded of **āci-*, swift (cf. Gr. *ἄκίς*) + *pet-*, fly (cf. *praepes*, *-petis*, of swift flight, Gr. *πέτομαι*, fly)]: the name given by Linnaeus to an order of carnivorous birds, including the eagle, vulture,



hawk, and owl. More recent ornithologists have named this order *Raptores*. This order comprises all the true birds of prey. As may be seen in the accompanying illustrations, the beaks and claws of the *Accipitres* are marvelously adapted, by their sharpness and curvature, to the predatory habits of these birds. See **RAPTORES**.

Ac'cius, Lu'cius (sometimes called *Attius*): the most distinguished Latin tragic poet; son of a freedman; b. at Pisaurum 170, and lived to an advanced age, perhaps

as late as 86 B. C. Cicero, his great admirer, alone refers to seventeen plays, and about fifty titles of tragedies and 700 verses are known to us. Most famous were the *Atreus*, *Epigoni*, *Epinausimache*, and *Philocteta*. He wrote also two *Prætextæ*—i. e. tragedies based upon Roman history. His *Didascalica* treated in verse of Greek and Roman poetry, and especially of the drama. He wrote on agriculture a work entitled *Praxidica*, and *Annales* in epic measure. Accius was also a grammarian, and proposed several orthographical reforms. See O. Ribbeck, *Tragicorum Romanorum Fragmenta* (Leipzig, 1871), pp. 136-227 and 281-285.
M. WARREN.

Acclamation [Lat. *acclamatio*, a shouting at; *ad*, to or at + *clama're*, shout]: a shout or some similar demonstration of approval, or the like; especially a spontaneous outburst of approbation or applause in a public or deliberative assembly. A motion or proposition is adopted by acclamation when the assent is so nearly unanimous that the counting of votes is omitted. The different modes of electing a pope are called scrutiny, acclamation, and inspiration.

Acclimatiza'tion: the process of becoming inured to a climate at first injurious. In general, the term is synonymous with acclimation, but some writers restrict the application of the latter term to man, and others use it to distinguish the spontaneous process of adaptation to climate, and use acclimatization to denote the act of man in aiding the process by transferring and selecting the species and varieties. In scientific discussions the word acclimatization is now preferred. The most diverse opinions are held in regard to acclimatization, some even denying its existence. This confusion arises from a misconception of the meaning of the term. A plant or animal becomes acclimatized only when it has overcome some injurious feature of climate. Many organisms possess a sufficient elasticity of constitution to allow them to become quickly cosmopolitan as soon as competition with other species is removed and they find means of becoming disseminated. Such plants or animals simply become *naturalized* when transferred to a foreign country, as is the case with most if not all of the weeds which have invaded our fields from Europe. Some plants and animals have been disseminated in many diverse climates because of the protection afforded by man, who, by skillful planting and cultivating, or by shelter, overcomes in great measure the adverse influences of climate. Such beings are simply *domesticated*. From these remarks it will be seen that it is difficult to determine in any case whether an organism has actually overcome any influence of climate; and the difficulty is particularly great in the case of animals—especially of man—because they possess to some extent the power of protecting themselves from inclemencies, or of migrating to avoid them. In the case of man, the commonest instances cited of acclimatization are those in which immunity from fevers or other diseases comes to be enjoyed; but disease is not an attribute of climate. Another misconception which has confused the discussion of acclimatization is the common notion that the adaptation relates simply to relative temperature; but adaptation to humidity, progression of seasons, cloudiness, and other phenomena are equally the subjects of our inquiry.

The definition is equally satisfied whether the adaptation takes place in the modification of the constitution of an individual animal or plant, or whether it is expressed in a variation of habit in the offspring. The discussion is clarified if it is divided as follows:

- I. Acclimatization through a change in the individual plant or animal.
 - A. Through modification of constitution.
 - B. Through modification of habit.
- II. Acclimatization through variation in offspring.
 - C. Through variation in constitution.
 - D. Through variation in habit.

It is difficult in any case to determine if acclimatization occurs in an individual plant or animal which is transferred to a new climate, especially through a modification of constitution (A). There is no doubt, however, that modification of habit (B), by which the individual evades some injurious feature of climate, sometimes occurs. This is best seen in plants, in which leafing and flowering occur relatively earlier in the season as the individual is moved northward. By this means the plant accomplishes its growth before overtaken by frost. But it is through variation in offspring that acclimatization is unequivocal. Most of the tender fruit-trees illustrate acclimatal variation in constitution (C).

Thus it is well known that the peach-tree endures lower temperature in New York than in Delaware and Maryland; and this illustration can be applied to many plants. Most plants and animals exhibit, under necessity, an acclimatal variation in habit (D) in the offspring. Indian corn may be taken as an example, although this plant is often cited in proof of the assertion that acclimatization does not exist. In certain tropical or sub-tropical regions the season of growth of Indian corn extends through six months. As it is taken toward the poles, its season shortens in accommodation to the climate, until in some parts of Canada it matures in less than three months. This shortening of season—or earliness—is associated with other variations, as smallness of stature, a tendency to sucker, and the change from dent corn to flint. In general, it may be said that acclimatization is only one of the expressions of variation induced in all animals and plants by the change of environment, and that there is every reason to expect its occurrence in any organism to a greater or less extent when occasion demands it. L. H. BAILEY.

Accolade [viâ Fr. from Ital. *accollare*, to embrace about the neck]: the embrace by which a sovereign formerly conferred knighthood. Later a gentle blow or “dub” on the shoulder of the candidate with the flat of a sword was substituted for the embrace.

Accol'ti, BENEDETTO: Italian writer and lawyer; b. at Arezzô in 1415; became chancellor of the republic of Florence in 1459. He wrote a Latin history of the crusade which Godfrey of Bouillon conducted to Palestine. This was the basis of Tasso's great poem. D. in 1466.

Accommodation and Adaptation: See the Appendix.

Accommodation Paper: See BILL OF EXCHANGE.

Accom'plice [extension of older *complice*; Lat. *complex*, interwoven]: one of several persons associated in a crime. In its broadest use it includes all connected with the offense, whether as principals or accessories; but it is generally applied to those who give evidence against fellow criminals.

Accord: in music, concord; the relation of two sounds which are agreeable to the ear.

Accord' and Satisfac'tion: in law, the word “accord” by itself denotes an agreement, but as used in this common phrase it denotes an agreement between the parties to a legal claim or demand that something different from a complete payment or discharge, according to the terms of the claims, shall be received in satisfaction thereof; and such accord, if it have the proper legal requisites and result in the satisfaction agreed upon, is a complete defense to a suit upon the original demand. This defense is available in actions both of contract and of tort. The subject is governed by well-settled rules, such as that the thing to be done must not be uncertain, that it must be advantageous to the injured party, and that the agreement must be fully carried into effect. Thus it would not be a valid accord to give the injured party something to which he was already entitled; as e. g. to pay a portion of the debt when the whole became due. Sometimes a new agreement, though unperformed, amounts to a satisfaction of a prior claim, but this happens only when there is a positive agreement to this effect.

GEORGE CHASE.

Accor'dion: a musical instrument in which the tones are produced by the vibration of metallic springs moved by wind, which is applied by a bellows. It was invented by Damian, a Viennese, about 1829.

Accoucheur, a-koo-shér': a physician who assists women in child-birth. See OBSTETRICS.

Account' [remotely from the Lat. *ad*, to + *computa're*, calculate]: a computation or calculation; a statement of the receipts and payments of one who acts in a fiduciary relation, as an executor or a trustee, or a statement showing in detail the transactions between merchants or others who have dealt together. An account current is one that is open, running, and unsettled. An account stated is one which has been adjusted between the parties, and a balance struck. An account may also become stated without any express agreement, and by implication, as where one of two merchants who have dealt together draws up a formal statement of their dealings and sends it to the other, and the latter receives it and retains it without objection for a reasonable time. He is thus presumed to assent to its correctness.

Account, or account render, is the name of a common-law action which lay against one who by virtue of his position or office ought to have rendered an account and refused to do

so. This action is now almost obsolete. A court of equity has much more complete power to grant relief in all cases of mutual accounts, and in cases where the taking of an account is incidental to other matters over which that court has jurisdiction. Some of the instances in which an account may be taken on the one ground or the other are agency, general average, apportionment, contribution between sureties, waste, trusts, express or implied, including administration, guardianship, and partnership. In suits for an account both parties are deemed to be substantially plaintiffs for many purposes, and an affirmative decree may be made for the defendant, if a balance be found in his favor, as well as for the plaintiff. T. W. DWIGHT.

Accountant: the officer of a company who has the care of its books and accounts, and who makes up for it periodical statements and balance-sheets. In Great Britain the business is recognized as a distinct profession, and includes also the management and realization of bankrupt and other estates. Institutes of accountants, incorporated by royal charter, exist in London (founded 1880), Edinburgh (1854), Glasgow (1855), and Aberdeen (1867). A member of one of them is termed a chartered accountant (C. A.).

Accra: See AKKRA.

Accre'tion [Lat. *accr'e'tio*, *ad*, to + *cres'cere*, grow]: a gradual accumulation; specifically in law, the gradual accumulation of soil along the banks of a river or the sea, formed by the washing of the water. In the case supposed the increase belongs to the owner of the adjacent land. If the increase be sudden, the alluvion formed upon the seashore or navigable river belongs to the state.

Ac'erington: a manufacturing town of England; in Lancashire, in a deep valley, and at the junction of two railways, 13 miles E. of Preston and 19 miles N. by W. of Manchester (see map of England, ref. 7-G). It has increased rapidly in population and importance, and is considered the center of the cotton-printing business. It has also extensive manufactures of cotton cloth, and coal mines in which many of the inhabitants are employed. Among the public buildings is a fine Gothic church built in 1838. Pop. (1881) 31,435; (1891) 38,603.

Accuba'tion [Lat. *accuba'tio*; *ad*, to, beside + *cuba're* lie]: the reclining posture in which the ancient Greeks and Romans took their meals. Two or three couches were spread around the dining-table, each of which was capable of containing three persons. The guests lay on their left sides, their heads or elbows being supported by pillows, the feet of the first being behind the shoulders of the second, and those of the second behind the third. The middle place was generally deemed the most honorable.

Ac'cum, FRIEDRICH: German chemist; b. at Bückeberg in 1769. Having removed to London in 1793, he became Professor of Chemistry in that city about 1802. He promoted the use of gas for illumination by a valuable work entitled a *Practical Treatise on Gaslight* (1815). He wrote other works. D. in Berlin in 1838.

Accu'mulated Force [accumulated, from Lat. *accumula're*; *ad*, to + *cumulus*, heap]: the power of a moving body to overcome resistance. When a force acts on a body so as to produce its motion, the force must be in excess of the resistance to the motion, and, as power is imparted to the body at each instant, this is termed accumulated force. Thus if a strong man should pull on a rope attached to a ship at rest, but floating free in still water, his efforts at first would seem unavailing, because his strength would be so slight compared with the *vis inertiae* (which is proportioned to the weight) of the ship. If, however, he continue to pull steadily, the force applied will gradually impart a slow motion to the vessel. This is an example of the accumulation of force, which, however, is less manifest in this instance, owing to the fact that not merely the *vis inertiae* of the vessel but also the weight and friction of the opposing water are to be overcome. But let us suppose a mass of iron or lead of many thousand tons to be suspended by a huge chain or cable extending to an immense height.* In this case, as there would be no appreciable resistance from the air, the constant application of a very small force would at length, by accumulation, communicate a rapid motion and pro-

* It is obvious that if the chain or cable were not very long, the weight soon after it began to move (acting like a pendulum) would necessarily rise considerably higher than the point at which it was first suspended; hence a great part of the force applied would be lost in overcoming the attraction of gravitation.

digious momentum to the huge mass in question—a momentum which a force applied in an opposite direction and a thousand times as great could not suddenly overcome, and indeed could only overcome at all by a continual application in an opposite direction.

Accumulator (*storage battery* or *secondary battery*): a form of voltaic battery in which the electro-motive force after using can be restored to its initial value by passing an electric current through the cell in the reverse direction. In practice the electrodes of accumulators are almost invariably lead plates, which have been coated with a preparation of the oxides of that metal. The liquid is dilute sulphuric acid, sp. gr. 1.15, or an acidulated solution of some sulphate. In the original process of producing a secondary cell, as described by Planté, the coatings were formed upon the surface of the lead by long-continued action of the current. The result of passing the electric current through an electrolytic cell, the terminals of which consist of lead in dilute sulphuric acid, is gradually to deposit spongy lead upon the electrode through which the current leaves the cell, and an oxide of lead, PbO_2 , at the other terminal. When the two lead terminals have thus become coated, the electrolytic cell has been converted into a voltaic battery, and is capable, in turn, of generating electric current in any circuit with which it may be connected. Such a cell is called an accumulator. After being exhausted, it may be replenished over and over again by the electrolytic process just described. The present practice in the construction of storage batteries is founded upon the Faure process, which consists in applying preparations of the higher and lower oxides of lead to the surface of the plates before "forming" them by the action of the current. In this way the "forming process," which is both tedious and expensive, is much shortened, and the amount of active material on the plates is greatly increased.

The electro-motive force of storage batteries, when newly charged, is 2.2 volts, which rapidly falls when the cell is used to about 2 volts, then slowly to 1.8 volts, at which point the battery is ready for recharging. The percentage of electrical energy recovered from a secondary battery during discharge is from 75 to 85 per cent, the latter proportion being rarely attained under the conditions of operation met with in commercial practice.

Accumulators possess several advantages over primary batteries: (1) Their internal resistance is very small, so that in any outer circuit of good conductivity very large currents can be obtained from a single cell. (2) The source of energy in the primary battery is the oxidation of some metal, as zinc. In the accumulator it may be derived from the consumption of some cheaper fuel, as coal, or from falling water, or even from the action of the wind.

The disadvantages are the considerable first cost of the cells, the great weight per unit of storage capacity, and the tendency of the plates to rapid deterioration after having been in service for a certain time.

At the present time (1892) the development of the accumulator has reached its highest point in Germany, where this form of battery bids fair to take an important place in the industrial application of electricity. In that country single cells are manufactured which will furnish a current of 600 ampères for three hours, or 275 ampères for ten hours, the weight of the cell being 560 kilog.

In the latest form of accumulator the leaden plates are reduced to a very slight grating or grid, which is completely filled with the active material. The weight of the cell is thus reduced to a minimum, and the life of the plate is increased.

One of the earliest uses of the storage battery was in street-railway work, but the great weight of the battery has proved a serious objection to this method of propulsion. Upon the water, where the battery can be used in place of other ballast, no such difficulties arise; and wherever there is considerable traffic over short distances, electric propulsion by means of accumulators has been found a very satisfactory substitute for steam.

Upon the Thames, above London, the number of electric launches is already so large and is increasing so rapidly as to make it seem probable that steam navigation in such localities will be entirely superseded.

Many substitutes for lead and oxides of lead in accumulator cells have been proposed, but no other materials have as yet stood the test of long-continued application.

In static electricity the word accumulator is applied to an apparatus by means of which a considerable charge of electricity is gathered in a condenser by automatic repetition of

what is known as "electrophorus action." See ELECTROPHORUS, ELECTRICAL MACHINES, and REPLENISHING. The term *replenisher* is more frequently used for such machines.

E. L. NICHOLS.

Accusative: See DECLENSION.

Aceldama, a-sel'da-ma [Aramaic, field of blood]: a potter's field, said to have been situated S. of Jerusalem, and purchased by the Jewish priests with the money received by Judas for betraying Christ. It was set apart for a burial-place for strangers dying in Jerusalem, and is still shown on the hills S. of Mt. Zion.

Acéph'ala [Gr. ἀκέφαλα, adj. neut. plur., headless; ἄ-, not + κεφαλή, head]: a class of mollusks, usually called the *Lamellibranchiata*, and including the oyster, clam, mussel, etc. See MOLLUSCA.

Acéph'ali: in the early Christian Church, bishops exempt from the jurisdiction of their patriarchs; also the Eutychians who, when Pope Felix rejected (452) the Emperor Zeno's *Henoticon*, broke away from Peter Mongus, Patriarch of Alexandria.

Acer'ra (anc. *Acer'ra*): town of Italy, in the Campagna, 7 miles by railway N. E. of Naples (see map of Italy, ref. 7-F). It has a cathedral and a seminary. The sluggish channels of the Agno render the place unhealthy. Pop. 15,768.

Acetab'ulum [Lat. vinegar cup or cruet]: one of the suckers on the arms of the cuttlefish and other dibranchiate cephalopods, which are hence termed *Acetabulifera*. In anatomy, acetabulum signifies the cavity of the hip joint. In entomology, it is the socket on the trunk of an insect in which the leg is planted.

Ac'etate: one of a class of salts derived from acetic acid (*q. v.*). The acetates are all soluble in water, and, for the most part, crystallize readily. Many of these are extensively used either in dyeing or for medical purposes. The following are among the most important: *Aluminium Acetate*.—This salt exists only in solution, being decomposed by evaporation. It is largely used in dyeing and calico-printing as a mordant, and is prepared by precipitating alum with lead acetate, lead sulphate being thrown down, and a mixture of aluminium acetate and potassium sulphate remaining in solution. *Ammonium Acetate*.—The neutral acetate is a white crystalline salt, readily soluble in water and alcohol, and evolving ammonia on evaporation, so that it is difficult to obtain it in its crystalline form. Its solution is known in pharmacy as *Spir'itus Mindere'ri*. *Copper Acetate*.—Copper forms several acetates; the normal salt is known as crystallized verdigris. It forms dark, bluish-green prismatic crystals, which are efflorescent and very poisonous. There are three basic acetates of copper, all contained in common verdigris, which is largely used both as a pigment and as a mordant in dyeing. It is obtained by submitting metallic copper to the joint action of air and acetic acid. *Copper Aceto-arsenite*.—A beautiful but very poisonous green pigment, known in commerce as arsenic green, imperial green, Paris green, and Schweinfurt green. It is insoluble in water, and is prepared by boiling verdigris and arsenious acid together. *Iron Acetate*.—Iron forms two acetates; the only one of importance, however, is the ferric acetate, which is generally prepared by mixing ferric sulphate with lead acetate. It has not been obtained in the crystalline state, but forms a red-brown solution, which decomposes on ebullition. A very crude mixture of the ferrous and the ferric acetate, known as pyrolignite of iron, is largely used as a mordant in dyeing black. *Lead Acetate*.—Lead forms a normal and several basic acetates. Normal lead acetate (known as sugar of lead) is a white crystalline salt, having a sweet astringent taste. When oxide of lead is digested with a solution of normal acetate, the tribasic acetate is formed in long, silky needles. A solution of this salt is frequently used on account of its power of precipitating many vegetable substances, such as gum and coloring-matters. It is used in medicine under the name of Goulard water or Goulard extract (*liquor plumbi subacetatis*). *Potassium Acetate* is a very deliquescent salt, and is obtained with difficulty in a crystallized state; it melts to a limpid liquid below redness. It exists in the juices of many plants, and is prepared artificially for medicinal purposes by neutralizing acetic acid with potassium carbonate. *Sodium Acetate*.—An efflorescent crystalline salt, prepared by saturating acetic acid with sodium carbonate. On evaporation it separates in large transparent prisms. It is similar in its medical properties to potassium acetate.

Revised by IRA REMSEN.

Acetic Acid [Lat. *acētum*, vinegar]: the most common of the vegetable acids, and the essential constituent of vinegar. It is composed of carbon, oxygen, and hydrogen. It occurs in the juices of many plants, and in some animal secretions. It is produced by the decomposition and oxidation of many organic bodies. It is prepared from weak alcoholic liquids, as wine, cider, and beer, by oxidation, "acetous fermentation," and by the destructive distillation of wood, "pyroligneous acid."

The chemical formula of acetic acid is $C_2H_4O_2$. Alcohol can be converted into acetic acid by bringing it into contact with spongy platinum, from which it absorbs oxygen. (See FERMENTATION.) Crystallizable or glacial acetic acid, the most concentrated form of acetic acid, is obtained by distilling dry acetates with concentrated sulphuric acid.

Acetic Ethers: acetates of the alcohol radicals, such as ethyl acetate ($C_2H_5C_2H_3O_2$); methyl acetate, "æther lignosus" ($CH_3C_2H_3O_2$), found in crude wood vinegar; amyl acetate ($C_5H_{11}C_2H_3O_2$), made by distilling potassium acetate, fusel oil, and sulphuric acid.

Acetone, or **Pyro-acetic Spirit**: a limpid, mobile liquid of agreeable odor and biting taste, like that of peppermint. It is made by heating acetates. It is manufactured from calcium acetate or acetate of lime, and used in the preparation of chloroform. It mixes with water, alcohol, and ether, and dissolves many camphors, fats, and resins. Acetone represents a class of organic bodies called ketones.

Acetylene: See the Appendix.

Achæan League: a confederation of Grecian cities formed about 280 B. C. Previous to the invasion of Macedonia by the Gauls, the Achæans had performed an insignificant part in the history of Greece, but soon after that event four Achæan towns formed a league for mutual protection. Aratus of Sicyon induced his native town to join the league (251 B. C.), and was himself made strategos (general-in-chief) of the confederacy. Corinth joined the league in 243 B. C., and was soon followed by Epidaurus, Megara, and several other cities. Philopœmen, called the "last of the Greeks," became strategos of the league in 208 B. C. In 191 B. C. the confederacy included Sparta, Athens, and nearly all the cities of the Peloponnesus, and for fifty years maintained the cause of Grecian independence against the Ætolians and against the encroachments of Rome. The confederates, under Diæus, were defeated at Corinth by the Roman General Mummius, and Southern Greece was made a Roman province under the name of Achaia (146 B. C.). The Achæan confederacy may be said to furnish the most perfect example of the federative system which ancient Greece affords, and its history forms one of the most glorious chapters in the annals of ancient times.

Revised by R. LILEY.

Achæans (Gr. *Ἀχαιοί*): one of the four races of inhabitants of ancient Greece. The name is often extended in the Homeric poems to the whole Greek people. The Achæans proper inhabited parts of Thessaly, and in the Peloponnesus they anciently occupied Argos, Laconia, and the neighboring regions, whence they were, for the most part, expelled by the Dorians, the exiles settling along the northern shore of the Peloponnesus, and founding there a new community. They remained an obscure people till the founding of the ACHÆAN LEAGUE (*q. v.*).

Acha'ia (Gr. *Ἀχαια*): state of ancient Greece; in the north part of the Peloponnesus; bounded E. by Sicyonia, N. by the bay of Corinth, and S. by Arcadia and Elis (see map of Greece, ref. 16-J). It was about 65 miles long from E. to W. The surface was hilly or mountainous. Achaia and Elis constitute a province of modern Greece. Area, 1,901 sq. miles. Pop. (1889) 210,713. In the days of the New Testament writers, Achaia signified the whole Peloponnesus.

Acha'o: a town of Chili; on the northeastern end of Quinchao island, Gulf of Ancud; on the east side of the northern end of the island of Chiloe; approximate lat. 42° 20' S., lon. 74° 20' W. Pop. of commune, 13,873.

Achard, *ã-shaar'*, FRANZ KARL; b. in Berlin, Apr. 28, 1753; studied physics and chemistry, and published *Vorlesungen über Experimentalphysik* (4 vols., 1791-92); made extensive researches and experiments with reference to the production of sugar from the beetroot, the results of which he published in 1799-1800, and received from the Prussian king the estate of Cunern in Silesia for the purpose of establishing there a beetroot-sugar manufactory; succeeded in 1806 in developing the true practical process of manufacturing, and brought the establishment into splendid condition,

especially during the enforcement of the continental system; wrote *Die europäische Zuckerfabrikation aus Runkelrüben* (3 vols., 1809). D. Apr. 20, 1821.

Achard, LOUIS AMÉDÉE EUGÈNE: French novelist; b. in 1814; was contributor to the *Courrier de Paris* in 1845, and after the revolution of 1848 became a political writer in the camp of the royalists. He wrote, among other works, *Belle-Rose* (1847); *Histoire d'un homme* (1863); *Souvenirs personnels d'émeutes et de révolution* (1872); *Histoire de mes amis* (1874). D. Mar. 25, 1875.

Acha'tes: a friend and companion of Æneas (*q. v.*), noted for his fidelity. The proverbial phrase *fidus Achates* is often applied to a man who is a devoted follower of his chief.

Achelo'us (Gr. *Ἀχελῷος*), now **As'pro-Pot'amo**: the largest river of Greece, rises in Mt. Pindus, flows nearly southward, forms the boundary between Acarnania and Ætolia, and enters the Ionian Sea after a course of about 100 miles.

Achenbach, *aa'khen-baäk*, ANDREAS: landscape and marine painter; b. in Cassel, Germany, Sept. 29, 1815. Pupil of the Düsseldorf Academy; member of the Berlin, Amsterdam, and Antwerp academies. Works by him are in the principal German galleries and in private collections in the U. S. Received, among other honors, a first-class medal at the Paris Exposition, 1855; Legion of Honor in 1864.

WILLIAM A. COFFIN.

Achenbach, HEINRICH: a German jurist and statesman; b. Nov. 23, 1829; became, in 1860, Professor of German Law at the University of Bonn; entered the Prussian Diet in 1866; fought (though a Conservative) on Falk's side in the Kulturkampf; and became, in 1873, Minister of Commerce, Agriculture, and Public Works. He founded and edited for many years *Zeitschrift für Bergrecht*, and his *Das französische Bergrecht* (1869), *Das deutsche Bergrecht* (1871), etc., have greatly influenced mining legislation. D. Potsdam, July 10, 1899.

Achenbach, OSWALD: landscape painter; brother and pupil of Andreas; b. in Düsseldorf, Feb. 2, 1827. Painted many pictures of subjects in Switzerland and Italy. Works in the National Gallery, Berlin, and many are owned by collectors in the U. S. Second-class medal, Paris Salon, 1861; Legion of Honor, 1863.

WILLIAM A. COFFIN.

Achenium, *a-kee'ni-ūn*, or **Acheue**, *a-keen'* [for *achænium*, Gr. *â-* not + *χαλνείν*, gape]: a dry, hard, one-seeded, indehiscent fruit or pericarp, such as that of the buttercup and the thistle.

A'chenwall, GOTTFRIED: German writer on statistics; b. at Elbing in 1719; reputed to have originated statistical tables. He became Professor of Philosophy at Göttingen about 1750. He introduced the term *Staatswissenschaft* (politics), by which he proposed to include all the knowledge essential to statesmanship. D. in 1772.

Acheron, *äk'er-on* (Gr. *Ἀχέρων*): the ancient name of a river of Elis; also a river of Epirus. It was also applied in mythology to a river of the infernal regions; the bitter stream over which the souls of the dead were ferried by Charon.

Acheron'tia, or **Death's-head Moths** [from *Acheron*, in the Greek mythology a river of the dead]: a genus of moths, belonging to the family *Sphingidæ*. There is found in Great Britain and other European countries a species of this genus (the *Acheron'tia at'ropos*), having on the back of the thorax a remarkable representation of a human skull, and it has hence received the name of death's-head moth. This is a very handsome insect, and is from 4½ to 5½ inches in expanse of wing. It is much dreaded by the ignorant and superstitious, who consider its appearance to be ominous of evil. It does not hesitate to attack beehives,

devouring the honey and putting the bees to flight. Though possessing no weapons of defense that have yet been discovered, it appears to suffer no harm from its armed enemies. Its larva is a large caterpillar about 5 inches in length, with beautiful markings; the color is a kind of greenish yellow, and the back is traversed by lines partly blue and partly white, speckled with black spots. The caterpillar feeds mostly on the leaves of the potato plant; and it retires deep



Death's-head moth.

into the earth, and changes into a chrysalis in the month of September. It emerges the following June or July, transformed into a perfect insect. This moth is seen most frequently in the mornings and evenings of autumn.

Acheru'sia: I. A lake in Epirus, into which the river Acheron flows. II. A cavern in Bithynia, near the city of Heraclea; through it Hercules is said to have dragged Cerberus up to the light of day.

Achill, *akh'il*, or **Eagle Island**: an island off the west coast of Ireland, forming part of the county of Mayo (see map of Ireland, ref. 7-B). It is about 15 miles long by 12 miles broad. Pop. about 5,000. On the coast is a sheer precipice 2,200 feet high.

Achil'les (Gr. Ἀχιλλεύς): a famous Grecian warrior, the hero of Homer's *Iliad*; son of Peleus, King of Thessaly, and the sea-nymph Thetis. From the name of his father, he was often called Peli'des. At the siege of Troy he was pre-eminent for courage, strength, and swiftness, but, having been offended by Agamemnon, he refused to fight. When, however, his friend Patroclus had been killed, he returned to the war to avenge his death. He slew Hector and many other Trojans. According to a poetic legend, his mother, by dipping him in the river Styx, had rendered him invulnerable in every part except his heel, by which she held him. He was killed with an arrow by Paris, who shot him in the heel.

Achilles Tatius: author (about 450 A. D.) of a popular Greek romance, *The Story of Leucippe and Clitophon*, largely borrowed from the still more popular romance of Heliodorus. He is said to have become a Christian and a bishop, but the immorality of his work is peculiarly heathen. Achilles is distinctly inferior to Heliodorus; there are too many speeches, letters, and descriptions of works of art. Edited, with commentary, by Fr. Jacobs (1821); revised text, by Hercher, 1858; translated into English by R. Smith (Bohn's Classical Library). See Rohde, *Griechischer Roman*, p. 472.

B. L. GILDERSLEEVE.

Achil'les' Ten'don, or **Tendon of Achilles** (in Lat. *ten'do Achil'lis*): the tendon which connects the muscles of the calf of the leg with the bone of the heel. It is the strong band which is felt at the posterior part of the foot behind the ankle. The name is given in allusion to the mythological tale of the famous Grecian warrior Achilles, who was said to have been held by the heels by his mother Thetis as she bathed him in the river Styx shortly after his birth. This is said to have rendered him invulnerable in all parts save that which was held above water, and his death was finally caused by an injury to the heel. This tendon plays an important part in one of the forms of club-foot in which it becomes contracted, so that the toe is kept permanently drawn downward.

W. P.

Achil'li, GIOVANNI GIACINTO, Dr.: Italian Protestant; formerly a Dominican friar; b. at Viterbo in 1803. He left the Roman Catholic communion about 1839, and issued an Italian version of the New Testament, which is regarded by some as the best in that language. In 1850 he went to Great Britain, where, as "Father Achilli," he lectured extensively, and where he became involved in a lawsuit (in 1852) which he brought against Dr. John Henry Newman for slander. The case was tried before Lord Campbell, and a verdict given for the plaintiff. Dr. Achilli has also been Professor of the Italian Language and Literature in the English College at Malta.

Achin', or **Acheen'**: the northwestern portion of the island of Sumatra, formerly an independent state, now nominally a Dutch political district (see map of East Indies, ref. 5-A). The Dutch declared war against the Sultan of Achin in 1873, and in 1878 they formally extended their administration over his dominions. As an administrative district, Achin consists of the western extremity of the island for about 250 miles, and includes the large island of Labuan on the S. and many small ones. Area, about 20,000 sq. miles. Pop., 445,000 natives (mostly Malay in origin), 2,000 Chinese, and 242 Europeans (1891). About one-half of the territory, in the interior and occupied by more than half of the population, is still unconquered. See SUMATRA. M. W. H.

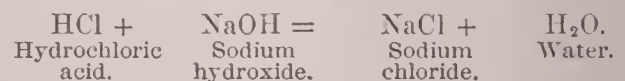
Achromatic [Gr. ἀ-, without + χρώμα, color]: transmitting light without decomposing it into its constituent colors; applied to telescopes and microscopes, the objectives of which are constructed of such a combination of glasses as will refract rays of all colors to nearly the same focus. See TELESCOPE.

Achromatin: in biology, that constituent of the substance of the nucleus of a cell which does not stain, or only slightly so, with the coloring reagents. See CELL.

Achro'matism [see ACHROMATIC]: absence of coloration. (See CHROMATIC ABERRATION under ABERRATION.) A prism of flint glass will cause a certain amount of refraction and of dispersion, and if a similarly shaped prism of the same glass be placed behind it, in the reverse position, the refraction and dispersion in one direction by the first prism will be exactly neutralized by the refraction and dispersion in the opposite direction by the second prism, and as a result there will be no refraction and no color. But suppose a prism of *crown glass*, having the same dispersion as the one of flint glass, be placed behind the latter in the reverse position, the two dispersions, being opposite and equal, will neutralize each other, and the result will be white light; but the mean refractions being different, they will not neutralize each other, and the beam of light will pass through achromatic, or almost free from color, but refracted more or less. As a lens may be looked upon as a combination of prisms with curved surfaces, achromatic lenses may be produced in the same way as achromatic prisms. Absolute achromatism is perhaps unattainable by art, owing to the spectra from different dispersive media not having an exact proportionality to one another. This is called *irrationality of dispersion*. It may be remedied in some degree by introducing a third lens of plate glass in addition to the flint and crown glass lenses. An under-corrected lens is one in which the correcting lens of flint does not quite accomplish the purpose, and the violet ray will come to a focus a little within the red. In an over-corrected lens the error is of the opposite kind, and the order of colors inverted.

Acid [Lat. *a'cidus*, sour]: one of an important class of chemical compounds, of which acetic acid, sulphuric acid, hydrochloric acid, nitric acid, phosphoric acid, and oxalic acid are well-known examples. In general terms, all acids have an acid taste; they have the power to change certain vegetable colors, as blue litmus, which they change to red; and, further, and this is the most characteristic property of acids, they form compounds known as salts when brought together with the so-called bases. Some compounds have the power to neutralize acids, and are themselves neutralized at the same time. The meaning of this can be illustrated by taking a simple case. Hydrochloric acid acts energetically upon many things; it has in a marked degree the properties of acids. Sodium hydroxide, or, as it is also called, sodium hydrate or caustic soda, also acts energetically upon many things. The name caustic suggests the character of the substance. Sodium hydroxide is a marked example of the class of compounds called bases. Now, when hydrochloric acid and sodium hydroxide are brought together, the two act upon each other in such a way as to cause the formation of sodium chloride and water, the marked properties of both the acid and the base being destroyed, both being, as we say, neutralized.

In chemical language the change is represented thus:



The sodium chloride formed is the substance familiar to all as *salt*. It has none of the striking properties of the acid and base from which it is derived.

Whenever an acid and base act upon each other, they are neutralized, and a salt and water are formed. The salts thus formed differ widely from one another in their properties. Examples are potassium nitrate, KNO_3 , derived from nitric acid and potassium hydroxide, or caustic potash; sodium sulphate, Na_2SO_4 , derived from sulphuric acid and sodium hydroxide; sodium carbonate, Na_2CO_3 , derived from carbonic acid and sodium hydroxide; copper sulphate, or "blue vitriol," CuSO_4 , derived from sulphuric acid and copper hydroxide.

Acids contain hydrogen as the essential constituent, and most of them contain oxygen. So commonly is the latter element contained in them that it was for a long time regarded as the essential constituent, and the name oxygen, from the Greek *ὀξύς*, acid, and *γενεῖν*, to form, is a reminder of this view.

A base contains a metallic element, as potassium, sodium, calcium, iron, copper, zinc, together with hydrogen and oxygen. Thus the substances named below are bases:

Potassium hydroxide.....	KOH.
Sodium hydroxide.....	NaOH.
Calcium hydroxide.....	Ca(OH) ₂ .
Ferric hydroxide.....	Fe(OH) ₃ .
Copper hydroxide.....	Cu(OH) ₂ .
Zinc hydroxide.....	Zn(OH) ₂ .

When a salt is formed from an acid and a base, the metal of the base enters into the acid in place of the hydrogen, and the hydrogen combines with the hydrogen and oxygen of the base to form water, thus:

HNO ₃ + Nitric acid.	KOH = Potassium hydroxide.	KNO ₃ + Potassium nitrate.	H ₂ O. Water.
H ₂ SO ₄ + Sulphuric acid.	2NaOH = Sodium hydroxide.	Na ₂ SO ₄ + Sodium sulphate.	2H ₂ O. Water.

Chemists distinguish between strong and weak acids. Among the strongest are the three well-known ones, hydrochloric, nitric, and sulphuric acids. Boric acid, from which borax is derived, silicic acid, from which are found the silicates, and most vegetable acids, such as citric, tartaric, oxalic, and malic acids, are weak. These expressions are not generally used in a very definite sense, but their meaning is clear enough for most purposes. Again, acids are said to be monobasic, dibasic, tribasic, etc. Examples of monobasic acids are hydrochloric and nitric acids; of dibasic acids, sulphuric and oxalic acids; and of tribasic acids, phosphoric acid:

Hydrochloric acid.....	HCl.
Nitric acid.....	HNO ₃ .
Sulphuric acid.....	H ₂ SO ₄ .
Oxalic acid.....	H ₂ C ₂ O ₄ .
Phosphoric acid.....	H ₃ PO ₄ .

The basicity depends upon the number of hydrogen atoms in the molecule. If there is but one, the acid is monobasic; if two that can be replaced by metallic atoms, the acid is dibasic; if three that can be replaced by metallic atoms, the acid is tribasic.

IRA REMSEN.

Acidim'eter [from Lat. *ac'idum*, acid + Gr. *μέτρον*, measure]: an instrument for determining the strength of an acid by its saturating power. It usually consists of a glass tube graduated into 100 equal parts, and containing an alkaline liquor of known strength, the proportion of which requisite to saturate a given quantity of any acid is the equivalent of that acid. See CHEMICAL ANALYSIS and VOLUMETRIC ANALYSIS under ANALYSIS.

Acipeuser'idæ: See STURGEON.

Acireále, ã-chee-rã-aa'lay: a town and seaport of Sicily; in the province of Catania; at the mouth of the river Aci, near the foot of Mt. Etna, and 7 miles by rail N. E. of Catania. (See map of Italy, ref. 10-F). It is built mostly of lava, has many fine edifices, and is an important health resort. Here are mineral springs and the Cave of Polyphe-mus. Pop. 35,000.

Ack'ley: railroad junction, Hardin co., Ia. (for location of county, see map of Iowa, ref. 4-H); 132 miles W. of Dubuque; has five churches, a convent in charge of the Sisters of Mercy, and a soap-factory. Pop. (1880) 1,517; (1885) 1,473; (1890) 1,286; (1900) 1,445. EDITOR OF "ENTERPRISE."

Acknow'edgment: in law, the act by which one who has executed an instrument declares or acknowledges, before some authorized officer, that it is his act or deed. The term is also applied to the officer's certificate of this fact indorsed on the instrument. The general object of an acknowledgment is twofold: first, to comply with the recording acts, so that the instrument may be lawfully recorded; secondly, to give the instrument such authenticity that it may be put in evidence in courts of justice, without further proof of its execution. As a general rule, it is not necessary to the validity of the instrument, though the laws of some of the States provide that a wife's conveyance of real estate or release of dower is invalid unless on a private examination apart from her husband she acknowledges that she executed it freely and without fear or compulsion of her husband. This rule is borrowed in its substance from an English practice under a so-called statute of fines. The officers generally authorized to take acknowledgments are judges and clerks of courts, mayors, justices of the peace, commissioners of deeds, and notaries public.

Acknowledgments of conveyances of real estate should correspond in form with the requirements of the law of the

State where the land is situated, though that law sometimes permits them to be valid if they conform to the law of the place where they are executed.

Ac'land, ARTHUR H. D.: See the Appendix.

Acland, HENRY WENTWORTH, M. D., D. C. L., F. R. S.: b. in 1815; educated at Christ Church, Oxford, where he took his degree of M. D. in 1848. He was one of the founders of the University Museum, and became in 1858 Regius Professor of Medicine. He accompanied the Prince of Wales to America in 1860; and published *The Plains of Troy* (1839), a *Memoir on the Visitation of Cholera in Oxford in 1854*, and scientific and medical papers. D. Oct. 15, 1900.

Acóme'tæ [literally the sleepless, from Gr. *ἀκοιμητος*, sleepless; *ἀ-*, not + *κοιμᾶσθαι*, fall asleep]: an order of monks, sometimes called Watchers, which was founded at Constantinople early in the fifth century. They performed divine service day and night, and were divided into three classes, each of which had its share of duty. They established many monasteries, and were held in high estimation. Studius, a Roman noble and a member of this order, built a monastery called Studium, and the monks were styled Studitæ. Having afterward favored the doctrines of Nestorius, their credit declined.

Ac'olyte [Lat. *acolythus acolitus* for more correct *acolūthus* = Gr. *ἀκόλουθος*, attendant]: the highest of the four minor orders in the Roman Catholic Church. The acolyte assists at mass by presenting the wine and water and by carrying the lights. The order is mentioned by Pope Cornelius in the third century, and must still be received by candidates for the priesthood, though its functions are often performed by laymen.

Acoua: See KERESAN INDIANS.

Aconca'gua: one of the highest peaks of the Andes; in Chili, lat. 32° 39' 40" S., lon. 70° 1' 43" W., on the frontier between Chili and the Argentine Republic. Its height is 23,910 feet above sea-level.

Aconca'gua: a province of Chili; bounded N. by Coquimbo, E. by the Argentine Republic, S. by Santiago and Valparaiso, W. by the Pacific. Area, 5,840 sq. miles. This province is the most mountainous part of Chili, and contains the highest peak of the Chilean Andes, Aconcagua. The climate is very dry, and owing to the high mountain ranges there is very little vegetation in this province. Pop. in 1878, 135,190; (1885) 144,125; (1895) 113,165. Chief town, San Felipe.

Ac'onite: a plant of the genus *Aconitum* and the family *Ranunculaceæ*. The Old World contains many species of this genus, some of them, particularly *Aconitum ferox* of India, very poisonous. *Aconitum napellus*, or monkshood, a native of Europe and Asia, is the plant which yields most of the aconite used in medicine. Several species occur in the U. S. The "winter aconite" (*Eranthis*) of Europe is of the same family, but is more nearly related to hellebore.

Acouitia: See MONKSHOOD.

Ac'orus Cal'amus (sweet flag): a medicinal plant of the family *Araceæ*. Its aromatic stem (rhizoma) is used as a stomachic and tonic. It is a native of both continents.

Acos'ta, GABRIEL: Jewish reformer; b. in 1594 in Oporto, Portugal; educated in the Roman Catholic religion, but went to Holland, where he embraced the faith of his fathers, and changed his name to Uriel. He was condemned and persecuted as a heretic by the rabbis, and died by suicide in 1647. His autobiography was published in Latin and German in 1847.

Acotyledonous Plants [Gr. *ἀ-*, without + *κοτυληδών*, cup-shaped cavity, from *κοτύλη*, cup]: an old term applied to the flowerless (and therefore seedless) plants, as ferns, mosses, fungi, etc. It is now rarely used. CHARLES E. BESSEY.

Acoustics, a-koos'tiks [Gr. *ἀκουστικός*, pertaining to hearing; *ἀκούειν*, hear]: the study of the nature, the production, and the perception of sound.

Strictly speaking, sound is a sensation which is produced when vibrations of a certain character are excited in the auditory apparatus of the ear. These vibrations are generated by progressive tremors in the atmosphere, called sound-waves, the nature of which we shall briefly consider. Let it be premised that the particles of the air, and of all elastic media, are ordinarily maintained in a state of equilibrium and rest by mutually repellent forces. If any particle be disturbed from its position of equilibrium, it must be by an impulse received from some body foreign to the medium;

and when so disturbed it is solicited to return by a force directly proportioned to the distance, or *amplitude*, of its displacement from that point. Also, the velocity with which it will be animated on reaching in its return the point of original rest will be directly proportioned to the extreme amplitude of its displacement; so that, in virtue of its inertia, it will make an equal and similar excursion in the opposite direction. When in its return from this it reaches once more the point of equilibrium, it will have passed over the entire range of its movement in both directions; and this is said to constitute one complete oscillation or double vibration.

From the law of force above stated the following deductions are made by the help of the calculus: Put a to represent the extreme amplitude of displacement; V , the maximum velocity of the vibrating particle (the velocity with which the particle passes the point of equilibrium, expressed by the distance such velocity, continued uniformly, would carry a body in one second of time); T , the time of a complete double vibration; and π , the ratio of the circumference to the diameter of the circle. Then $V = 2\pi\frac{a}{T}$, and $T = 2\pi\frac{a}{V}$; from which last expression it appears that the time of vibration is constant, whatever be the amplitude of displacement, since a varies directly as V .

But in an elastic medium one particle can not be displaced from the position of equilibrium without disturbing the equilibrium of its nearest neighbors. The neighboring particle toward which it is driven will begin, almost but not quite in the same instant, to move in the same direction; and this will disturb the next, and through it the third, and so on, the tremor being rapidly propagated throughout the medium. The distance to which this tremor will have reached when the particle first disturbed has completed one entire double vibration is the length of the sound-wave, or of one complete undulation.

The relation between vibration and undulation may be made more clear by the following illustration. Since VT is the distance accomplished in time, T , with velocity, V , and since $VT = 2\pi a$, it follows that if, with radius, $a = CA$ or CB , we describe a circle, $ADBE$, a particle, p , will describe the circumference, $ADBE$, with velocity, V , continued uniform, in the same time, T , in which the vibrating particle p performs a complete double vibration on the diameter AB . If p leaves D in the same instant in which p passes C , the two will be together at B , and again at A ; and it is further provable that, at any intermediate instant, the line joining p and p' , as FG or HK , will always be parallel to CD , and perpendicular to AB . Also, that if the

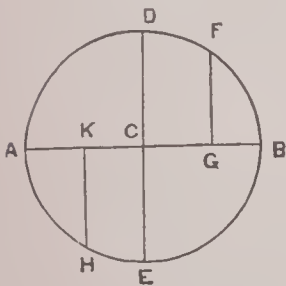


FIG. 1.

arcs of revolution be reckoned from D , and the time from D to F , or from D to H , be called t , the distance $y = CG$ or CK , of p from the point of equilibrium, C , will always be representable by the formula $y = a \sin 2\pi\frac{t}{T}$; and the velocity, v , of the same particle will always be $v = V \cos 2\pi\frac{t}{T}$.

Now the rapidity of the propagation of the tremor through the elastic medium is, for all tremors producing the sensation of sound, vastly greater than the velocity v or V ; and this velocity of propagation is uniform, although the several velocities of the particles of the medium which successively take up the tremor, diminish with the increase of distance from the origin, because of the diffusion of the exciting force through a constantly increasing number of particles. This diminution for moderate distances may be disregarded. If the foreign body which disturbs p be, for instance, the limb of a tuning-fork making 500 double vibrations per second, the time of describing CB will be but the 2,000th part of a second. During this time the tremor in the air will advance more than 6 inches, while CA will hardly exceed $\frac{1}{10}$ th of an inch. The velocity of propagation in this case therefore exceeds the mean velocity of vibration more than 240 times. But if we consider the movement of p through CB to be made up of an indefinite number of exceedingly minute elementary motions, these elementary motions will have all the different velocities corresponding to the possible values of FG between C and B ; and each one of these velocities will be successively transmitted along the line of propagation, one behind the other; so that, when p reaches B and comes to rest,

all these velocities will still be living in a row of particles extending over a distance of 6 inches, the largest being foremost, and the least, which is zero, being that of the particle p itself. As p returns toward C , it leaves its next neighbor toward the right partially unsupported, and that neighboring particle follows it. There occurs then a second series of propagated movements, all the molecules moving in the returning direction, though the tremor advances, forming the wave of dilatation, as the former was the wave of compression. Sound-waves may accordingly be represented graphically by a curved line, as in Fig. 2, where the portion of the



FIG. 2.

curve above the horizontal straight line represents the wave of compression, and the part below the wave of dilatation. The ordinates to the different parts of this curve represent the velocities animating the particles in the different parts of the wave, those above being advancing velocities, and those below receding.

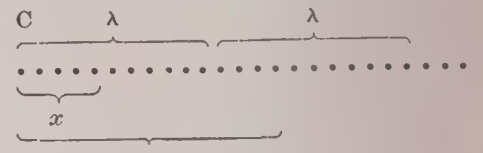


FIG. 3.

The distance between M and N is the length of a complete undulation, commonly represented by λ . Then if x (Fig. 3) be taken to represent any distance from the point of rest, C , of the disturbing or sounding body, the distance, y , of the particle at x from its place of equilibrium will be expressed by the formula

$$y = a \sin 2\pi\left(\frac{t}{T} - \frac{x}{\lambda}\right);$$

and the velocity animating that particle at the instant by the formula

$$v = V \cos 2\pi\left(\frac{t}{T} - \frac{x}{\lambda}\right).$$

For examples under the first formula, let $t = nT$; i. e. let p have made an exact number of complete oscillations; then by giving different values to x we ascertain the condition of corresponding points along the line. Thus if $x = 0$, we have $y = 0$; or p is at this moment in its position of equilibrium.

Making x successively $= \frac{\lambda}{8}, \frac{\lambda}{4}, \frac{\lambda}{2}, \frac{3\lambda}{4}, \lambda, 2\frac{1}{2}\lambda$, and substituting these values, we have the corresponding values of y equal to $-a\frac{1}{\sqrt{2}}, -a, 0, +a, 0$; positive signs indicating displacement to the right, and negative signs the reverse.

For examples under the second formula, let $t = nT$, as before, and put $x = \frac{\lambda}{6}, \frac{\lambda}{3}, \frac{2\lambda}{3}, \frac{7\lambda}{8}, \frac{5\lambda}{3}, \frac{\lambda}{2}, \frac{7\lambda}{4}$, successively.

We shall then have $v = +\frac{1}{2}V, -\frac{1}{2}V, -\frac{1}{2}V, +\frac{1}{10}V, -\frac{1}{2}V, V, 0$, for the corresponding velocities; positive signs indicating movement toward the right, and negative signs the reverse. The signs of displacement and movement for the same particle are half the time alike and half the time unlike.

Velocity of the Propagation of the Sound-Waves in the Air.—This has been the subject of a considerable number of experiments, of which we give below the most important. In 1822 a determination of this kind was undertaken by some members of the French Academy; the stations selected were at Montlhéry and Villejuif, the distance being 18,622·27 meters. Cannon were alternately discharged at the two stations at night, and the time which elapsed between the flash and the perception of the sound noted. On the first night twelve and seven shots were heard—on the second only one. The result was, that at a temperature of 0° C. sound travels with a velocity of 331·2 meters per second. It is somewhat strange that to this important experiment only two nights were devoted.* We have besides this the more careful experiments of Moll and Van Beek† in the following year, who obtained for their result at 0° C. 332·05 meters per second; and finally we must add the experiments of Bravais and Martins,‡ who measured the velocity of sound in a slanting upward direction from the Lake of Brienz to a station on the Faulhorn, obtaining as result at 0° C. a

* *Ann. de Chim. et de Phys.*, t. xx, p. 210.† *Pogg. Ann.*, bd. v. s. 351, 469.‡ *Pogg. Ann.*, bd. lxvi. s. 851

velocity of 332·37. This last experiment is interesting as showing that sound travels with the same velocity in an upward direction as on a level, as is required by the formula of Laplace.

Recently several pieces of apparatus have been devised by which the velocity of sound can be measured when the distance traveled over is only a few feet; so that it is now possible to make this experiment in a small apartment. Suppose that we generate a sharp, short sound at the open extremity of a tube, the other end being closed by a membrane; the sound-impulse, reaching the closed end of the tube, would announce its arrival by giving the membrane a little push outward; and if we had fastened on it a pencil, this might be caused to make a mark on a sheet of paper at the same instant. Let us now imagine that we had, near each other, *two* such tubes, the second one being longer than the first, but bent so that both still terminated side by side, each with its membrane and pencil, and that finally our sheet of paper, instead of being stationary, were in motion. Then, under these circumstances, the sound-wave traveling through the shorter tube would make its mark first, and the paper would have a chance to move a few inches before receiving the pencil mark due to the companion wave; and if we knew the rate of the paper's motion, it is evident that we could easily calculate the velocity with which the sound had traveled through our apparatus. This general explanation will give an idea of the principle involved in a number of new contrivances, with some of which it is even possible to experiment at various temperatures and on other gases than our atmosphere. A simple and cheap apparatus of this kind was, in 1866, devised by Dr. Ernst Neumann,* a school-teacher in Dresden; the difference in the paths of the sound-waves was about 20 feet, although the length of the apparatus was only 3 feet; the sound was generated by the discharge of a child's brass cannon. The paper was attached to a circular disk arranged with a handle, which enabled the experimenter to revolve it with a velocity of only one turn per second, which was roughly accomplished by watching a seconds pendulum, consisting of a ball attached to a string having a length such as to cause it to vibrate seconds. The mean of a number of experiments gave a result far more accurate than would have been expected. Using the same general idea, but causing the sound-waves to act on little gas-burners connected with the two membranes, in the same year Ivan Zoch,† in Erlangen, contrived a far more delicate instrument, with which he obtained results rivaling those of the French Acad my in 1822, although in his case the difference of the paths was only 3 or 4 feet. With it he measured the velocity in various gases, and by driving a current of air through during the experiment was actually able to ascertain the change due to this cause. A somewhat similar idea was used in this fruitful year by Prof. Quincke,‡ of Berlin, in a very beautiful contrivance, where, unlike the two preceding, the signal was given not to the eye but to the ear, the two sounds being made to destroy each other, producing silence in a manner presently to be explained. With this instrument Dr. Seebeck§ has proved that in *small* tubes sound travels slower than in the open air, partly, as it would seem, owing to friction, and partly to loss of heat developed by the sound-wave itself through conduction by the walls of the tube. He has also shown that in *small* tubes the velocity is less in the case of deep notes than with those which are higher.

Laplace's formula for the velocity of sound in gases and vapors is

$$v = \sqrt{\frac{g h}{d} K};$$

v = the number of meters traversed by the sound-wave in a second of time; g = the accelerating force of gravity = 9·8088 meters; h = the height of the mercury in the barometer reduced to the height it would have at 0° C.; d = the specific gravity of the gas, mercury at 0° being taken as unity; K = the quotient of the specific heat of the gas at a constant pressure, divided by its specific heat at a constant volume = 1·42. It is seen from this formula that the velocity is directly proportional to the square root of the pressure the gas is under, and inversely proportional to the

square root of its specific gravity. It is evident also that the velocity is independent of the height of the barometer, for a change in the barometer affects not only h in the numerator, but also d in the denominator, in such a way that the value of the fraction remains constant. No term relating to the distance of the sounding body enters the formula; hence the velocity is independent of the distance—that is, of the amplitude of the sound-wave. The following is the convenient formula for calculating the velocity of sound in air at various temperatures:

$$v = 333 \cdot M \sqrt{1 + at};$$

a = coefficient of expansion of air for 1° C. = 0·003665; t = the temperature in degrees of the centigrade scale; M standing for meters. It was also found experimentally that sound moves quicker with the wind and slower against it; the final velocity being in the one case equal to the sum, in the other equal to the difference, of the velocity of wind and that of the sound-wave itself. In gases, the velocity of sound, of course, as indicated by the formula, increases with the temperature; in air this increase is about 2 feet per second for each degree centigrade. The velocity of sound in oxygen gas at 0° C. is 1,040 feet; in carbonic acid, 858 feet; in hydrogen, 4,164 feet.

In 1827 Colladon and Sturm determined experimentally the velocity of sound in fresh water. The experiment was made on Lake Geneva, and it was found to be 4,714 feet per second at a temperature of 15° C. Laplace has also given a formula for the velocity of sound in liquids:

$$v = \sqrt{\frac{g}{\lambda}};$$

g as before = 9·8088 meters, and λ is the amount which a column of the liquid one meter long shortens under a pressure equal to its own weight; it hence is necessary to determine the compressibility of the liquid in order to employ this formula, as the velocity is inversely proportional to the square root of the compressibility. The velocity of sound in alcohol at 20° C. is 4,218 feet; in ether, at 0°, 3,801; in sea-water, at 20° C., 4,768.

The velocity of sound in solids can be calculated by this last formula, and can also be experimentally determined; that in

	At 20 C°.	At 100°.
Gold is	5,717.....	5,640.
Lead is	4,030.....	3,951.
Copper is	11,666.....	10,802.
Iron is	16,822.....	17,386.

The Intensity of Sound varies inversely as the square of the distance of the sounding body from the ear; it is also proportional to the square of the amplitude of the sound-wave. Thus far we can hardly be said to possess a phonometer or instrument for the purpose of comparing the relative intensities of two sounds or sets of sound-waves; hence we must regard with interest the step taken in this direction by Prof. A. M. Mayer, of Hoboken, who, by employing small vibrating flames and the principle of interference, succeeded in solving this problem in certain cases. For details we must refer the reader to the original article published in the January number of the *American Journal of Science and Arts*, 1873.

Reflection of Sound.—The waves of sound can be reflected like the waves of light, and obey the same law, the angle of incidence being equal to the angle of reflection; this can be proved indirectly with the aid of spherical or parabolic mirrors, though, from the circumstance that the sound-waves are large relatively to such reflecting surfaces as can be used, the experiments are far more difficult than with the almost infinitely shorter waves of light. The author has recently contrived a new method by which the reflection of sound can be studied, and the relative reflecting powers of different substances examined. A circular disk with open and closed sectors, or with sectors of different materials, is made to revolve rather slowly near a sounding reed, in such a way that the sound is from time to time re-enforced by reflection. The result is that a sound resembling "the beats" is produced, these alternations of sound and comparative silence disappearing when the disk is made complete, or when its alternate sectors are composed of substances having the same power of reflection. The same apparatus can be used to determine the relative powers of different bodies for the transmission of sound. Echoes are cases of the reflection of sound, and the wonderful power of very long tubes in conveying sounds to a great distance is due to the same property.

* Pogg. Ann., cxxviii. s. 307.

† Pogg. Ann., cxxviii. s. 497.

‡ Pogg. Ann., cxxviii. s. 177.

§ Pogg. Ann., cxxxix. s. 104. Compare also the experiments of Regnault on this subject (*Comp. Rend.*, t. lxvi. p. 209); also those of Kundt (*Pogg. Ann.*, cxxx. s. 337); and finally those of Schneebeli (*Pogg. Ann.*, cxxxvi. s. 296).

Refraction of Sound.—Sound-waves can be refracted or bent out of their course by denser or rarer bodies in a manner corresponding to light; this can be demonstrated by the use of a large lens of carbonic acid inclosed in a thin membrane, when it will be found that the sound-waves from a watch will be concentrated just as a glass lens concentrates the rays of light. Recently the refraction of sound has been directly studied with a prism, according to the method which has long been used in light. Prof. C. Hajech generated sound-waves in the interior of a box, *b*, by the aid of a bell which was struck by clockwork; traveling along a tube, *t*, they reached the prism, *P*, and were refracted by it as indicated in Fig. 4. The amount by which they were bent out

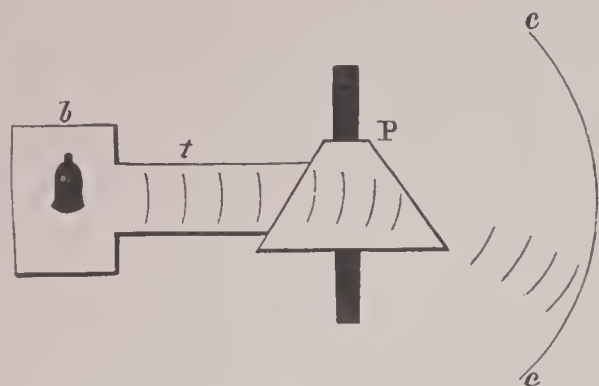


FIG. 4.

of their path was ascertained by moving the ear over the graduated circle, *cc*, which was in an adjoining room till the position of maximum intensity had been ascertained. The sides of the prism were made of thin membrane, of paper, or finally of sheets of mica. Experiments were performed on hydrogen, ammonia, illuminating gas, carbonic acid, and on sulphurous acid gas. Besides these gases, two liquids were also employed—ordinary water and water saturated with common salt. Among other results it was found that the same prism refracted waves of different lengths (or different tones) alike. The results of these measurements corresponded with those indicated by the known velocities of sound in the substances employed, taken in connection with the explanation of refraction as given in the undulatory theory of sound.

Sound-Waves rendered Visible.—Quite recently this feat has been accomplished by the German physicist Töpler, who employed the snap of an electric spark for the generation of the sound-wave, and then illuminated it by the instantaneous light of a second spark. He was thus not only able to see with distinctness a simple sound-wave, but also to observe its reflection, refraction, and the interference of two sound-waves. (Pogg. Ann., cxxxi. s. 180, 1867.)

Inflexion of Sound-Waves.—From the circumstance that the sound-waves are not minute relatively to the obstacles they encounter, it happens that they manifest this property of traveling around corners in a high degree. The corresponding experiments with light require some care, but the inflexion of sound-waves is something that we with difficulty escape from, obstacles placed in their path casting but little acoustic shadow.

Interference of Sound-Waves.—Thus far we have occupied ourselves with single sets of waves, and have supposed the particles of air to be acted on by only one wave at a time. It will, however, more commonly happen that it is necessary to deal with particles which are at the same instant being acted on by more than a single wave. Let us take the simplest case, and suppose our particles acted on by two equal and similar sound-waves; now, it may happen under these circumstances that the two waves agree in their action, any particular layer of air being at the same moment subjected to a condensation or rarefaction from both these sources. When this happens the motion of its particles will be twice as great, and we shall hear a louder sound. But something else is equally likely to occur: it may happen that just at the moment when the layer ought to be condensed by one wave, its companion attempts to rarefy or expand it; these two motions will then neutralize each other, and instead of sound we shall have silence. This can be illustrated with two similar organ-pipes which give exactly the same note; sounding them both together may give a louder tone, or one which is quite faint. If closed organ-pipes are used, the silence, as far as the musical note is concerned, is quite complete, nothing but the hoarse noise which is always mingled with it being perceptible. We can com-

bine both these experiments into a single one by employing organ-pipes which give slightly different tones; if now both sets of waves start fairly together, the condensations and rarefactions being in harmony, this state of things can not long remain, owing to the inequality in their length, as is shown in Fig. 5, where condensation is marked heavily,

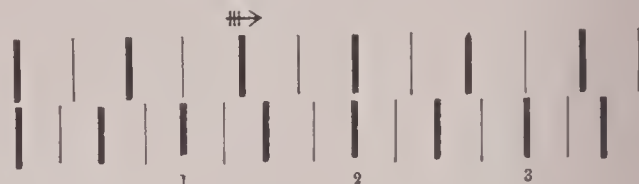


FIG. 5.

rarefaction lightly. Already at 1 the condensation coincides with the rarefaction; farther on, at 2, the old state of things has returned; and the condition at 3 is the same with that at 1. Hence in this experiment we must expect to have alternations of sound and silence, the tone rising and swelling to a maximum, then dying away again to repeat itself, etc. These alternations are called *beats*, and furnish even to the unmusical ear a very accurate means of judging of the identity of musical tones. Having considered briefly these general properties of sound-waves, we pass on to some of their distinguishing characteristics. Among the most important of these is—

Length of Sound-Waves.—The pitch of the note, other things being equal, depends on the length of the wave; long waves give low notes—short waves, those that are high. The longest waves, in the air at a temperature of 0° C., which are capable of producing the sensation of sound, have a length of about 66 feet. The tone, from a musical point of view, is imperfect, and in order to remove this defect entirely it is necessary to shorten the wave to about $27\frac{1}{4}$ feet. On the other hand, when the waves are reduced to a length of three or four tenths of an inch, they again become inaudible; to have a useful musical effect their length must be increased to about 3.2 inches. Instead of speaking of the length of the sound-waves, which evidently must vary with temperature, it is more customary to use the number of vibrations producing a given sound; thus, as sound travels at the rate of 1,090 feet per second in the air at 0° C., it follows that a wave 66 feet long will execute in a second $16\frac{1}{2}$ vibrations, and one which is $27\frac{1}{4}$ feet long, 40 vibrations, etc. We give below a table, arranged in octaves, of the number of vibrations of the notes used in music:

$16\frac{1}{2}$	33	66	132	264	528	1056	2112	4224
$\overline{\overline{C}}$	\overline{C}	C	c	\overline{c}	$\overline{\overline{c}}$	$\overline{\overline{\overline{c}}}$	$\overline{\overline{\overline{\overline{c}}}}$	$\overline{\overline{\overline{\overline{\overline{c}}}}}$
$\overline{\overline{C}}$	$\overline{C'}$	C	c	$\overline{c'}$	$\overline{\overline{c''}}$	$\overline{\overline{\overline{c'''}}}$	$\overline{\overline{\overline{\overline{c''''}}}}$	$\overline{\overline{\overline{\overline{\overline{c'''''}}}}}$
$\overline{\overline{C_2}}$	$\overline{C_1}$	C	c	$\overline{c_1}$	$\overline{\overline{c_2}}$	$\overline{\overline{\overline{c_3}}}$	$\overline{\overline{\overline{\overline{c_4}}}}$	$\overline{\overline{\overline{\overline{\overline{c_5}}}}}$
$\overline{\overline{c-3}}$	$\overline{c-2}$	$\overline{c-1}$	$\overline{c^0}$	$\overline{c^1}$	$\overline{\overline{c^2}}$	$\overline{\overline{\overline{c^3}}}$	$\overline{\overline{\overline{\overline{c^4}}}}$	$\overline{\overline{\overline{\overline{\overline{c^5}}}}}$
$\overline{\overline{ut-2}}$	$\overline{ut-1}$	$\overline{ut-1}$	$\overline{ut_2}$	$\overline{ut_3}$	$\overline{\overline{ut_4}}$	$\overline{\overline{\overline{ut_5}}}$	$\overline{\overline{\overline{\overline{ut_6}}}}$	$\overline{\overline{\overline{\overline{\overline{ut_7}}}}}$

As will be seen, several modes of notation are employed, the last being the French—that preceding, the method proposed by Sondhaus for scientific purposes. In large organs C with $16\frac{1}{2}$ vibrations is reached, the effect being imperfect:

the piano reaches a with 3,520 vibrations, and sometimes c with 4,224. The highest note employed in the orchestra is d_5 , with 4,752 vibrations (piccolo flute). The practical range in music is from 40 to 4,000 vibrations, embracing seven octaves. The human ear is, however, able to reach eleven octaves; that is, the sensation of sound is produced by vibrations varying from $16\frac{1}{2}$ up to 38,000 in a second.

It is not difficult to measure the length of the sound-waves or the number of vibrations producing them; a very simple means is with the siren of Cagniard de Latour. This instrument consists of a circular revolving disk, C F (Fig. 6), which is provided with fifteen small apertures cut in its substance in a slanting direction; below this disk is a second one, which is stationary, and also provided with a similar set of holes. When air is driven through the apparatus by a wind-bellows the upper disk is set in rotation after the manner of a reaction mill, which has the effect of rapidly opening and closing the set of apertures, so that when a sufficient velocity of rotation has been attained, the pulses of air rushing through produce a low musical note, the pitch rising with the velocity or number of vibrations communicated to the air in a second. Upon the axis is an endless screw, E H,

which, acting on a toothed wheel, S, registers the number of turns made by it in a given time—say, in fifteen seconds. In using this apparatus it is only necessary to raise the pitch of the note furnished by it till it is in unison with the note

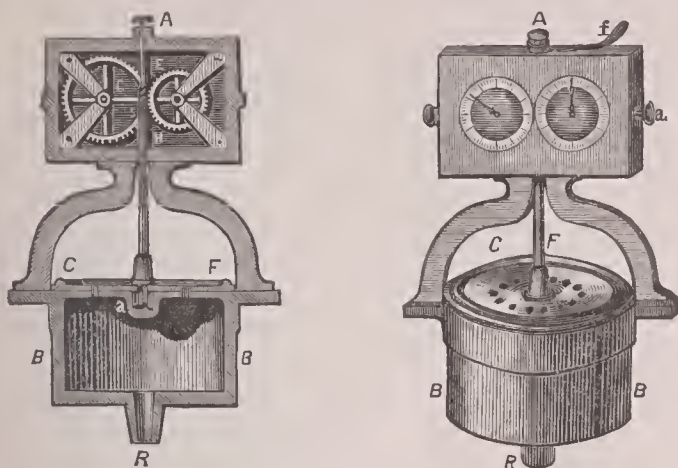


FIG. 6.

whose number of vibrations we wish to determine. If, then, this unison is maintained for fifteen seconds, we can, without calculation, read the required number of vibrations directly on the dial-plate of the sirene; then, by dividing the velocity of sound in the air by this number, we have the length of the wave. In the case of a tuning-fork the number of vibrations can be still more directly ascertained by attaching to one of its arms a small piece of fine wire or a minute portion of a feather, and causing this to act as a pen on a revolving cylinder. This latter is covered by a sheet of paper which has been smoked by burning camphor, and when set in revolution registers the vibrations made by the tuning-fork on the lampblack surface. Seconds marks are simultaneously impressed on the smoked paper by an electro-magnetic attachment; so that afterward it is not difficult to obtain the desired result with a high degree of accuracy. There are also other methods of measuring the length of sound-waves, based on the principle of interference, and Prof. Mayer, of Hoboken, has succeeded in measuring wave-lengths in the air. (*American Journal of Science and Arts*, for Nov., 1872, p. 387.)

The Form of a Sound-Wave.—In all that has preceded, and also in the formulas for the sound-wave, we have assumed that the particles of air swing backward and forward, obeying the law of the pendulum; and this is true for pure, simple tones, such as those furnished by tuning-forks. The ear is so constructed as to be able to take up these pendulum-like vibrations, which then produce appropriate sensations in the brain, but it is not capable of directly taking up vibrations which are executed according to laws different from that of the pendulum. Let us take a simple case, and suppose the air acted on by two pendulum-like sets of impulses, due to the joint action of two tuning-forks, one of which in a second executes twice as many vibrations as the other. The particles of air will then obey a new law, and will assume positions and velocities which are the *resultants* due to the action of the two original forces, and the form of the wave will be entirely altered. When this new kind of wave strikes upon the ear it is instantly analyzed into its two constituents, which independently affect their corresponding nerve-fibrils, and a peculiar sensation is produced, due to the presence of two distinct sensations; indeed, as Helmholtz, to whom we owe these interesting facts, has shown, it is possible after some practice to actually recognize the two original constituents. If we add a third, a fourth, or any number of new sets of impulses, the law changes with each, and also the resulting form of the wave, and consequently the final sensation. Conversely, if by any other means we generate waves having forms *not normal*, and present them to the ear, they will instantly be analyzed into a sufficient number of normal forms to meet the requirement, and a corresponding number of sensations will be produced. For example, reed-pipes, or a reed alone, furnish waves with an abnormal form, and the sound from them is analyzed, as Helmholtz has shown, by the ear into sixteen to twenty sets of normal waves or pure simple tones. We may add here that, as in this example, it is not necessary that these distinct sets of waves or notes should be independently generated, but merely that the original wave should have a form capable of being analyzed into these simple constituents. Even the form of the wave furnished by the sirene is not

normal; along with its proper or fundamental note the octave is *virtually present* in an amount which is often somewhat embarrassing. These higher notes, which accompany the proper or fundamental tone, are called overtones, or harmonicals, and it is their presence which determines the quality of the sound, or its *timbre* or *clang-tint*. In the case of tuning-forks the overtones are absent, hence the hollow and somewhat poor character of the sounds they emit; with closed organ-pipes they are scarcely present to any extent, though more so with open pipes, where the first and second overtones can be distinctly recognized—i. e. the octave and the twelfth. In reed-pipes they are present in great abundance and strength, so as quite to change the character of the fundamental note; the same is true of stringed instruments. It is the presence of these overtones which enables us to distinguish between different instruments, even when sounding the same fundamental note, and finally which, as we shall see, enables us to recognize the voices of different persons under similar conditions. Our inability to distinguish at once the presence of particular overtones is simply the result of want of practice, and is shared alike by the musical and unmusical. This can be corrected by practice, or by the use of the resonators contrived by Helmholtz. These instruments have usually the form of a hollow sphere, open at both ends of its diameter; one of these openings has a shape adapting it for insertion into the ear; the other aperture is larger, its size being determined by experiment. The size of this opening and the capacity of the sphere are so related that when the sphere is placed in connection with the ear the experimenter is rendered comparatively deaf to all notes but one, the strength of this latter being greatly exalted by the instrument. The analysis of which we have just spoken was to a great extent effected by the aid of these contrivances, a large number of these spheres being of course necessary for purposes of investigation. We may add here that Mr. R. Koenig, so celebrated for his beautiful acoustic apparatus, has pushed this matter one step further, and by connecting these resonators with manometric capsules and small gas-flames has succeeded in rendering *visible* the phenomena of which we have been speaking, thus enabling a person who is deaf still to pursue these investigations.

Cause of Dissonance or Discord.—This peculiar effect, which sometimes attends the reception of two or more sets of sound-waves, has also recently been explained by the investigations of Helmholtz, which have thrown a flood of light on this obscure subject. It has for a long time been known that when two sets of sound-waves are simultaneously presented to the ear, the relation between their length being in some simple proportion, such as 1 : 2, 2 : 3, 3 : 4, or 4 : 5, an agreeable effect is produced, the sounds seeming to melt into each other, producing what is known as consonance; while, on the other hand, more complicated relations often generate discord. To account for this, many fanciful theories have been proposed, of which we will merely allude to that of Leibnitz, who imagined that the mind delighted in the perception of simple mathematical relations, and was displeased by the reverse! It is hardly necessary to say that this is not the true explanation, which we must seek in certain relations of the nerves of sensation to external stimulating causes. The nerves of vision, touch, and hearing are endowed with the following property: when stimulated, the sensation produced is at the first instant at a maximum, and rapidly becomes less intense; if, however, the nerves are allowed to rest for small intervals of time, they quickly regain their former sensitiveness, and this process may be repeated indefinitely. If, now, we expose the eye, for example, to light, we obtain the maximum sensation; then the periodic withdrawal and return of the light may readily be so arranged as to produce in succession a long series of these maxima of sensation, which quickly become disagreeable, and even may be dangerous; it is the case of a flickering light, whose bad effects are so well known. The sensation of tickling is strictly analogous to the above, and is produced by corresponding causes. The nerves have, however, another well-known property; after stimulation the sensation produced is found to remain, or “persist,” for a minute interval of time with undiminished strength; so that in the case of light and sound, if the successive stimulations follow each other at sufficiently rapid intervals, these evil effects are naturally abolished, and only continuous sensations are perceived. Discord is, then, as Helmholtz has ascertained, due to the presence of the beats, or to rapid alternations of sound and comparative silence, they corre-

sponding to the flickerings of a flame. When from any cause these beats follow each other at the rate of about 33 in a second, the discord is at its maximum, becoming more tolerable with twice this number, and finally disappearing altogether as their number is increased to about 120 in a second. On the other hand, if the beats follow quite slowly—for example, at the rate of three to five in a second—the effect is not unpleasant, and can even be employed in music, suggesting as it does the idea of trilling. Discord is then due to the production of beats by the interference of the overtones, which almost always accompany the fundamental notes, and, as has been shown by calculation, this can be entirely or partially avoided only by the use of such simple ratios as those above indicated. For further details we must refer the curious reader to the original work of Helmholtz (*Die Lehre von den Tonempfindungen*, 1865).

Effect of communicating Motion to the Source of Sound or to the Ear.—In all the foregoing it has been tacitly assumed that during experiment the position of the source of sound and of the recipient ear remained invariable; when this ceases to be true, certain curious changes are produced, which recently have grown into importance, owing to their correspondence with certain optical phenomena by which it is possible to study the motion of the fixed stars toward or away from our planet. Let us suppose that the sounding body is stationary, and that the ear of the observer is moved with some rapidity toward it; then it will result that in a given time the observer will receive a larger number of impulses than at first, and that the pitch of the sound will be correspondingly elevated. The same effect will be produced by moving the sounding body toward a stationary ear. And from the same cause it is evident that motion of the ear away from the source of sound will lower the pitch of the note, etc. These ideas were first brought forward by Christian Doppler in 1842, and since then have been repeatedly subjected to the test of experiment. Dr. Ballat, in Belgium, with the aid of a locomotive and a party of musicians, proved their correctness in a quantitative manner, and Dr. Mach has contrived an apparatus with a moving reed-pipe by which they can be studied in an ordinary room; and finally by the use of tuning-forks Prof. Mayer, of Hoboken, has succeeded in illustrating them before large audiences. (*American Journal of Science and Arts*, April, 1872, p. 267.)

The Voice.—As the human vocal organs are built essentially on the plan of a reed-pipe, it is desirable at the start to understand the construction and action of one of these instruments. A reed-organ pipe consists, then, of two parts, a vibrating tongue or reed, and a variously shaped pipe. When connected with a wind bellows the reed is thrown into vibrations, and, after the manner of a siren, permits the air to pass through in a series of puffs, which, linking themselves together, generate a musical tone. The waves furnished by the reed are not, however, normal in form, but, as previously explained, have a form such as would be generated by the joint action of a fundamental normal tone or wave, combined with a set of shorter waves or overtones: in other words, practically it furnishes a fundamental note with a series of strong overtones, the particular fundamental note and corresponding set of overtones depending on the construction of the reed itself and the manner in which it is tuned. The function of the pipe is to strengthen any or all of these notes; thus conical pipes strengthen all the overtones up to a certain height, excluding those that are not much longer than the aperture of the pipe itself, while cylindrical pipes strengthen the odd overtones, or those whose rates of vibration are related to each other, as 1, 3, 5, etc. Hence the pitch of the note is determined by the rate of the reed's vibrations—the quality, or clang-tint, of the sound by the shape and size of the pipe. In the human vocal organs the reed is supplied by two vibrating membranes at M (Fig. 7), called the vocal cords. For the production of sound it is necessary that they should be stretched, and that at the start the opening between them should be closed. Air is then forced through them from the lungs; they are set in vibration, and allow it an interrupted passage, exactly as in the case of a reed, as has been shown by experiments on the living and dissected larynx, or with the aid of artificial vocal cords made of sheet india-rubber. The pitch of the voice depends on the extent to which the membranes are stretched. Müller, by increasing the tensive force $\frac{1}{2}$ oz. up to 18 oz., raised the tone with one of his dissected preparations more than two octaves. The pitch depends also to some extent on the strength of the cur-

rent of air employed, rising as the latter is increased. The human voice includes not quite four octaves, though no one single voice would be able to compass a scale of this extent. The pitch also, other things being equal, depends on the

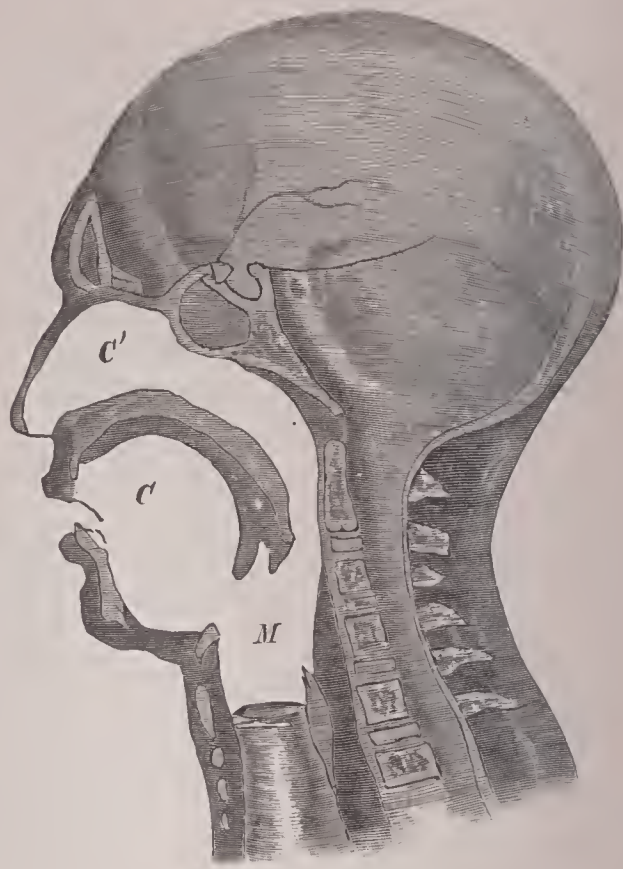


FIG. 7.

length of the vocal cords; that of men is about 18 mm., with women it is only 12. The clearness of the voice depends on the accurate closure of the slit between the cords, from time to time, while they are in operation. Theory and experiment alike point to the fact that when the vocal cords are set in action waves having an abnormal form are generated, corresponding to a fundamental note with a set of overtones. The function of the cavity of the mouth and nose C C' (Fig. 7) is to strengthen or weaken the fundamental tone and various sets of the overtones; and in this action the size of the opening of the mouth also plays an important part; thus the quality of the sound uttered, or its clang-tint, depends finally on the shape and size of the cavity of the mouth and nose. This cavity, then, corresponds to the pipe of a reed-organ pipe. The vocal cords retaining all the time the same tension, by altering the shape and size of the cavity of the mouth and its opening we can generate sounds having a different clang-tint, as, for example, Ah, O, etc. It is not even necessary to set the vocal cords into action if a complex sound consisting of many tones is supplied from some outward source; thus we were informed by President Barnard, of Columbia College, that by taking advantage of the complex sounds or noise of a railroad-car, and by varying suitably the cavities just referred to, he succeeded in producing musical notes in rapid succession, such as the notes of any familiar melody, at pleasure.

The Vowel Sounds are the simplest which can be uttered by the human voice, and have frequently been made the object of investigation. In 1831 Willis in England found that by mingling certain tones produced by reed-pipes he could to some extent imitate the vowel sounds. (*Pogg. Ann.*, bd. xxiv. s. 397.) In this mode of working there is the obvious difficulty that reed-pipes furnish large sets of notes, so that it is not possible to obtain very accurate knowledge by such experiments. More recently Helmholtz, with the aid of his resonators, above described, succeeded in analyzing the vowel sounds, although they present greater difficulties than most other sounds of equal complexity. This results from the circumstance that, from childhood upward, we all have been accustomed to regard the tones of the vowel sounds as independent wholes, making no attempt to ascertain their musical components, since in the case of a vowel sound the clang-tint is all important, and is indeed the only means by which we judge of its identity. Helmholtz ascertained that vowel sounds are produced by the presence of a fundamental note mingled with its higher

overtones in various proportions; he even was able to prove that the intensity of the highest of these overtones varies somewhat in different individuals, being greater in voices that are shrill than in those whose sound is softer. Having finished this labor, he undertook the artificial reconstruction of the vowel sounds from pure constituents. These are best furnished by vibrating tuning-forks. One of these instruments, alone by itself, furnishes a tone which at a little distance is quite inaudible, but by causing it to vibrate directly in front of a hollow *metallic* cylinder of exactly the right capacity its sound is greatly strengthened, and can be distinctly heard in a room of large dimensions. The cylinder is of course entirely closed, with the exception of a circular opening at the end near the fork. When the fork is thus caused to vibrate in connection with a resonator, the sound is instantly extinguished if the aperture in the cylinder be closed, but as it is gradually opened the sound correspondingly gains in intensity; so that it is evidently in the power of the experimenter to regulate the loudness of the tone produced. A tuning-fork, however, soon ceases to vibrate, and accordingly must be provided with a contrivance to obviate this difficulty. By placing it between the arms of an electro-magnet having the form of a horseshoe, it can be caused to vibrate for any period of time, provided the magnetic attraction is intermittent, and always exercised at exactly the right moment. This is accomplished by breaking and re-establishing the electric current with the aid of another tuning-fork, which vibrates at exactly the same rate; and the second fork, being also provided with a similar electro-magnet, is able independently to maintain itself in vibration for any length of time, as is the case with the vibrating attachment so often found on electrical apparatus for medical purposes. It would not be possible with this arrangement to sustain in vibration a third fork whose rate was a *little* slower or faster than that of its two companions: but if its rate should be exactly twice, three, or four times as great, this end could easily be accomplished; for then, though the attractive impulses might be fewer than desirable, at least they would always be rightly timed. Hence it is evident that a series of forks whose rates of vibration are as 1, 2, 3, etc., can be kept simultaneously in vibration by a contrivance of this nature. This was, then, the plan actually employed by Helmholtz; keys being connected by strings with the valves of the resonators, and being opened by the pressure of the fingers, the proper notes were obtained with the desired strength. Helmholtz's vowel sound apparatus, as made by Mr. Koenig, of Paris, consists of eight tuning-forks with their resonance cylinders, the fork which establishes and regulates the current being on a separate stand. These forks give the following notes: Ut_2 , Ut_3 , Sol_3 , Ut_4 , Mi_4 , Sol_4 , Ut_5 , Si_5 . When all these forks are set in vibration, their resonance cylinders remaining closed, only a low humming sound is heard, but by pressing one or more keys the corresponding notes are called forth with any desirable degree of strength. The German vowel sound *u* can be approximately imitated by sounding the Ut_2 fork alone, or better by adding the two first overtones—i. e. the octave and twelfth, Ut_3 and Sol_3 . *O* is obtained with a weak Ut_2 and strong Ut_4 ; Ut_3 , Sol_3 , and Mi_4 mingling to a small extent. The German *a*, with Ut_5 and Mi_4 strong; Ut_3 , Ut_4 , Sol_4 having a moderate strength. In the same language the *æ* is given by Mi_5 and Sol_5 strong, with the notes Ut_4 , Ut_5 , Sol_4 weaker; and finally the *e* by the aid of Sol_5 , Si_5 , and Ut_6 strong; Ut_3 and Ut_4 being weaker.

Of course, since only pure musical notes are employed, they can only reproduce the musical constituents of the vowel sounds; hence the effect resembles the sound of the vowels as sung rather than pronounced. Corresponding with these remarkable experiments, Helmholtz also found it possible to imitate with the same apparatus certain varieties of organ-pipes; at least to reproduce the musical constituents of their tones, though of course the noise with which they are often accompanied was absent; he in addition imitated the nasal tones of the clarinet by the use of a portion of the forks, while the joint action of the whole set gave the softer tones of the bugle-horn. For exciting the apparatus into action he used only two of Grove's cups, though other experimenters have since then found it somewhat difficult of manipulation, and an attempt has been made by Appun to replace it by a series of reeds provided with resonators, with which it has been found possible to reproduce some of the sounds in question (*u* and *a*).^{*} We

must here mention the remarkable results attained in the last century by Prof. v. Kempelen in Vienna with his speaking-machine, which more recently has been greatly perfected by the two Fabers, uncle and nephew.* Some time ago the latter exhibited in Columbia College, New York, this wonderful apparatus, which is capable of uttering not only syllables, but words and sentences with a certain mechanical precision. In it the human vocal organs are directly imitated by vibrating plates of ivory, and it is remarkable that it is operated on by only fourteen keys or stops, which give the five vowels and the nine consonants, *l, r, w, f, s, b, d, g, sch*. The other consonants are produced partly by combinations of the above, and partly by increasing the strength of the current of air from the bellows. For the purpose of causing the machine to speak French, an extra attachment is provided, whereby more nasal tones can be generated. Mr. Faber has also connected with it a singing attachment, in which, by means of quick changes in the form of the vocal cords, the musical scale can be executed.

Consonants.—These sounds are generally regarded not as constituted of notes having any particular musical relation to each other, as in the case of the vowel sounds, but rather as consisting of different varieties of noise. Thus as examples of explosive noise we have *p* and *b*, *t* and *d*, *k*, *g*, *q*; of frictional noise, *s*, *z*, *sch*, *l*, *f*, *v*, *m*, *n*, and *h*; of intermittent noise, *r*.† The mechanical mode by which the consonants are produced is to a considerable extent understood, but their actual acoustic elements resist all attempts at complete analysis. That they have an acoustic character can not, however, be doubted, and some progress has been made toward ascertaining the natural pitch of their predominant notes. Thus upon repeating (in German) the consonants *b, k, t, f, s*, it will be found that *b* is the deepest in tone, *s* the highest; and that, taken together in the above order, they constitute a series of perceptible musical gradations. For further information we must refer the reader to the original investigations of Dr. Oskar Wolf, who seems to have succeeded in actually determining the pitch of the predominating constituent in the case of most of the consonants.‡

The Ear.—The sensation of sound is produced by the stimulation of certain nerve-fibrils in the interior of the ear, and this result is brought about by the *sound-waves* in the following manner: These waves first strike upon the external ear, and possibly are, to some slight extent, concentrated by it; afterward they travel along the tube D (Fig. 8), and reach the tympanum or drum of the ear at

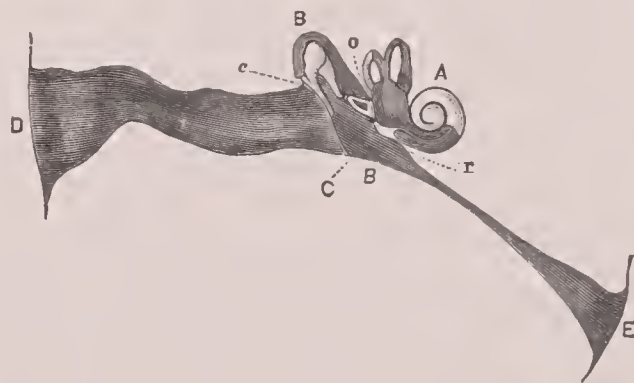


FIG. 8.

C. This consists of a thin membrane which closes the external passage, and which is capable of being set in vibration or of responding to an immense variety of waves or impulses. It may here be remarked that a catholicity of this kind has not thus far been observed in experiments on membranes artificially stretched, whose range is found to be far more limited. There is also some reason to believe that the tympanum is capable of a certain degree of "accommodation" to the sounds that are presented to it, following the well-known analogy of the eye in this respect. Attached to the inner side of the tympanum is a series of three small bones, called respectively the malleus, *c*, the incus, and the stapes, *o* (the hammer, the anvil, and the stirrup. See Fig. 8). These bones are rather closely bound together, and transmit the vibrations of the tympanum finally to the stirrup, which is destined to communicate

* *Der Mechanismus der menschlichen Sprache nebst Beschreibung einer Sprechenden Maschine von Wolfgang v. Kempelen, Vienna, 1791.*

† See the work of G. Gattfried Weiss, Brunswick, 1868.

‡ *Sprache und Ohr*, Dr. Oskar Wolf, Brunswick, 1871.

them to the inner ear. The portion we are now engaged with has a communication with the mouth by means of the Eustachian tube, E, which is closed except in the act of swallowing; its function is to preserve an equilibrium between the pressure of the air in the middle ear and that on the other side of the drum. While the middle ear is filled with air, the inner is filled with a liquid, and is completely inclosed for protection in solid bone. In Fig. 9 a

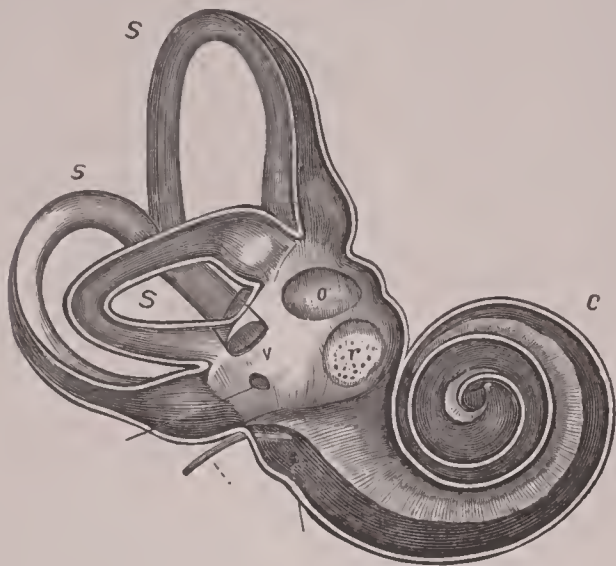


FIG. 9.

section of the inner ear is given. SSS are the semicircular canals cut open; V is the vestibule; o and r are the foramen ovale and the foramen rotundum; C is a section of the cochlea. We give in addition a *plan* of the ear, after Helmholtz (Fig. 10), the cochlea, for the sake of clearness, being supposed to be unrolled. A is the vestibule; C the cochlea; a the foramen ovale; b the foramen rotundum; f the nerves of hearing. The sacs at d contain attached to their walls small crystals of carbonate of lime in contact with the nerves, and their function, as it appears, is to render us sensible of simple short sounds or shocks, which probably would not affect the vibratory apparatus presently to be described. They act as *drags* on the nerves when the latter vibrate with the water in which they are bathed, and thus produce sensation. This is the simplest portion of the apparatus for hearing, and is found in many of the lower animals, where the more complicated arrangements are entirely absent. These sacs contain also, in connection with the nerves, certain microscopic hairs, that are quite elastic and brittle, and probably capable of being set into vibration when the particular notes to which they are tuned are presented to them, just exactly as a tuning-fork can be set in vibration by the waves proceeding from a second fork of the same pitch. (See Fig. 11.) In the cochlea we also find a membrane (the organ of Corti) with a great number of fine microscopic cords stretched in it, which probably have the same function. The reader will find, by opening a piano and pressing the foot upon the right-hand pedal, that if then the vowel sounds, for example, are pronounced in a loud, clear voice over the strings, it will result that the strings which are capable of giving the notes of which they are built up will be set in vibration, and will echo back somewhat faintly the original sounds. And so it is probably in this portion of the ear; these microscopic strings, being thus set in vibration, stimulate the nerves connected with them and produce corresponding sensations. If the

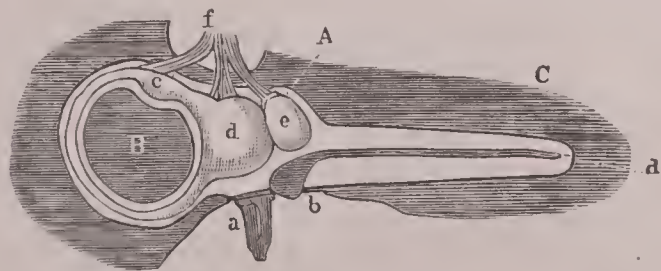


FIG. 10.

sound is compound or the form of the wave abnormal, this sound is analyzed into its constituents, since the cords (and rods) can only execute normal vibrations; which circumstance explains much that was said under the head "Form of the Wave"; and we see finally that the clang-tint is the

sensation produced by the simultaneous action of two or more of these strings upon their appropriate nerves. The cochlea contains about 3,000 of these strings, and if, with Helmholtz, we suppose that 200 of them are useful for rendering us sensible of tones not used in music, there will remain for the musical tones proper 2,800 for the seven octaves, or 400 for each octave, 33½ for each half tone. Now, according to the experiments of E. H. Weber, skillful musicians can distinguish ¼ of a half tone, which is a smaller quantity than corresponds to the number of these strings. It would appear, then, that in this case *two* of these strings are at the same time excited into action, and the musician by practiced attention is able to notice which of them vibrates the more strongly.

As rendering the above views more probable, we may mention the experiments of Von Hensen on the ears of crabs, which he inclosed in an artificial ear corresponding to the labyrinth. The ears of these crustaceans are partially external, and consist of sets of hairs capable of vibration, connected with the nerves, as in the case we have just been considering. When different notes were sounded, Von Hensen was able with the microscope to notice that certain hairs responded, etc.* The functions of certain portions of the ear are still involved in much obscurity; this is the case, for example, with the three semicircular canals, concerning whose object and use we possess as yet no certain information. Among the fishes the myxine has one of these canals, the lamprey has two, the higher forms three; and it appears that in birds of prey they become highly developed.

In closing this article it may be proper briefly to mention the results obtained with the *phonautograph* of Scott and Koenig. This may be regarded as a gigantic ear, endowed with the power of permanently registering the vibrations of its own tympanum. It consists of a parabolic mirror, M (see Fig. 12), of zinc, which concentrates the sound-waves,

and causes them to set in vibration a thin membrane, t, which is provided with a "pen" attached to its center. The vibrations are in this way finally inscribed on the surface of a revolving cylinder, C, which is covered with paper smoked by burning camphor. The figure gives a view of this apparatus seen from above. With this instrument Koenig succeeded in obtaining the autographic curves to single notes, or to the joint action of several within the compass of an octave. Donders, however, was able after much trouble to obtain the complex curves due to the vowel sounds. For u (German) it was a common sine curve, as it should be; this was also true for ü and i, the instrument being able to reproduce neither the weak overtones of the first nor the high overtones of the second. The form of the curve altered with the pitch of the voice uttering the vowel, but changes in dialect produced only slight modifications. With diphthongs the duration of the sound and modifications due to change from one diphthong to another were rendered visible. Consonants spoken just before a vowel altered only the beginning of the curve, and produced only a corresponding modification when uttered immediately after the vowel. The duration of a in the word daag = 42, in dagen = 37, in

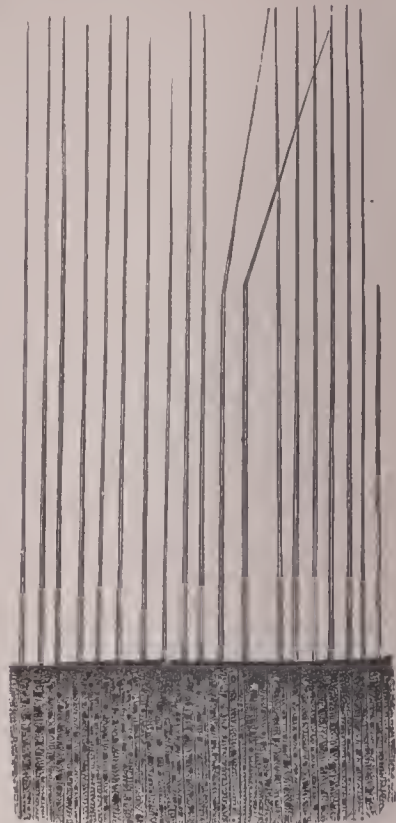


FIG. 11.

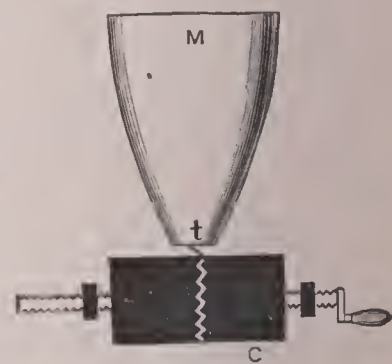


FIG. 12.

* Von Hensen, *Studien über das Gehörorgan der Dekapoden*; Von Siebold u. Kölliker, *Zeitschrift für wiss. Zoologie*, bd. xiii.

dag = 16 vibrations, each single vibration consuming $\frac{1}{16}$ of a second, so that the actual durations were 0.16, 0.142, 0.061 of a second of time.

O. N. ROOD.

Acoustic Telegraph: any telegraphic system in which messages are received by ear. The Morse system of telegraphy as practiced in the U. S., where the "sounder" takes the place of the "recorder," is an example. See TELEGRAPH.

Acoustic Telephone: a telephone in which the voice is transferred between the transmitter and receiver by means of sound-waves traveling along the wire or other conductor connecting them. No electric current, as in other telephones, is used. Acoustic telephones are of comparatively limited application, their range of effective use rarely exceeding a mile. Over short distances, however, they may be made to give excellent service. See TELEPHONE.

Ac'qui, ak'kwee: a town of Italy, in the province of Alessandria, on the Bormida; 21 miles by rail S. S. W. of Alessandria (see map of Italy, ref. 3-B). Here are iodide and sulphate-of-lime waters, which are much frequented, and ruins of an old Roman aqueduct. Acqui is of great antiquity, and its hot sulphur baths were known to the Romans, who called the place *Aque Statiellæ*. Good wine is made in the vineyards of the district, and the rearing of silkworms is followed with much care. It has a cathedral, several fine buildings and silk factories, a royal college, and is a bishop's see. Pop. 11,300.

Acquit'tal: [O. Fr. *aquiter*; Lat. *ad* + *quieta're*, settle]: in law, a release from a contract or other obligation; more usually employed in criminal practice, where it denotes a judicial deliverance from a charge of guilt, either by a verdict of not guilty by a jury upon a trial, termed "acquittal in fact," or by mere operation of law, as where one has been charged simply as accessory, and the principal is acquitted. An acquittal is a bar to any future prosecution for the same offense. In the U. S. this is secured by a constitutional provision that "no person shall be twice put in jeopardy for the same offense." The judicial construction of this clause prevents a second trial for the same offense after an acquittal.

A'cre [from the Ang.-Sax. *acer* or *æcer*, a field, etymologically allied to the Lat. *ager* and Ger. *Acker*]: a superficial measure of land; equal to 4,840 sq. yards. The "English" or statute acre of Great Britain is the same as the acre of the U. S. Forty-eight Scotch acres (now seldom used) are equal to 61 statute acres. The Irish acre (now seldom used) contains 7,840 sq. yards. The Welsh acre, or *erw*, contains 4,320 sq. yards. A French acre contains about one *arpent* and a half.

Acre, ak'er, Ak'ka, or **St. Jean d'Acree** [Phœnician *Acho*, and called by the Greeks *Ptolema'is*]: a city and seaport of Syria; on the Mediterranean; 30 miles S. of Tyre and 8 miles N. of Mt. Carmel; lat. 32° 54' N., lon. 35° 6' E. (see map of Palestine, ref. 5-D). The "key of Palestine," it has been the scene of many famous sieges and battles. It was taken by the Crusaders in 1104, and retaken by the Saracens in 1187. In 1191 it was recovered by the Crusaders (under Guido of Jerusalem, Philip of France, and Richard the Lion-hearted of England), and held by them till they were finally driven out of Palestine in 1291. Bonaparte besieged it for sixty days in 1799, but failed to take it. In 1840 it was bombarded and captured by the English fleet. Pop. about 8,000, of whom 5,600 are Moslems.

Acre'lins, ISRAEL: a clergyman; b. at Ostaker, Sweden, Dec. 25, 1714; was educated at Upsal, and was appointed in 1749 a provost to take charge of the Swedish congregations on the Delaware. After a sojourn of seven years in the U. S., he returned to Sweden in 1756. He wrote a description of the Swedish colonies in America (1759). D. Apr. 25, 1800.

Ac'robat [viâ Fr. *acrobate*, from Gr. *ἀκρόβατος*, walking on tiptoe, climbing aloft; from *ἄκρος*, highest + *βαίνειν*, go]: a rope-dancer, or person who entertains the public by performances on the tight rope or slack rope, and by gymnastic feats of agility, such as vaulting and tumbling.

Acrob'ates (i. e. the acrobat): a genus of Australian marsupials, which contains only the "opossum mouse" (*Acrobates pygmæus*), which has a fold of skin running along the sides of its body, as in the flying squirrel. It is about 4 inches long, and shows remarkable powers of leaping. It feeds on insects, and on honey which it obtains from flowers.

Aerocerau'nia [from *ἄκρον*, a peak or promontory, *κεραυνός*, thunder]: the ancient name of a chain of mountains on the western coast of Greece, and extending into the sea by a bold promontory; so called because violent thunderstorms are said to be frequent in that region. The modern name is Chimara. The Aeroceraunian promontory is Cape Linguetta; lat. 40° 27' N., lon. 19° 18' E. (see map of Greece, ref. 14-II).

Ac'ro-Corin'thus: a steep, rocky hill near the city of Corinth, in Greece; about 2,000 feet high. On this hill stood the Acropolis or citadel of Corinth. The view from the top is very extensive and beautiful.

Acrog'enous [Gr. *ἄκρον*, tip + *γεν-*, come into being]: growing only at the apex of the stem. Conferva, molds, etc., are plainly acrogenous. The term was formerly applied to mosses and ferns exclusively (class *Aerogens*), but has fallen into disuse, as it is now known that all the larger plants are as truly aerogenous as these. CHARLES E. BESSEY.

Aero'lein, Acryl'ic Al'dehyde, C₃H₄O: an intolerably pungent body produced by the dehydration of glycerin. It is always produced when neutral fats containing glycerin are subjected to destructive distillation, and is the chief cause of the offensiveness of that operation. It is the substance that acts so strongly upon the eyes when in cooking meats the fats are heated too high.

Aeron'ycal, or (more correctly) **Aeronychal** [Gr. *ἀκρόνυχος*, at evening, from *ἄκρον*, extremity + *νύξ*, night]: in opposition, diametrically opposite. A star or planet is said to be acronycal when it is opposite to the sun, or passes the meridian at midnight. It rises acronycally when it rises as the sun sets, and sets acronycally when it sets as the sun rises.

Aerop'olis [Gr. *ἀκρόπολις*, citadel; from *ἄκρος*, highest + *πόλις*, city]: the citadel of an ancient Grecian city, usually built on the peak or top of a hill. The Acropolis of Athens was especially celebrated, and was adorned with the Temple of Minerva or Athena, called the Parthenon, the Erechtheum, the Propylæa or gate-house, and a number of smaller buildings, monuments, and statues, among which was a colossal statue of Athena which must have been visible many miles at sea.

Aeros'tic [etymologically spelled *acrostich*; cf. *distich*; Gr. *ἀκροστιχίς*, from *ἄκρος*, extreme + *στίχος*, line]: a poem so contrived that the first, last, or other series of letters of the lines shall form some name or phrase. Sir John Davies wrote twenty-four hymns to Astræa, each of which is an acrostic on Elizabetha Regina (Queen Elizabeth). On a somewhat similar principle, in the poetry of the Hebrews the initial letters of the verses were made to correspond to the letters of the alphabet in their proper order. The 119th Psalm affords perhaps the most remarkable example of this. Every line in the first division of the psalm begins with א (aleph), and in the second division with ב (beth), and so on.

Act: (1) in dramatic literature, a division of a drama; it is again subdivided into scenes. The Greek dramas of the old model were naturally divided into separate portions by the choric odes (or stasima), which occur at intervals, during which the stage was left to the sole occupation of the chorus. Nevertheless, the Greek writers do not notice this division in express terms; nor do we know the origin of the famous rule of Horace, that every dramatic piece should be restrained within the limits of five acts, neither more nor less. The division into acts must be in great measure arbitrary, although rules have been laid down by various writers to define the story or plot which should be contained in each of them. Thus Vossius gives it as a rule that the first act should present the intrigue, the second develop it, the third be filled with incidents forming its knot or complication, the fourth prepare the means of unraveling it, which is finally accomplished in the fifth.

(2) In legal and political language, an act is a law or statute which is approved and ordained by the legislature, as an act of Parliament, an act of Congress. The proposed law is called a bill until it has passed through the first, second, and third readings, and has been approved by both Houses of Parliament (or Congress) and signed by the executive. An act which binds the community at large is a public one, while one that operates merely upon particular persons is said to be a private or special act.

(3) In the English universities, an act is an exercise performed by students before they receive a degree. The student who is said "to keep the act," and is called the respondent.

chooses certain propositions, which he defends by syllogisms. Several other students, called "opponents," who are nominated by the proctor, try to refute his arguments.

ACT OF SETTLEMENT, in Great Britain, is the title of the statute 12 and 13 of William III. c. 2, by which the crown was limited to the House of Hanover, and all Roman Catholics were excluded from the throne.

ACT OF SUPREMACY, the statute by which the supremacy of the British crown in ecclesiastical matters within the realm was established (1 Eliz. c. 1).

Ac'ta Diur'na (daily acts): also called *Ac'ta Populi*; an official gazette or journal published by authority in ancient Rome. It contained brief notices of the transactions of public assemblies, legal tribunals, etc., as well as of private events—births, marriages, divorces, deaths, etc. Julius Cæsar was the first to order that the Acta Diurna should be drawn up in regular form and exposed on a tablet in a public place, where they could be read and copied. They were afterward deposited with the state archives.

Revised by M. WARREN.

Ac'ta Erndito'rum (acts of the learned): the first literary journal founded in Germany; was established at Leipzig in 1682 by Otto Mencke and others. It had a high reputation, and was continued until 1782.

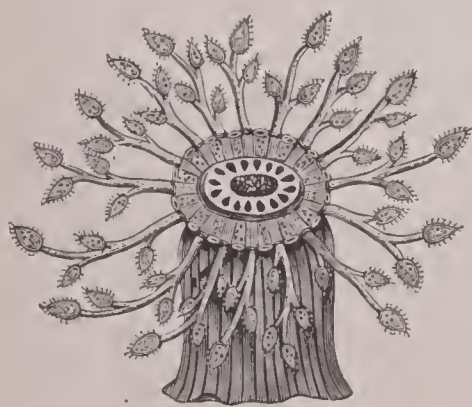
Ac'ta Mar'tyrum (acts of the martyrs): a collection of the lives of Christian martyrs. The most noted is that of Ruinart (Paris, 1689), commemorating the martyrs of the first four centuries.

Ac'ta Sancto'rum (acts of the saints): a collection of the lives of Christian saints of all ages. The most extensive collection is that of the Jesuit Bollandists, which begins with January and follows the calendar. The first volume appeared in 1643; the fifty-fourth, which comes down to Oct. 14, in 1793; the fifty-fifth in 1845; the sixtieth, which comes down to Oct. 29, in 1867; the sixty-first in 1875; the sixty-fifth in 1892. See *Études sur les Bollandistes*, by Pitra (Paris, 1850).

Actæ'on (Ἀκταίων): in Greek mythology, a famous hunter, grandson of Cadmus. It is said that he was changed into a stag and killed by his own hounds because he had seen Diana bathing.

Ac'tian Games: games celebrated at Actium, in Greece, in honor of Apollo. They were restored by Augustus to commemorate his victory over Antony at Actium (31 B. C.).

Actiniidæ [from Gr. ἄκτις, -ίως, ray + -ιδæ, family name]: a family of radiated marine animals, the sea-anemones, closely allied to the coral polyps, but growing singly instead of in colonies, and possessing no hard skeleton. They are cylindrical in form, with very contractile muscular walls, and attach themselves very firmly by one end, the pedal disk.



One of the actiniidæ.

The upper end of the cylinder is closed by the oral disk, which bears around its margin several rows of hollow tentacles. The mouth is an oval slit in the center of the disk, and from its edge an œsophageal tube, often called the "stomach," hangs downward, and opens freely below into the general body cavity. The latter is a sac in which digestion is carried on, and represents both body cavity and stomach. Its peripheral portion is divided into a number of compartments by means of thin partitions or mesenteries, which extend inward from the body wall, many of them joining the œsophagus. Below the latter their inner edges are free, and bear the gastric filaments together with other long, slender threads, richly provided with batteries of stinging cells. (See ACALÉPHÆ.) The genital glands lie embedded in the mesenteries. A nervous system is developed, but special sense organs seem to be wanting. Some of the sea-anemones are among the most beautiful of marine animals, their radiating tentacles and brilliant coloration suggesting the names by which they are known, sea-anemones, See-Rosen, anthozoa, etc. They occur in vast numbers along the shores, and often fairly carpet the rocks exposed at low tide. When

disturbed, or when thus exposed, they contract themselves into an unsightly ball, withdrawing from view the sensitive oral disk and its tentacles, leaving exposed only the tougher body wall. The latter is often covered with sand and broken shells, and the contracted animals thus simulate in color the rocks to which they are attached. DAVID S. JORDAN.

Ac'tinism [from the Gr. ἄκτις, -ίως, ray]: the chemical action of light. The rays of the sun produce three important effects: thermal, chemical, and optical. All rays, without exception, produce heat when intercepted, in direct proportion to their kinetic energy. All, so far as known, have chemical action; a single group only, lying between narrow limits as to wave-length, affects the eye. Actinism is the term commonly applied to the chemical action of light, an action scarcely less important than the thermal and optical effects, since in all probability many essential processes in nature, such as the formation of chlorophyll and the accompanying reactions so necessary to plant life, are dependent upon it. Those rays which lie beyond the violet of the visible spectrum are generally known as the actinic rays, for the reason that the reactions by means of which actinism was first investigated, such as the combination of hydrogen and chlorine, and the modification of certain salts of silver and of other metals, chiefly employed in photography, are most marked in the violet and the ultra violet.

When a beam of compound light is dispersed by the prism, the most energetic action upon the chloride of silver is found in the violet rays of the spectrum; but this effect, as shown by Stokes, extends very far into the darkness beyond the violet. Stokes made the additional remarkable discovery that these non-luminous rays become luminous when certain substances are presented to them. Such substances, among others, are solution of quinine sulphate, infusion of horse-chestnut bark, glass tinted yellow by oxide of uranium, and fluor-spar. This phenomenon was named, by its discoverer, *fluorescence*. (See FLUORESCENCE.) The heating effect of the prismatic spectrum, on the contrary, is found to be more remarkable in the red than anywhere else among the luminous rays; while the maximum heating effect is entirely outside the spectrum, and in the dark. This discovery, made long ago by Sir William Herschel, is a counterpart to the more recent one of Stokes just mentioned; and both taken together show that the sunlight, as dispersed by the prism, spreads through a wide space, in which the rays exciting vision occupy only the middle part.

The luminous, heating, and chemical effects of light being so broadly different, it was natural, in the earlier stages of this investigation, to ascribe them to agencies or forces essentially differing from each other in physical character. It was common, therefore, to say that the sunlight is made up of three independent species of rays: the colorific, the calorific, and the chemical.

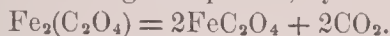
Instead of the word chemical, Dr. Draper, of New York, proposed, in 1842, to substitute the term *tithonic* to distinguish the rays of the class last mentioned; this term being derived, by a fancied analogy, from the beautiful myth of Tithonus and Aurora. Sir John Herschel, a little later, suggested the term *actinic*, which ultimately prevailed. To the three kinds of rays above mentioned, Dr. Draper, in 1844, proposed to add a fourth, under the name phosphorogenic rays; that is to say, rays which cause certain substances, which have been acted upon by them, to continue for some time afterward to *phosphoresce*, or to give light in the dark. Dr. Draper believed it to have been established by his experiments that these rays, though imparting to material bodies the light-producing power, are themselves totally distinct from light. It is now perfectly well established, however, that, physically considered, the sunlight is homogeneous, the variety of effects produced by it being consequences of the different degrees of rapidity with which the vibrations of the luminiferous ether are performed, and being especially dependent on the nature of the surface and of the substance upon which the rays are received.

The actinic properties of light have formed the basis of an art having an almost endless variety of useful applications. For particulars in regard to this, see PHOTOGRAPHY. See also Abney, *A Treatise on Photography*; Meldola, *The Chemistry of Photography*. Revised by E. L. NICHOLS.

Actinom'eter [from Gr. ἄκτις, ray + μέτρον, measure]: an instrument for measuring the sun's radiation. The earliest form was described by Herschel in 1825; other forms are due to Pouillet, Violle, Crova, and Langley. The principle

made use of consists in determining the initial rate of heating of a thermometer bulb when exposed to the direct rays of the sun, the water equivalent of the bulb being known. The loss by radiation, etc., is controlled by surrounding the bulb by a spherical shell, which is maintained at a constant temperature.

The name has also been applied to instruments for measuring the brightness of daylight or sunlight by means of its chemical action. To this class belong the hydrogen-chlorine actinometer suggested by Draper, and later elaborated by Bunsen and Roscoe—an instrument for determining the intensity of illumination from the rapidity with which a mixture of the two gases combines under exposure to form hydrochloric acid. To the same class belongs Dr. Henry Draper's apparatus for the reduction of ferric to ferrous oxalate, under light exposure, by the reaction,



Much better than these was the recording actinometer of Bunsen and Roscoe, afterward perfected by Roscoe, and independently modified and elaborated by Abney, in which carefully prepared chloride-of-silver paper of standard sensitiveness was exposed for a definite interval of time, and under uniform conditions, to the action of the light to be measured.

It must be said of all chemical actinometers that they are ill adapted to afford exact indications of the intensity of sunlight. On the one hand, whatever reaction may be selected, the effect will depend upon the presence of some particular group of rays, and will not be directly proportional to the intensity of that group; on the other hand, daylight, owing to the selective absorption of the earth's atmosphere, varies widely in composition, so that the ratio of intensity of the particular wave-lengths upon which we depend for the chemical reaction to the total intensity fluctuates. The indication of the chemical actinometer is therefore not a direct measure of the solar radiation. As a means of showing the chemical activity of sunlight for a given class of sensitive salts such instruments serve a useful purpose. See Herschel, *Edinburgh Journal of Science* (1825), and Pouillet, *Comptes Rendus* (1838); Violle, *Annales de Chimie et de Physique* (1877-79); Langley, *Researches on Solar Heat*, p. 45 (professional papers of the Signal Service, No. 15); Bunsen and Roscoe, *Pogg. Annalen*, c. ci. cviii.; Abney, *Treatise on Photography*, p. 247. E. L. NICHOLS.

Actinom'etry: the measurement of solar radiation. The instruments chiefly employed for this purpose are various forms of actinometer (*q. v.*) and the pyrhelimeter of Pouillet; all of which are designed for the determination of the total energy derived from the sun's rays in a unit of time, per square centimeter of surface exposed to radiation, without reference to the composition of the ray. The researches of Langley, Crova, Vogel, and others on solar radiation have shown the inadequacy of the usual methods. The complete solution of the great problem with which actinometry has to deal will involve the study of the action of each wave-length separately, and of the ever-varying constitution of sunlight, as modified by the absorption due to the earth's atmosphere. See **BOLOMETER**, **RADIATION** (in the article **HEAT**), and **SPECTROPHOTOMETER**. E. L. NICHOLS.

Ac'tion: in law, a proceeding before a court of justice by one person against another to obtain redress for the infringement of a right, in the manner prescribed by law. This definition would exclude such proceedings as mandamus and prohibition. The word is not properly applied to courts of equity, but the corresponding proceeding is there termed a suit. A civil action is instituted for the enforcement of a private right or the redress of a similar wrong. In reference to the place in which they are to be brought, they are either local or transitory. Civil actions are either real, personal, or mixed. Criminal actions are prosecuted in the name of the state against some person charged with the commission of a crime. The distinction between real and personal actions refers to the point whether the recovery of land is sought, or damages by way of compensation, or specific personal property. An action is local when by a rule of law it must be brought in a particular locality, such as a county. Actions not so localized are termed transitory. Penal actions are brought to enforce a penalty imposed by law for the commission of a prohibited act. Common law actions are those which can be maintained without the aid of a statute, while those which are based on statutes are called statutory actions.

The number of actions under these rules is quite consider-

able. The distinctions between them are sometimes subtle and perplexing. There is a marked tendency in this country to modify or to do away with them, and to establish a single form of civil action, embracing proceedings both in law and in equity. Revised by H. W. ROGERS.

Action (local): in voltaic cells, see **BATTERY**.

Ac'tium (now called **A'zio**): a promontory and town of ancient Greece, in Acarnania, near the entrance of the Ambracian Gulf (see map of Greece, ref. 16-I). Here occurred the great naval battle of Actium (31 B. C.), between Octavius Cæsar and Mark Antony; the former gained a decisive victory.

Activity: See the Appendix.

Acton, JOHN EMERICH EDWARD DALBERG, Lord: b. in 1834; elected to Parliament for Carlow in Ireland in 1859. He belonged to the liberal Catholic party, in whose interest he founded the *Home and Foreign Review*, which was published 1862 to 1864, when it was condemned by the English Roman Catholic hierarchy. In 1865 he was returned to Parliament from Bridgnorth by a majority of one, but on a scrutiny he was unseated, and in 1869 created a peer of the United Kingdom by the title of Baron Acton of Aldenham. In the same year he repaired to Rome on the assembling of the Ecumenical Council, where he rendered himself conspicuous by his opposition to the definition of the dogma of papal infallibility. In 1887 Lord Acton was made D. C. L. at Oxford, and in 1890 was elected to an honorary fellowship at All Souls College, Oxford, a distinction shared only by Mr. Gladstone. Educated in early life under the direction of the celebrated Dr. Ignatius von Döllinger, of Munich, Lord Acton's intimacy with this distinguished theologian ended only with the death of Von Döllinger.

Revised by W. S. PERRY.

Act of Parliament: See **ACT**.

Acts of the Apostles: See **APOSTLES**, **ACTS OF**.

Acts of Uniformity: acts passed by the Parliament of England in 1549, 1559, and 1662, the object of which was to secure in every congregation of the Church of England the same form of public prayer, administration of the sacraments, and other rites. The act passed in 1662 is still in force, though an amendment, or an amended act, was adopted, 35 and 36 Victoria, cap. 35, providing for a shortened form of service for morning and evening prayer on any day other than Sunday, Christmas day, Ash-Wednesday, Good Friday, and Ascension day, and also supplying services for other special occasions.

Actuary: primarily a clerk; one who keeps records. The term is used more especially to designate those officers of business corporations whose duty it is to apply the doctrine of chances to financial matters. The work of the actuary is the basis for the business of life-insurance.

Actus: a term used in scholastic philosophy to mean actuality as opposed to potentiality. Two kinds are distinguished: First act is the being or existence of a thing—that determination whereby pure being is particularized or differentiated so as to constitute this being in contrast to that being. Second act, called also immanent or transient act, is the operation or activity of the thing which passes over to another thing in the shape of influence or causality. *Actio immanens*, or immanent act, is an action that does not proceed beyond the being—contemplation, for example—while *actio transiens*, or transient act, proceeds out to another. *Actus purus* is an important distinction in theology, meaning a being which has all its possibilities realized, so that it is a perfect being. God is *actus purus*, and not a mixed being containing potentiality. These distinctions are derived from Aristotle, *actus* being equivalent to *ἐνέργεια*, and *actus purus* being equivalent to *ἐντελέχεια*. See Thomas Harper, *The Metaphysics of the School*, and Pierre Nova's *Dict. de Terminologie scolastique*. W. T. HARRIS.

Ac'upuncture [as if from Lat. *acupunctu'ra*; *acū*, with a needle + *pun'gere*, prick]: the surgical operation of puncturing a diseased part with needles. The operation of introducing needles for curative effects has been practiced in the Orient from prehistoric times; the same mode of treatment was in vogue among Western nations, and was largely used in Europe during the Middle Ages. Acupuncture consists in the introduction of long needles directly into a diseased part, such as the muscles of the back in lumbago or those of the thigh in sciatica. Practically no pain is given, and if the needles are sharp and clean no injury results. Six

or more needles are inserted deeply into the affected part and allowed to remain for ten or more minutes. The improvement is sometimes marvelous and immediate. W. P.

Ada: on railroad, Hardin co., O. (for location of county, see map of Ohio, ref. 3-D); 57 miles W. of Crestline, 15 miles E. of Lima, in the midst of a rich agricultural region; has but few factories, but is an educational center, the Ohio Normal University, with over 3,000 students, being located here. Pop. (1880) 1,760; (1890) 2,079; (1900) 2,576.

EDITOR OF "RECORD."

Adagio, a-daa'jō [Ital. *adagio*, at ease]: Italian musical term, denoting a slow movement of measure of time.

Adai: See CADDOAN INDIANS.

Adair, a-dār', JOHN: general; b. in South Carolina in 1759. He commanded a body of Kentuckians at the battle of New Orleans in 1815, and was Governor of Kentucky from 1820 to 1824. He was U. S. Senator (1805-06) and member of Congress (1831-33). D. May 19, 1840.

Adal, ää-daal': a narrow tract of Eastern Africa, bordering on the Red Sea, and extending from Massowah to the Strait of Bab-el-Mandeb, now a part of the Italian colony of ERITREA (*q. v.*).

Adalbert: a descendant of the famous Saxon family, the Counts of Wettin; was appointed Archbishop of Hamburg and Bremen—to which diocese the whole of Scandinavia belonged—in 1043 by the emperor, Henry III., and in 1050 Leo IX. made him legate to the North. Endowed with a powerful intellect and an irresistible eloquence, and possessed of a vast ambition, he formed a plan for combining Germany and Scandinavia into a northern patriarchate—a plan which, if realized, would have changed not only the history of Germany, but probably that of the Roman Catholic Church. But all his exertions were frustrated by the resistance of the Norwegian King Harald, by the intrigues of Cardinal Hildebrand, and by the death of his great patron, Henry III. He now confined himself to German politics, and gained such an ascendancy over the young Henry IV. that for years he was the actual ruler of the empire. In 1066 his enemies, the Archbishops of Mayence and Cologne, succeeded in expelling him from the court; the Billmeyer, a rival Saxon family, invaded his territory; and the Slavs burnt down Hamburg. But Adalbert came victorious out of all his trials. In 1069 he returned to the imperial court, and vindicated himself in his position till his death, Mar. 16, 1072. See Grünhagen's *Adalbert, Erzbischof von Hamburg* (1854).

Adalia, or **Satalieh** (anc. *Attalia*): a seaport of Turkey in Asia; in Anatolia, on the gulf of the same name; 175 miles S. E. of Smyrna, in lat. 36° 52' 2" N., lon. 30° 45' E. (see map of Turkey, ref. 6-E). It is built on the slope of a hill, has narrow, dirty streets, and a small but good harbor. Tropical fruits are exported hence. Pop. estimated at 13,000, of whom about 3,000 are Greeks.

Adam [Heb. אָדָם, i. e. man]: the first man (see Gen. i., ii. and iii.); supposed to have been created, according to the Hebrew chronology, 4004 B. C., and according to the Septuagint chronology 5411 B. C., though some writers contend that no chronology of the creation of man was intended to be given in the Bible. See PRE-ADAMITES.

Adam, ADOLPHE CHARLES: French composer; b. July 24, 1803; published numerous popular operas and ballets, of which the most celebrated are *Le postillon de Longjumeau*, which was played for the first time in 1836, and gained great applause; *L'roi d'Yvetot* (1842); *Richard in Palestine* (1849); and *La jolie fille de Gand* (1839). D. May 3, 1856. Best known in the U. S. by his *Cantique de Noël* (holy night).

Revised by DUDLEY BUCK.

Adam, Mme. EDMOND (née *Juliette Lamber*): author; b. at Verberie, 1836; married first M. la Messine, and afterward M. Edmond Adam, who was prefect of police in Paris during the Franco-German war. Mme. Adam remained in Paris during the siege, and published her experiences in *Le siège de Paris: Journal d'une Parisienne* (1873), which has been followed by numerous works, mainly on political and social subjects, especially the condition of women. She founded the *Nouvelle Revue*, and conducted it with great ability from 1879-86.

Adam, GRAEME MERCER: Canadian author; b. at Loanhead, Midlothian, Scotland, in 1839. He was educated at Edinburgh; went to Canada in 1858, and engaged in literary work and publishing in Toronto; removed to New York

in 1876, and helped to found the publishing-house since developed into the John W. Lovell Publishing Co. He returned to Toronto in 1878; established *Canada Educational Monthly* in 1879, and was its editor for five years. In 1880 he became editor of *Canadian Monthly*, established by Prof. Goldwin Smith and himself some time before. Among his works are: *The Northwest, its History and its Troubles* (Toronto, 1885); *Outline History of Canadian Literature* (1886); and, in conjunction with Ethelwyn Wetherald, *An Algonquin Maiden* (1887).

NEIL MACDONALD.

Adam, ROBERT: British architect; b. at Kirkcaldy, Scotland, in 1728; d. in London in 1792. He designed several important buildings, among which may be mentioned the University, St. George's church, and the Register House, Edinburgh. He is best known by his work on the ruins of the palace of Diocletian at Spalatro, published in 1764. This is, except the work of Stuart and Revett, the most important archæological book of the eighteenth century.

RUSSELL STURGIS.

Adam of Bremen (*Adam Bremensis*): the author of a history (in four books) of *The Propagation of the Christian Religion in North Germany and Scandinavia* from the time of Charlemagne down to Henry IV., to which work is added *A Geographical Description of Denmark and the Countries beyond Denmark* (Sweden, Norway, Iceland, Greenland, the Faröes, etc.). The year of his birth is not known, but he was invited from Magdeburg to superintend the high school of Bremen, and all the schools of the Bremen church, in the year 1067. He was one of the best educated men of his time. He was thoroughly acquainted with the Church fathers, such as Hieronymus, Ambrosius, Orosius, Cassiodorus, Gregory of Tours, Gregory the Great, and Beda. He had diligently studied the heathen poets, Vergil, Horace, Juvenal, Perseus, and Lucan, who were his favorites. Among the prose-writers he gave special attention to Sallust, Cicero, Macrobius, Solinus, and Martianus Capella. With such preparation he went to work toward the close of his life to write the history of the Church of the North. In order to get the facts he went personally to Denmark, where he visited Svend Estridson, "who knew the history of the barbarians by heart, as if it had been written." Adam succeeded in getting at all the facts, and produced, writing in Latin, the most complete and the most reliable work on the propagation of Christianity in the North that we have. The appendix to his work, which gives a pretty complete geographical description of the North, is especially valuable, for it contains a distinct mention of America, which had been discovered by the Norsemen. After Adam has described Iceland and Greenland, he says: "Besides, he (Svend Estridson, King of Denmark and nephew of Canute the Great) mentioned another land which had been discovered in this ocean (the Atlantic), which is called Vinland, because the vine, producing excellent wine, grows there spontaneously; and corn grows there abundantly without being sown. This we know, not from fabulous conjecture, but from positive statements of the Danes." Adalbert, Archbishop of Bremen, died in 1072, and Svend Estridson in 1076. Adam of Bremen's book being written after Adalbert's death, and before the death of Svend Estridson, it must have been composed some time between 1072 and 1076. Whether Adam himself died immediately after the completion of his celebrated work is not known. According to the *Church Book* of Bremen he died on Oct. 12, but the year is not given. He was buried in a grove that was once his property, but which he had donated to the cloister of Romeslo. The oldest translation of his work is into French by De Chastelus of Saumur in the year 1796. It was translated into German by Miesegaes (1825), and by Laurent (1850). The geographical appendix was translated into Swedish by Peringskjöld in 1817, and into Danish by Suhm in 1790. The whole work appeared in a Danish translation in Copenhagen by P. W. Christensen in 1862. R. B. ANDERSON.

Adamant [Gr. ἀδάμας, -ντος, a hard metal, invincible; from ἀ-, not + δαμᾶν, tame]: the ancient name of the diamond, is also a word used to denote a substance of extraordinary hardness and strength or durability.

Adama'wa: a semi-independent territory in Central Africa; between the parallels 5° and 10° N. lat., and lon. 10° and 15° E.; formerly considered a province in the great native kingdom of Sokoto, now within the "sphere of interest" of the German Cameroon district, while Sokoto proper is in the British "sphere" of influence. It is in part on the upper waters of the Benue river, the principal tributary of

the Niger, in part in the Congo basin, and in part is drained directly into the Bight of Benin. The Benue valley is fertile and highly cultivated; the remainder is little known. The country is occupied by various African tribes, but the political ascendancy is in the hands of a race called the Fulbe. The capital is Yola, on the Benue, in lat. 8° 50' N., lon. 13° 30' E. Pop. about 12,000. Mt. Alantika, 25 miles S. S. E. of Yola, is the highest mountain (9,800 feet).

Adami, JOHN GEORGE: See the Appendix.

Ad'amites: a heretical sect said to have sprung up in the north of Africa in the second century. They rejected marriage and appeared naked in their assemblies, which were called paradises. This name was also assumed by a sect of fanatics who arose in Bohemia in the fifteenth century and advocated a community of wives. They still exist in Bohemia, and are said to be guilty of great excesses, though outwardly discreet.

Adamnan, SAINT: abbot of the early Irish Church; b. about 625 in Donegal; elected Abbot of Iona 679; d. Sept. 23, 704; author of *Vita Sancti Columbæ*, which is the chief source of information about the early Scotch-Irish Church. The work forms vol. vi. of *Scottish Historians* series (1857), edited by Dr. Reeves for the Bannatyne Society of Edinburgh.

Adams: town of Berkshire co., Mass. (for location, see map of Massachusetts, ref. 2-C); on a branch of the Boston and Albany R. R.; contains Mt. Greylock, 3,505 feet high, the highest point in Massachusetts. The town formerly included what is now known as *North Adams*, which was set off in 1878 as a separate town. Adams is a typical New England manufacturing town; has 7 churches and a fine school system. It is connected with North Adams, 5 miles distant, by an electric railway, and is also within easy access of the Fitchburg R. R. The S. branch of the Hoosac river flows north through the town. The principal industry is the manufacture of textile fabrics. Pop. (1880) 5,591; (1890) 9,213; (1900) 11,134.

EDITOR OF "FREEMAN."

Adams: on railroad, Jefferson co., N. Y. (for location of county, see map of New York, ref. 2-G); 156 miles W. N. W. of Albany; seat of Adams Collegiate Institute; has 4 churches, electric lights, water-works, 2 malt-houses, a machine-shop, and carriage, furniture, canning, and sash and blind factories. Pop. (1880) 1,250; (1890) 1,360; (1900) 1,292.

EDITOR OF "JOURNAL."

Adams, BROOKS: author; son of Charles Francis Adams; b. in Quincy, Mass., June 24, 1848; was graduated at Harvard, 1870. Studied in Harvard Law School one year; then went to Geneva as secretary to his father, whither the latter had been sent as arbitrator of the Alabama claims. Was admitted to the bar, and practiced till 1881. Since that time has devoted himself to literary work. Author of *The Emancipation of Massachusetts* and *The Law of Civilization and Decay*.

Adams, CHARLES BAKER: naturalist; b. at Dorchester, Mass., Jan. 11, 1814. He graduated at Amherst College in 1834; served as tutor there 1836-37; was Professor of Chemistry and Natural History in Middlebury College, 1838-47, when he became Professor of Zoölogy and Astronomy in Amherst College, which post he held till his death, Jan. 19, 1853. He wrote reports upon the geological survey of Vermont; also *Contributions to Conchology*.

Adams, CHARLES FRANCIS, LL. D., D. C. L.: diplomatist; son of John Quincy Adams; b. in Boston, Aug. 18, 1807. He graduated at Harvard in 1825, and was admitted to the bar in 1828. In 1848 he was nominated for Vice-President by the Free-soilers, who supported Mr. Van Buren for the presidency. He published *Life and Works of John Adams*. Having joined the Republican party, he was elected a member of Congress in 1858 and in 1860. In 1861 he was appointed minister to Great Britain, the duties of which position were during the civil war very arduous and critical. He performed these duties with much ability and prudence, and returned in 1868. In 1871 he was appointed one of the arbitrators on the Alabama claims. D. Nov. 21, 1886.

Adams, CHARLES FRANCIS, JR.: b. at Boston, Mass., May 27, 1835; graduated at Harvard 1855; was admitted to the bar 1858; served as an officer of cavalry in the civil war, rising to the brevet rank of brigadier-general; has since taken a prominent part in the discussion of social, economical, and political questions; has written in the *North American Review* on railroad management, and was appointed railroad commissioner for Massachusetts in 1869; author of

Chapters of Erie (1871); *Three Episodes of Massachusetts History* (1892). For several years he was president of the Union Pacific Railway, from which office he resigned in 1890.

Adams, CHARLES KENDALL, A. B., A. M., LL. D.: educator and historian; b. at Derby, Vt., Jan. 24, 1835; educated at the University of Michigan, and in Germany, France, and Italy; Assistant Professor of History and Latin, University of Michigan, 1863-67; Professor of History, University of Michigan, 1867-85; non-resident Professor of History, Cornell University, 1881-85; became President of the Cornell University, 1885; resigned in May, 1892, and two months later accepted the presidency of the University of Wisconsin. Prof. Adams founded the Historical Seminary in the University of Michigan in 1869, and was thus the first to introduce the seminary method of instruction in history into the U. S. On the establishment of the School of Political Science in the University of Michigan he became its dean. He took an active part in the organization of the American Historical Association, of which he was president in 1890. Author of *Democracy and Monarchy in France* (New York, 1872; German version, Stuttgart, 1873); *Manual of Historical Literature* (New York, 1882); *British Orations* (New York, 1884); *Christopher Columbus, his Life and Work* (New York, 1892); and of a large number of papers on historical and educational topics in the *North American Review*, *The Forum*, *New Englander*, *The Contemporary Review*, and other periodicals. Editor-in-chief of *Johnson's Universal Cyclopædia* (1892). C. H. THURBER.

Adams, EDWIN: actor; b. in Medford, Mass., Feb. 3, 1834; first appeared in Boston, Aug. 29, 1853, at the National theater as Stephen in *The Hunchback*. When Booth's theater was opened in Feb., 1867, Adams played Mercutio and other prominent characters. He is best known by his personation of Enoch Arden, which made him a great favorite. He appeared with Edwin Booth in a number of Shakespeare's plays. D. in Philadelphia, Oct. 25, 1877. B. B. VALLENTINE.

Adams, HANNAH: one of the first women in the U. S. to engage in literary pursuits; b. at Medfield, Mass., in 1755. She wrote a *View of Religions* (1784); *History of New England* (1799); *Evidences of Christianity* (1801); *History of the Jews* (1812); *Letters on the Gospels*; an *Autobiography*; and other works. D. at Brookline, Mass., Nov. 15, 1832.

Adams, HENRY: historian; son of Charles Francis Adams; b. in Boston, Feb. 16, 1838; graduated at Harvard College, 1858; was private secretary to his father while the latter was minister to England, 1861-68; became Professor of History in Harvard College in 1870; editor of the *North American Review*, 1870 to Oct., 1876; author of *Essays in Anglo-Saxon Law* (1876); *Historical Essays* (1871); *Life of Albert Gallatin* (1879); *John Randolph* (1882); *Documents Relating to New England Federalism, 1800-1815* (1877); *History of the United States, 1801-1817* (1889-91, 9 vols.). C. H. T.

Adams, Rev. HENRY CADWALLADER: philologist and novelist; educated at Oxford, where he graduated B. A. in 1840. Author of *The Cherrystones* (1851); *Greek Delectus* (1851); *Latin Delectus* (1852); *Greek Text of the Gospels* (1855); *Twelve Foundations, and other Poems* (1858); *Schoolboy Honor* (1861); *Baldersconrl, or Holiday Tales* (1865); *Tales upon Texts* (1869); *The Winborough Boys* (1870); *Frank Lawrence*, 3 vols. (1873), etc., etc.; *Wykehamica, a History of Winchester College* (1878); *Perils in the Transvaal* (1887). W. S. P.

Adams, HENRY CARTER, Ph. D.: economist; b. at Davenport, Iowa, Dec. 31, 1852; educated at Iowa College and Johns Hopkins University; was first a fellow, then a lecturer in the latter institution; lecturer at Cornell University; professor in the University of Michigan; statistician to the Interstate Commerce Commission; and had charge of the transportation department of the eleventh census. He has written: *Public Debts* (1887; 2d ed. 1890); *Outlines of Lectures upon Political Economy* (1881; 2d ed. 1886); *Taxation in the United States, 1789-1816*, in Johns Hopkins University Studies (1884); *Relations of the State to Industrial Action*, published by the American Economic Association (1887); *Relation of American Municipalities to Quasi-Public Works*, published by the same association; *Annual Reports of the Statistics of Railways in the United States*, published by the Interstate Commerce Commission (1889-91). C. H. T.

Adams, HERBERT BAXTER, Ph. D.: Professor of History; b. April 16, 1850, near Amherst, Mass.; educated in the public schools of Amherst, at Phillips Exeter Academy, Amherst College, and Heidelberg University; appointed Fellow of History at the Johns Hopkins University 1876; Associate in History in 1878; associate professor in 1883, and university professor in 1891; historical lecturer at Smith College, Northampton, Mass., 1878-81, and at Chautauqua, 1888-91; was awarded the Regents' prize by Chancellor George William Curtis for the best published account of university extension; took an active part in 1884, with Prof. C. K. Adams, Justin Winsor, and Andrew D. White, in organizing the American Historical Association, and has been secretary of the society since its foundation. Editor of *The Johns Hopkins University Studies in Historical and Political Science*, and of *Contributions to American Educational History*. Author of *Maryland's Influence in Founding a National Commonwealth*; *The Study of History in American Colleges and Universities*; *The College of William and Mary*; and *Thomas Jefferson and the University of Virginia*. C. H. THURBER.

Adams, Rev. JASPER, D. D.: b. at East Medway, Mass., Aug. 27, 1793; graduated at Brown University in 1815; Professor of Mathematics there (1819-24); president of Charleston College, S. C., in 1824 and again in 1827-36, of Geneva (now Hobart) College in 1825-27. He was (1838-40) chaplain and Professor of Moral Philosophy at the U. S. Military Academy. His principal literary work was *The Elements of Moral Philosophy*, which won the high commendation of Mr. Justice Story. D. Oct. 25, 1841.

Revised by W. S. P.

Adams, JOHN: second President of the U. S.; b. at Braintree, Mass., Oct. 19, 1735, O. S.; graduated at Harvard College 1755; studied law, and was admitted to the bar in 1758. For this profession he was well fitted by a clear, sonorous voice, a ready fluency of speech, and a quick conception. In 1764 he married Abigail Smith, a woman of superior intelligence. His attention was drawn to political affairs by the passage of the Stamp Act in 1765, and he offered on that subject a series of resolutions which were very popular. He removed to Boston in 1768, became one of the most courageous and prominent advocates of the popular cause, and was chosen a member of the General Court (the Legislature) in 1770.

He was one of the delegates that represented Massachusetts in the first Continental Congress, which met in Sept., 1774. He distinguished himself in Congress by his capacity for business and for debate, and advocated the movement for independence when the majority of the members were inclined to temporize and to petition the king. In May, 1776, he moved and carried a resolution in Congress that the colonies should assume the duty of self-government. In June a resolution that the U. S. "are and of right ought to be free and independent" was moved by Richard Henry Lee, seconded by Mr. Adams, and adopted by a small majority. Mr. Adams was a member on the committee of five appointed June 11 to prepare a declaration of independence, in support of which he made an eloquent speech, about July 2. He was the chairman of the board of war appointed in June, 1776, and was sent as commissioner to France in 1778, but returned in July, 1779. Having been appointed as minister to negotiate a treaty of peace and commerce with Great Britain, he went to Europe early in 1780. Conjointly with Franklin and Jay he negotiated a treaty, the preliminary articles of which were signed Nov. 30, 1782. He was employed as minister to the court of St. James from 1785-88, and during that service wrote his *Defense of the American Constitutions* (1787). In 1789 he became Vice-President of the U. S., and about that time identified himself with the Federal party, by which he was re-elected to the office of Vice-President in 1792.

In 1796 Mr. Adams was chosen President of the U. S., receiving 71 electoral votes, while his competitor, Thomas Jefferson, received 68 votes. He sympathized with the anti-Gallican party, and pursued the policy of neutrality between France and Great Britain. Involved in a quarrel with the French Directory, which interfered with the maritime interests of the citizens of the U. S., he sent Mr. Murray as minister to France early in 1799, in order to avert a war. This act gave much offense to the Federalists, and broke the unity of that party. Among the unpopular measures for which Mr. Adams was held responsible were the Alien law and the Sedition law. In 1800 he was the Federal candidate for the office of President, but he was not cordially sup-

ported by Gen. Hamilton, the favorite leader of his party. Receiving 65 electoral votes, he was defeated by Thomas Jefferson, who received 73 votes.

Mr. Adams then retired from public life to his large estate at Quincy, Mass., and gave his attention partly to agriculture. The general neglect and odium which he experienced were at last compensated by the election of his son John Quincy to the presidency of the U. S. He died on July 4, 1826. It is a curious coincidence that of the three Presidents of the U. S. who have died on that anniversary (Adams, Jefferson, and Monroe), two had signed the Declaration of Independence. Revised by R. LILLEY.

Adams, JOHN COUCH: astronomer; b. in Cornwall, England, June 5, 1819; educated at Cambridge, where he obtained the position of Senior Wrangler, 1843. In 1841 he began to search for the causes of the irregularities in the motion of Uranus. He ascertained that they were caused by the attraction of a planet then unknown, and thus shares with Leverrier the honor of the discovery of Neptune, for which he received the Copley medal in 1848. In 1851 he was elected president of the Royal Astronomical Society; and in 1858 became Professor of Mathematics in the University of St. Andrews (where he taught until May, 1859), and about the same time was appointed Lowndean Professor of Astronomy and Geometry at Cambridge, an office which he held until his death, Jan. 21, 1892. In 1861 he succeeded Prof. Challis as director of Cambridge Observatory, and in 1866 received the Royal Astronomical Society's gold medal for his investigations regarding the lunar parallax and the secular acceleration of the moon's mean motion. He was one of the British delegates to the International Prime Meridian Conference held at Washington in 1884.

Revised by R. LILLEY.

Adams, JOHN QUINCY: sixth President of the U. S.; b. in Braintree, Mass., July 11, 1767. He was eldest son of President John Adams and his wife, Abigail Smith, who was descended from the family of Quincy. In 1778 he was placed at a school in Paris, and in 1780 passed to the University of Leyden. He returned home in 1785, and finished his education at Harvard College, where he graduated in 1788, after which he studied law with Theophilus Parsons, and was admitted to the bar in 1791. Having gained distinction by some political essays, he was appointed minister to The Hague in 1794. In 1797 he married Louisa Catherine Johnson of Maryland, and in the same year was sent as minister to Berlin, from which he was recalled in 1801, when the Republicans obtained power.

He was elected a Senator of the U. S. by the Federalists in 1803, but voted for Jefferson's embargo in 1807, and thus separated himself from the Federal party and lost his seat in the Senate in 1808. Before this date he had distinguished himself as a public speaker, and had been appointed Professor of Rhetoric at Harvard College (1805). In 1809 he was sent as minister to Russia. He was one of the commissioners that negotiated the treaty of peace with Great Britain, signed Dec. 24, 1814, and he was appointed minister to the court of St. James in 1815. In 1817 he became Secretary of State in the Cabinet of Monroe, in which position he remained eight years. In 1824 four candidates for the presidency were presented—John Q. Adams, Andrew Jackson, Henry Clay, and William H. Crawford—all of whom professed to be Democrats. Mr. Adams received 84 electoral votes, Jackson 99, Crawford 41, and Clay 37. As neither had the requisite majority, the election devolved on the House of Representatives, which chose Mr. Adams. This result was due to the influence of Henry Clay, and when Mr. Adams nominated him as Secretary of State, the friends of Jackson accused Adams and Clay of "bargain and corruption," but the charge is not generally credited. His administration was opposed by a powerful party, formed by a coalition of the Jacksonians with the friends of Crawford. This party had a majority of the members of Congress, and, uniting on Gen. Jackson as their candidate, triumphed in the election of 1828, when Mr. Adams received only 83 electoral votes out of 261, which was the whole number.

In 1830 he was chosen by the voters of his native district to represent them in Congress, in which he distinguished himself by his application to business, his assertion of the right of petition, and his resolute opposition to what he considered to be the encroachments of the slave power. He continued to represent the same district in Congress for seventeen years, during which he maintained a position independent of a party. He was seized with paralysis in

the Capitol on Feb. 21, 1848, and died on the 23d of that month. In religion he was a Unitarian. He left many writings in prose and verse, which have been published; also a voluminous diary of his public life.

Adams, JOHN QUINCY: a grandson of the preceding, and son of Charles Francis Adams, noticed above; b. at Boston, Mass., Sept. 22, 1833; graduated at Harvard in 1853. He was the Democratic candidate for Governor of Massachusetts in 1867 and 1868, but was both times defeated. He was also a candidate for the vice-presidency in 1872, on the ticket with Charles O'Connor. D. Aug. 14, 1894.

Adams, JULIUS WALKER: b. in Boston, Mass., Oct. 18, 1812; entered the U. S. Military Academy, June, 1830; assistant engineer of Stonington and Providence R. R. 1832, Norwich and Worcester R. R. 1836, Western R. R. of Massachusetts 1839, Albany and Schenectady R. R. 1842, U. S. dry-dock, Brooklyn navy-yard, 1844, Cochituate water-works, Boston, 1846; superintending engineer New York and Erie R. R. 1846; chief engineer Central R. R. of Kentucky 1852, Memphis and Ohio R. R. 1855; engineer for establishment of a system of sewers in Brooklyn, N. Y., 1856; engineer of New Haven water-works 1860. Served with credit as colonel of the 67th New York Vols., and was wounded at Fair Oaks. Since then has been engaged in many important hydraulic works; chief engineer city of Brooklyn; past president American Society of Civil Engineers; member of New York Academy of Science; author of various scientific papers; and consulting engineer to department of public works, New York.

Adams, NEHEMIAH, D. D.: theologian; b. at Salem, Mass., Feb. 19, 1806; graduated at Harvard in 1826, and at Andover Theological Seminary in 1829. He first settled at Cambridge in 1829, and in 1834 became pastor of the Essex Street church in Boston. He resigned his pastorate in 1870. He published several theological and other works, and a *South Side View of Slavery* (1854), which was severely condemned by the opponents of slavery. He had a high reputation for scholarship and pulpit eloquence. D. Oct. 6, 1878.

Adams, SAMUEL: patriot and orator; a second cousin of President John Adams; b. in Boston, Sept. 27, 1722; graduated at Harvard College in 1740; and became a merchant, but was not successful in business, and soon abandoned it. In 1765 he was chosen to represent Boston in the General Court of Massachusetts, in which he distinguished himself by his courage, energy, and oratorical talents, and acquired great influence. Before the Revolution he was an unflinching advocate of the popular cause, and took such an active part in political meetings that he was one of the two leading patriots who were excepted from a general pardon offered in 1775. He was a member of the first Continental Congress, which met in Sept., 1774, and he signed the Declaration of Independence in 1776. He remained in Congress about eight years, was afterward elected to the Senate of Massachusetts, and was a member of the State convention which ratified the Federal Constitution in 1788. His political affinities connected him with the Republican (or Jeffersonian) party. He was elected Governor of Massachusetts in 1794, was re-elected twice, and retired to private life in 1797. He died Oct. 2, 1803. In religion he was a decided Calvinist. In the letters and other writings of John Adams occur several passages which express a high opinion of the talents and merits of Samuel Adams, in whose productions he says may be found "specimens of a nervous simplicity of reasoning and eloquence that have never been rivaled in America." See W. V. Wells's *Life and Public Services of Samuel Adams* (3 vols. 8vo, 1865).

Adams, SARAH (Flower): poet; b. at Great Harlow, Essex, England, Feb. 22, 1805. She married Mr. W. B. Adams in 1834. Her principal work is *Vivia Perpetua* (1841), a dramatic poem dealing with the life of the early Christians. She was the author of many hymns, the best known of which is *Nearer my God to Thee*. D. August, 1848.

Adams, Rev. WILLIAM, D. D.: b. at Monaghan, Ireland, in 1813; educated at Trinity College, Dublin, and at the General Theological Seminary in New York city; was one of the founders of Nashotah Theological Seminary in Wisconsin, where, till his death, Jan. 2, 1897, he held the chair of Systematic Divinity. Besides numerous contributions to religious papers and reviews, he published *Mercy to Babes* (New York, 1847); *Elements of Christian Science* (Philadelphia, 1850); and *A New Treatise on Baptismal Regeneration* (New York, 1871).

W. S. P.

Adams, Rt. Rev. WILLIAM FORBES, D. D., D. C. L.: first missionary bishop of the American Episcopal Church in the jurisdiction of New Mexico and Arizona; b. in Ireland, Jan. 2, 1833. Removing in his boyhood to Tennessee, he was admitted to the bar in Mississippi, but was ordained deacon Dec. 27, 1859, and priest July 29, 1860. At the time of his election to the episcopate he was rector of St. Paul's in New Orleans. Consecrated Jan. 17, 1875; resignation, on account of physical disability, accepted by House of Bishops, Oct., 1877. Translated to the see of Easton, Md., 1887.

W. S. P.

Adams: WILLIAM HENRY DAVENPORT: author and journalist; b. in 1828; editor of *The Scottish Guardian*, 1870-77; published an annotated edition of Shakespeare; *The Bird World*; *The Arctic World*; *Memorable Battles in English History*; *Heroes of the Cross*; *England at Sea*; *Woman's Work and Worth*; *The Merry Monarch*; *Good Queen Anne*; *The White King*; *Witch, Warlock, and Magician*, etc. D. Dec. 30, 1891.—His son, W. DAVENPORT, has published a *Dictionary of English Literature*; *Famous Books*; and three collections of annotated poetry.

Adams, WILLIAM T.: a popular writer, known under the pseudonym of Oliver Optic; b. in Medway, Mass., July 30, 1822; published about a hundred works for children—viz., *The Riverdale Series* (1860); *Young America Abroad Series* (1866-69 and 1871-77); *Great Western Series* (1875-81), etc.; edited *Student and Schoolmate* (1858-66); *Our Boys and Girls* (1867-75); *Our Little Ones* (1886); and *Oliver Optic's Magazine*. D. Mar. 27, 1897.

Adam's Bridge: a chain of sand-banks and coral reefs extending from the N. W. point of Ceylon to the coast of India. Like Adam's Peak, it is associated with the legend of a visit by Adam to Ceylon. It is more than 30 miles long. Some of the banks and reefs are dry, and none are covered to a depth of more than 3 or 4 feet at high water. There are two or three tortuous channels through them, but these are practicable only for small craft, and for them only in calm weather.

M. W. H.

Adam's Needle: See YUCCA.

Adam's Peak: a mountain in Ceylon in lat. 6° 52' N., lon. 80° 32' E.; height, 7,230 feet. It is considered by the Buddhists as the holy center of the world. A temple is situated on the highest portion of the peak, under which the footprints of Buddha and Sripadam (i. e. luck) are said to be seen. Buddha is said to have left those traces upon his last visit to the earth. The Brahmans and Mohammedans also consider it a holy mountain—the former, because they consider Buddha as an avatar (incarnation) of Vishnū; the latter, because they ascribe the footprints to Adam, who is said to have here mourned for 1,000 years his expulsion from Paradise, standing on one foot. The shadow of the peak at sunrise shows some unique peculiarities. See Abercromby, *Seas and Skies in many Latitudes* (1888).

Adamson, PATRICK: b. at Perth, Scotland, in 1543; was licensed as a preacher; studied law, and went to France as tutor to a young gentleman; returned in 1573, took orders, and became minister of Paisley; was made Archbishop of St. Andrews in 1576 by his patron, the Earl of Morton, Regent of Scotland. He had many contests with the Presbyterians respecting episcopacy. D. Feb. 19, 1592.

Adan, LOUIS ÉMILE: painter of figure subjects; b. in Paris, Mar. 26, 1839. Pupil of Picot and Cabanel. First-class medal, Paris Exposition, 1889; Legion of Honor, 1892. One of the best of his works is *Autumn Evening* (1882). *The Ferryman's Daughter* (1883) is in the Luxembourg Gallery, Paris. Studio in Paris.

W. A. C.

Ada'na: a city of Asia Minor; on the river Sihoon; about 30 miles from the sea and 18 miles E. of Tarsus (see map of Turkey, ref. 6-G). It has some trade in grain, wine, cotton, etc. Here are interesting ancient remains. Pop. (1885) 45,000.

Adanson, MICHEL: French naturalist; b. at Aix, Apr. 7, 1727; educated at the college of Plessis. He went to Senegal in 1748 to explore the natural history of that region, in which he passed five years in his arduous and dangerous enterprise, and collected an immense number of animals and plants. He published, after his return, a *Natural History of Senegal* (1757), and *The Families of Plants* (1763), in which he opposed the artificial system of Linnæus. In 1759 he was elected a member of the Academy of Sciences. D. Aug. 3, 1806.

Adanso'nia: a genus of plants of the family *Sterculiaceae*; named in honor of the great naturalist, M. Adanson.



Adansonia.

The *Adansonia digitata*, or baobab, is found in tropical Africa, and is one of the largest trees in the world. It does not grow very high, but its trunk is often more than 20 feet in diameter. The fruit of the baobab is called monkey-bread. By a loose and vague overestimate some of these trees have been said to be 5,000 years old.

A'dar: the sixth month of the civil and the twelfth of the ecclesiastical year of the Jews, beginning with the new moon of February.

Ad'da (anc. *Ad'dua*): a river of Northern Italy; rises in the Valtellina, among the Rhetian Alps, and enters Lake Como, which is an expansion of this river. After issuing from that lake it flows nearly southward through Lombardy, and empties itself into the Po 7 miles above Cremona. Length of river and lake, about 130 miles.

Ad'dax: the *Oryx* (or *Ad'dax nasomaculatus*) of the naturalists; a large antelope found in North Africa and Arabia. Its broad-spreading hoofs enable the animal to obtain a firm foothold upon the dry and yielding sand. Its horns, which are from 3 to 4 feet long, are beautifully twisted into a spiral, having two and a half turns. The general color of the addax is a milk-white, but there is a black patch of hair on the forehead, and it has a dark-brown mane, with more or less of reddish brown mixed with gray on the head, shoulders, and part of the back.



Addax.

Ad'der: a common name of the viper or of any venomous serpent belonging to the family *Viperidae*. The name is popularly applied in the U. S. to several non-venomous snakes, as the "spreading-adder" (*Heterodon platyrhinus*).

Addington, HENRY: See SIDMOUTH.

Addington, ISAAC: b. in Boston, Mass., Jan. 22, 1645; member of House of Representatives and Speaker in 1685; opposed the administration of Sir Edmund Andros, and on its overthrow in 1689 became clerk of the Council of Safety, to whom the people committed the government; secretary from his appointment in 1690 till his death; judge of the court of common pleas, 1693-1702; chief justice of the Superior Court, 1702-03. He was many years chosen to the council, and was judge of probate court, 1702-15. D. Mar. 19, 1715.

Ad'discombe House: situated about a mile from Croydon, England; was formerly the residence of the Earl of Liverpool, and was purchased in 1809 by the East India Company, and opened by them in 1825 as a collegiate institution for the education of cadets for the whole of their military service except the cavalry. It is now called the Royal India Military College.

Addison: Steuben co., N. Y. (for location of county, see map of New York, ref. 6-E); on Canisteo river, and main line of New York, Lake Erie and Western R. R., 30 miles W. of Elmira; has 2 large union school-houses, 4 churches, 2 sash, door, and blind factories, plow-handle and step-ladder factories, 2 boot and shoe factories, and the foundry and machine-shops of the Addison and Pennsylvania R. R. Co. Tobacco is largely grown in the neighborhood. Pop. (1880) 1,596; (1890) 2,166; (1900) 2,080. EDITOR OF "ADVERTISER."

Ad'dison, JOSEPH: an English humorist, moralist, and author of great merit and celebrity; b. at Milston, near Amesbury, in Wiltshire, on May 1, 1672. He was a son of Lancelot Addison. In 1687 he entered Queen's College, Oxford, from which he passed to Magdalen College in 1689. He became a good classical scholar, and as a writer of Latin verse probably excelled all his contemporaries. At an early age he enjoyed the friendship and patronage of Dryden, Lord Somers, and Montagu (Lord Halifax), the last

of whom persuaded him to enlist as a Whig in the civil service of the state. Having in 1699 received a pension of £300, he visited France and Italy, and wrote a charming *Letter from Italy*, in verse, addressed to Lord Halifax (1701). He lost his pension on the death of William III. (1702), and returned home in 1703. His next work was *The Campaign*, a poem on the battle of Blenheim (1704), which was greatly admired, and he was rewarded with the office of commissioner of appeals. He afterward produced his interesting *Travels in Italy*, and *Rosamond*, an opera. He was appointed Under-Secretary of State in 1706, and was elected to Parliament in 1708. His diffidence disqualified him for public speaking, but this defect was compensated by his success as a political writer. He became in 1709 secretary to Lord Wharton, Lord-Lieutenant of Ireland, and contributed to the *Tatler*, of which his friend Richard Steele was the editor. On Mar. 1, 1711, Addison and Steele began to issue daily *The Spectator*, the most elegant and famous periodical and miscellany that ever appeared in England. Addison wrote the best of the essays, which form an epoch in literary history.

The Spectator ceased to appear daily in Dec., 1712, but was revived as a tri-weekly paper in 1714. Among his other works are the tragedy of *Cato* (1713), which was received with great applause, an ingenious *Dialogue on Medals*, and a series of able political papers called *The Freeholder* (1715). In 1716 he married the proud and un congenial Dowager Countess of Warwick, and early in 1717 was appointed Secretary of State. He resigned this office in 1718, and died in London, June 17, 1719, leaving only one child, a daughter. His marriage appears not to have been happy. Addison was greatly distinguished for his wit and colloquial powers. See Johnson's *Lives of the Poets*; Macaulay, *Critical and Historical Essays*; Aiken, *The Life of Addison* (1843); and Courthope's *Addison* (1884).

Addison, LANCELOT, D. D., father of Joseph Addison; b. at Meaburn Town Head, Westmoreland, England, in 1632; educated at Queen's College, Oxford; was seven years chaplain at Tangiers; became a royal chaplain about 1670. Dean of Lichfield 1683, and Archdeacon of Coventry in 1684. D. 1703.

Addison's Disease, or Suprarenal Melasma: a rather rare disease, the most obvious symptom of which is a gray-black or bronze color of the skin, gradually coming on. The chief lesion discovered after death is a cheesy degeneration of the suprarenal capsules, the result of a peculiar chronic inflammation. Patients usually suffer from extreme debility, depression of spirits, pain in the epigastrium and back, often accompanied by dyspepsia, vomiting, diarrhoea, and grave nervous symptoms. No remedy is known, and the disease, though careful nursing is extremely useful, is probably never cured. It receives its common name from the late Dr. Addison, of Guy's Hospital, London, England.

Address, FORMS OF: See FORMS OF ADDRESS.

A'delaer, CORT SIVERTSEN: naval commander; b. at Brevig, Norway, Dec. 16, 1622; served in the Dutch navy under Tromp, 1637-45; entered the Venetian service, and distinguished himself greatly in many actions; broke (May 13, 1654) with a single ship through a Turkish fleet consisting of 67 galleys stationed in the Dardanelles, and sank or burned 15 of the enemy's vessels; left Venice in 1661, and was placed at the head of the Danish navy in 1663, which he remodeled after the Dutch fashion. D. Nov. 5, 1675.

Ad'elaide (named after Queen *Adelaide*, the consort of William IV.): city; capital of South Australia; situated on both sides of the river Torrens, 8 miles from its entrance into the Gulf of St. Vincent (see map of Australia, ref. 7-G). It was founded in 1836, is the seat of an Anglican and a Roman Catholic bishop, and contains a government-house, an assay-office, a theater, and extensive manufactures. Pop. (1887) 111,300; (1895) 144,352. Port Adelaide, 7 miles N. N. W. of the city, with which it is connected by railway, is the center of the commerce of the colony. It has a heavy trade in copper and lead ores, grain, and wool.

Adelbert College of Western Reserve University: founded in 1826 under the name of Western Reserve College, and located at Hudson, O. A theological department was opened in 1828 and continued till 1859. A medical department was established in Cleveland in 1843, and was transferred to the Western Reserve University in 1884. In 1882 the college was transferred to the city of Cleveland, changing its name and receiving from Mr. Amasa Stone

\$450,000 of endowment and \$150,000 in buildings, and also about 20 acres of land from citizens of Cleveland. It has excellent buildings and a library of about 25,000 volumes. There are three courses of study, viz., classical, modern languages and Latin-English, and much attention is given, through electives, to practical training in chemistry, physics, and biology. For the purposes of this training there are three laboratories. The invested funds amount to \$700,000, the real estate and apparatus to \$300,000. The president is Rev. Charles F. Thwing, D. D. There are eleven professors and five instructors and lecturers. A gymnasium was added to the equipment in 1888. The college is distinctively a Christian institution, though not denominational. See WESTERN RESERVE UNIVERSITY. E. BUSHNELL.

Adelsberg: a small market-town of Carniola, Austria (see map of Austria-Hungary, ref. 8-D). A short distance from the town is the Adelsberg Grotto, which is one of the best known caverns of the world. It consists of five different parts, and is full of beautiful formations, stalactites, incrustations, and stalagmites. The length is $2\frac{1}{2}$ miles; temperature in the cave, 48° F. The cave was well known in the Middle Ages, and rediscovered in 1818.

Adelung, FRIEDRICH, von: German philologist; b. at Stettin, Feb. 25, 1768; became a resident of St. Petersburg, and preceptor to the grand duke who was afterward the Emperor Nicholas. He wrote on the Sanskrit language and literature, but his greatest services to scholarship were due to his investigations into the foreign sources of information for Russian history. His *Kritisch-literarische Uebersicht der Reisenden in Russland bis 1700* (1846) is the most important of his works in this direction. D. in St. Petersburg, Jan. 30, 1843.

Adelung, JOHANN CHRISTOPH: philologist, an uncle of Friedrich von Adelung; b. at Sparteckow, in Pomerania, Aug. 8, 1732. His reputation is founded chiefly on his *Attempt at a Complete Grammatico-Critical Dictionary of the German Language* (*Versuch eines vollständigen grammatisch-kritischen Wörterbuches der Hochdeutschen Mundart, 1774-86*). Among his other works is one on language, entitled *Mithridates oder allgemeine Sprachen-Kunde*, one of the most important of the early works on comparative philology. D. at Dresden, Sept. 10, 1806.

Aden, ā'den (i. e. Eden): Aden proper is a small volcanic peninsula on the south coast of Arabia, about 100 miles E. of the Straits of Bab-el-Mandeb (see map of Persia and Arabia, ref. 10-E). It was taken possession of by Great Britain in 1839. Later a small peninsula to the eastward and the coast between were purchased—making a total area of 70 sq. miles. Pop. (1891) 41,910, excluding the troops, mostly Mohammedans. Aden has an admirable position, and is strongly fortified. Its climate, though hot, is dry and salubrious. It was early an important port in the trade between Europe and India, but with the discovery of the route by the Cape of Good Hope it fell into decadence. With the opening of the Suez Canal it again rose into importance, becoming a coal-ing and watering station. It is a free port, and its trade is almost entirely a transshipment one. A sort of protectorate has been extended by Great Britain over the neighboring inland region, having an area of about 8,000 sq. miles, and a population of about 130,000 (estimated). See also PERIM, SOMALI COAST, SOCOTRA, and KURIA MURIA ISLANDS.

M. W. H.

Aden and Perim': a possession of Great Britain on the Gulf of Aden, and includes, besides the above named, the Somali Coast protectorate, Socotra, and the Kuria Muria islands. The government is subordinate to the Bombay Presidency, and is administered by a political resident, who is also commander of the troops. The only government revenue is from the duty on liquor, arms, opium, and salt.

Aden, GULF OF: that part of the sea lying between Arabia and Aden, and extending from the Strait of Bab-el-Mandeb to the Indian Ocean or Arabian Sea. On some maps this is marked as the Arabian Gulf. Length about 500 miles.

Adept': a person who is skillful or well versed in any art or science; formerly applied especially to an alchemist who was supposed to have discovered the secret of turning base metal into gold, or to have found the philosopher's stone.

Aderno, a-der'nō (anc. *Adranum*): a town of Sicily; at the foot of Mt. Etna; 17 miles N. W. of Catania; remarkable for the number of its convents and nunneries (see map of Italy, ref. 9-F). Portions of the ancient city still remain. Pop. (1881) 20,163.

A'dersbach Rocks: a remarkable group of high and detached sandstone rocks, near the village of Adersbach, in the northeast part of Bohemia. They present fantastic forms, and occupy an area of several miles in extent. One of the pinnacles is over 200 feet high.

Adet, PIERRE AUGUSTE: a French chemist and politician; b. at Nevers in 1763. He was sent by the French Directory as ambassador to the U. S. in 1795, but he suspended his functions in 1797, for the alleged reason that the U. S. Government had violated its neutrality. D. in 1832.

Adfoo: See EDFU.

Adhesion [Lat. *adhae'sio*; *ad*, to + *haere're*, stick]: in botany, the union of contiguous parts, as when the petals adhere and form a monopetalous corolla; the calyx often adheres to the ovary, and then seems as if it grew from the apex of it. This tendency causes great diversity of appearance in the organs of plants.

Adhesion, FORCE OF: the resistance of friction which exists between two surfaces at the moment when one begins to slide on the other. The force of adhesion is approximately proportional to the normal pressure between the two surfaces. The adhesion of the driving-wheels of a locomotive upon the rails of a track is about one-fourth or one-fifth of the weight that rests upon them. If the frictional resistances are greater than the adhesion, the wheels will revolve and the locomotive move forward; if the frictional resistances are less than the adhesion, the wheels will slip on the rails, and no forward motion will result. The force of traction is measured in any particular case by the horizontal pull required to start a locomotive with its train, and the greatest load which a locomotive can draw is that which has a frictional resistance equal to the adhesion.

MANSFIELD MERRIMAN.

Adian'tum: a genus of ferns, whose spores are produced on the margin of the leaves in short fruit-dots. There are many species, of which the maidenhair fern, *A. capillus-veneris*, and *A. pedatum* are common in the U. S.

Adiaph'orites: [from the Gr. *ἀδιάφορος*, indifferent]: a name given to Melancthon and his adherents, who were charged with making serious concessions to the Roman Catholics in the *Leipzig Interim* of 1548. Under *adiaphora* or non-essentials, such as the use of altars, pictures, lights, etc., it was alleged, matters involving fundamental articles of faith had been included. The chief opponents of Melancthon were Flacius and Amsdorf. A decision was reached in the *Formula of Concord*, art. x.

Adiathermancy: See DIATHERMANCY.

Adige, aa'dēe-jā (Lat. *Ath'esis*): a river of Italy; rises among the Alps in the Tyrol, where it is called the Etsch. Flowing southward, it passes by Trent, and enters Lombardy. After passing by Verona, it flows nearly southeastward, and falls into the Gulf of Venice about 13 miles N. E. of Adria. It is a rapid stream, about 220 miles long. It is navigable from its mouth to Trent, but the velocity of the current impedes navigation.

Ad'ipocere [viā Fr. *adipocire*, from Lat. *adeps*, fat + *ce'ra*, wax]: a substance which results from the decomposition of animal bodies, and resembles spermaceti, or a mixture of wax and fat. Human bodies buried in wet ground are often reduced to this condition, and are often supposed to be petrified.

Ad'ipose: of the nature of fat; fatty. Adipose tissue is an animal tissue which contains the fatty matter. It presents an aggregation of very small spherical pouches or vesicles filled with fat or oil. This tissue is organized and vital, but the fat is not.

Adiron'dack Mountains: an oval mountain tract in Northeastern New York, including parts of Hamilton, Essex, Franklin, and Clinton counties, and having an area of 5,000 sq. miles. Among its peaks are Mt. Marcy, 5,379 feet; Mt. McIntyre, 5,183 feet; and Mt. Dix, 4,916 feet, the highest summits in the State. The mountains consist of crystalline rocks, and about their flanks these are overlapped by Cambrian and Silurian sediments. Their surface characters were greatly modified by the Pleistocene ice-sheet, which traversed them from N. to S., scouring the soil from their summits and higher slopes, and depositing the material in an irregular way in the mountain valleys, so as to obstruct the drainage and produce a great number of lakes. Though densely forested, the tract is unsuited for agriculture, alike in soil and climate, and it is thus naturally reserved as an

immense park for purposes of rest and recreation. Through the game laws and timber laws of the State, it has been still further protected in the interest of the sportsman and tourist, so that its broad forests still abound in deer and other game and its waters in trout. G. K. G.

Adirondaek Park: a public park, established in 1892, situated within and occupying the larger part of the great forest of Northern New York. It includes Hamilton County, the large town of Wilmurt in Herkimer County, the western half of Essex, the western part of Warren, the southern part of Franklin, and the southeastern part of St. Lawrence County. It contains 2,807,760 acres, an area equal to that of the State of Connecticut. In character the lands are:

Primeval forest.....	1,575,483	acres.
Lumbered forest*.....	1,027,955	"
Denuded.....	50,050	"
Burned.....	13,430	"
Waste.....	18,526	"
Water.....	57,104	"
Wild meadows.....	495	"
Improved.....	64,717	"

Of the virgin forest about 50 per cent only of the trees are conifers; the rest are hardwoods, the maple, birch, and beech predominating largely. Within the park boundaries the forest is in good condition, and the small areas of burned land are rapidly reforesting themselves. The park is situated on an immense plateau, which extends throughout its entire area, with an average elevation of 1,800 feet above tide. It contains extensive mountain ranges, the highest peak, Mt. Marcy, attaining a height of 5,379 feet. There are eighteen other mountains within the park whose altitudes exceed 4,000 feet, while peaks of lesser height appear in every direction. There are over 1,200 bodies of water, varying in size from lakes 15 miles long to little mountain ponds. Twenty large rivers drain the region, part of them flowing to the Hudson, the others to the St. Lawrence. The park abounds in grand and beautiful scenery, its combination of mountains, lakes, rivers, and forests having no equal in this respect. Its waters are so connected that the tourist and his guide can make various journeys of over 100 miles each without retracing the route, the entire distance being traveled in a light "guide-boat," except occasional "carries" or portages varying in length from a few rods to three miles, or thereabouts. The hotels are numerous and excellent, and of classes to suit all. In each locality there are good, trusty guides, whose services can be secured at a moderate price. The region affords also an opportunity for coaching and driving, a good road leading through the beautiful and impressive scenery lying along the route from Westport and Elizabethtown through the Keene valley, by the Cascade lakes and Lake Placid, through the Wilmington Notch, to the Au Sable Chasm, a drive of 98 miles. The region abounds in fish and game. The lakes, in addition to their natural supply, have been fully stocked with fish from the State hatcheries. The smaller streams contain a plentiful supply of speckled trout.

But the Adirondaeks have a priceless value as a sanitary resort, the beneficial effect being particularly noticeable in pulmonary diseases. The Adirondaek Sanitarium, at Saranac Lake, in which consumptive patients only are treated, reports a percentage of permanent cures, together with a separate percentage showing permanent relief, which is unsurpassed in any other climatic resort.

The law establishing the park was passed in 1892. But the State lands at this time comprised only one-third of its area, leaving the remainder to be acquired by subsequent appropriations. The officers of the park consist of a superintendent, assistant superintendent, two inspectors, and a small number of foresters. They are appointed by the State Forest Commission, an honorary board of three members, who have the control and management of the park and other State forests. The principal object in establishing and maintaining the park is the preservation of its forests, the protection of the watersheds that supply the State rivers and canals, and the inauguration of a forest management that will insure a future and perpetual supply of timber. Its maintenance as a pleasure and health resort is incidental and subordinate to the main object. See *Report N. Y. State Forest Commission*, for 1891; also *Guide-book to the Adirondaeks*, by S. R. Stoddard, Glens Falls, N. Y. WILLIAM F. FOX, Supt. of State Forests.

* Lands from which spruce, pine, or hemlock trees have been taken, leaving a good hardwood forest, interspersed with young conifers.

Ad'it [Lat. *ad'itus*, approach; *ad*, to + *ire*, go]: a horizontal passage and entrance into a mine, designed partly to drain water from it. Adits occur chiefly in mountainous regions, and are sometimes several miles long.

Adja'cent Angle: an angle contiguous to another, so that one side is common to both angles.

Ad'jective [Lat. *adjecti'vus*, annexed; *ad*, to + *ja'cere*, lay]: in grammar, a word joined to a noun, in order to qualify the general idea expressed by it.

Adjective Law: rules of procedure or practice, as distinguished from the substantive law, or the law which courts are established to administer.

Adjourn'ment: the postponement of the proceedings of the U. S. Congress, or of either House of the British Parliament, or of any public or private deliberative body, from one time to another time, either fixed or indefinite. In parliamentary usage it differs from prorogation, which is an act of royal authority, whereas the power of adjournment is vested in each House respectively.

Ad'jutant, or Adjutant-bird: an East Indian bird (*Lep-top'tilus ar'gala*) allied to the stork. It is about 5 feet high, has long legs and an enormous bill, and can swallow a cat or a small leg of mutton with the greatest facility. It is very useful as a scavenger, cleansing the streets and public squares of various offal and dead animals. The famous marabou feathers are obtained from the adjutant and a kindred species, the marabou of Africa.

Adjutant-General: the principal agent of the commander of an army in publishing orders. The same agent of the commander of a division, brigade, geographical division, or department is styled assistant adjutant-general. The laws of the U. S., however, provide for but one adjutant-general, with the rank of brigadier-general, made by regulations chief of a bureau of the war department, and charged, under the general, with details affecting army discipline, with the recruiting service, records, returns, etc.; two assistant adjutants-general, with the rank of colonel; four with the rank of lieutenant-colonel; and ten with the rank of major. The bureau duties of adjutants-general and assistants are: publishing orders in writing; making up written instructions, and transmitting them; reception of reports and returns; disposing of them; forming tables showing the state and position of corps; regulating details of service; corresponding with the administrative departments relative to the wants of troops; corresponding with the corps, detachments, or individual officers serving under the orders of the same commander; and the methodical arrangement and care of the records and papers of his office. The active duties of adjutants-general consist in establishing camps; visiting guards and outposts; mustering and inspecting troops; inspecting guards and detachments; forming parades and lines of battle; the conduct and control of deserters and prisoners; making reconnoissances; and in general discharging such other duties as may be assigned them.

Adler, CYRUS: See the Appendix.

Adler, FELIX: b. at Alzey, Germany, Aug. 13, 1851; son of Samuel Adler; graduated at Columbia College, and subsequently studied at Berlin and at the University of Heidelberg, where he obtained the degree of Doctor of Philosophy. Returning to the U. S., he was Professor of Hebrew and Oriental Literature at Cornell University from 1874 to May, 1876. On May 15, 1876, he inaugurated the Society for Ethical Culture, a religious movement the principal tenets of which he briefly describes as follows: "There is a principle of unity in nature, all the laws of which are adumbrations of an underlying unity. The same principle of unity is obligatory in the sphere of action, and imposes its imperative mandate on the will." The society has founded a system of district nursing among the poor, a free kindergarten, a workingman's school, where technical and art education are made integral parts of the course of instruction, and a family home for neglected children. He published in 1877 a series of discourses, *Creed and Deed*, in addition to which he lectures weekly in Chickering Hall during the winter. The society has its center in New York, and has a branch at Chicago. Revised by C. H. THURBER.

Ad'ler, GEORG J., Ph. D.: German philologist; b. at Leipzig in 1821; emigrated to the U. S. in 1833. He was for some time Professor of German in the University of New York. He wrote several German-and-Latin school manuals and an excellent German-and-English dictionary. D. in New York, Aug. 24, 1868.

Adler, Rev. HERMANN, Ph.D.: Jewish rabbi and author: b. May 29, 1839, in Hanover; educated at University College, London, and at the universities of Prague and Leipzig; appointed principal of the Jews' College in London, 1863; drew public attention to the persecutions of the Jews in Russia by his article on *Recent Phases of Judaism*, published in 1881; elected chairman of the Council of Jews' Colleges in 1887. Author of sermons on *The Jews in England*; *Is Judaism a Missionary Faith?*, etc.

C. H. T.

Adler, SAMUEL: Jewish rabbi; b. at Worms, Dec. 3, 1809; studied philology and philosophy at the universities of Bonn and Giessen, 1831-36; Rabbi of Alzey, 1842-57; called to Emanu-El Temple, New York, 1857, of which he became emeritus rabbi in 1874; an acknowledged authority on matters of Jewish erudition, and an ardent friend of religious and political progress. D. in New York, June 9, 1891.

C. H. T.

Adlercreutz, CARL JOHAN, Count: Swedish general; b. in Finland, Apr. 27, 1757; served against Russia in 1788, and in the Finnish war of 1808. On Mar. 13, 1809, in consequence of several unpopular actions of the king, Gustavus IV., he arrested the king in the name of the people, which act gained him great popularity. D. Aug. 21, 1815.

Adler Sal'vius, JOHAN: Swedish ambassador and diplomatist; b. in Strengnäs, Sweden, in 1590; and d. at Stockholm in 1652. He was sent by Gustavus Adolphus on various missions of importance, and during the Thirty Years War he enjoyed the fullest confidence of that monarch. After the conclusion of peace he was created a councilor and baron.

Adlersparre, GEORGE, Count: Swedish officer and statesman; b. in Jemtland, Mar. 28, 1760; took part in the wars of 1788 and 1808 against Russia, and in the deposition of Gustavus IV. He received many indications of favor from the new king, but was dissatisfied with the result of the revolution, because he had not gained as much influence as he desired. He published, from 1830-33, a number of secret documents, as well as his correspondence with Charles XIII. and others, in consequence of which he was sentenced to pay a fine. He nevertheless continued to publish these documents. D. in Wermland, Sept. 23, 1835.

Adme'tus (Gr. Ἄδμητος): son of Pheres, who was the mythical founder and first King of Pheræ in Thessaly. He was one of the Argonauts, and took a part in the Calydonian Hunt. He won the hand of Alcestis by coming to the suit in a chariot drawn by boars and lions, that being a condition imposed by the bride's father, Pelias. The god Apollo procured from the Fates a grant that Admetus might be exempt from death if his father, mother, or wife should die for him. The touching story of Alcestis and her devotion, death, and restoration to life form the subject of one of the most celebrated tragedies of Euripides.

Administra'tion: literally "management" or the conduct of business. The word is often used to indicate the action of the executive department of government, as distinguished from the legislative and judicial. It sometimes is employed with reference to trust funds, but its technical meaning is the management or disposition, according to law, of the personal estate of an intestate or of a testator having no executor. The common-law distinction between heirs on the one hand and executors and administrators on the other should be noted. When an owner of real estate died, his estate devolved upon his heirs, who were persons related to him by blood; when an owner of personal property died, leaving a testament or will, that branch of his estate devolved upon his executors, if such were named; if there were none, then upon administrators appointed by a court of justice. Administration in this sense was in England under the control of the ecclesiastical courts until 1857, when it devolved upon a newly created court of probate. In the U. S. it is generally vested in special tribunals termed probate or orphans' or surrogates' courts. By such a court administration is conferred on the person or persons entitled to it by the local rules of law. It is in general committed first to the widow or husband, then to the children, and then to the other next of kin, in a prescribed order. The court has power of selection among the next of kin in equal degree. These provisions are substantially copied from early English statutes. The person thus intrusted with the administration is called an administrator. The court grants him "letters of administration" as evi-

dence of his authority. He represents the deceased. He must make an inventory of the personal estate, collect the assets, and convert the property into cash, pay the debts, render an account, and distribute the balance in his hands among the persons entitled to it. He is a trustee, and under the control of a court of equity as well as of the probate court.

When the deceased leaves a will, but there is no executor, the person to whom administration is granted is termed an administrator "with the will annexed" (*cum testamento annexo*). In this case the will is to guide the administrator in his duties. Should an administrator die before his duties are fulfilled, another is appointed to perform the residue of his functions, called "administrator *de bonis non*."

While an administrator exercises full control over the personal estate of the deceased, his authority is confined to it unless it is insufficient to pay debts; in which case the probate court generally has by statute the right to direct him to sell enough of the real estate to satisfy them.

Letters of administration confer no power to bring actions in foreign states. Where there are assets in another state or country, a subordinate or ancillary administrator is appointed, who acts under the direction of the foreign court, and remits according to its order any funds which he may receive to the principal administrator. T. W. DWIGHT.

Administrative Law: that branch of public law which deals with the various organs of the sovereign power considered as in motion. It includes such subjects as the collection of the revenue, the collection of statistics, sanitary measures, the regulation of military and naval forces, the organization of schools, the supervision of places of amusement, the protection of the coinage, the poor laws, etc.

HENRY WADE ROGERS.

Administrator: See ADMINISTRATION.

Admirable Crichton, The: See CRICHTON, JAMES.

Ad'miral [Fr. *amiral*, from Arab. *amir*, commander; cf. *ameer*, *emir*]: the title of a naval officer of the highest rank. The English word was formerly *amiral*, as in Milton's *Paradise Lost*. Vice-admiral is the title of the officer next in rank to the admiral; and a rear-admiral is the third in the scale. Admirals are frequently called *flag-officers*, from the fact that the symbol of their rank is a flag.

The grades of rear-admiral and commodore in the U. S. navy were first established by act of July 16, 1862, which provided that the number of each grade shall not exceed 9 rear-admirals, 18 commodores, 36 captains, etc. By act of Congress of Dec. 21, 1864, the President was authorized to appoint from the rear-admirals one vice-admiral, who should be the ranking officer in the navy of the U. S., and whose relative rank with officers of the army shall be that of lieutenant-general in the army. This grade was created for and bestowed upon Rear-Admiral Farragut. By act of July 25, 1866, it was provided that the number of officers of each grade on the active list should be one admiral, one vice-admiral, 10 rear-admirals, 25 commodores, etc. The rank of admiral thus created was bestowed upon Vice-Admiral David Farragut, succeeded by David D. Porter. A law was passed abolishing grades of admiral and vice-admiral when said grades became vacant. These grades have now (1892) become vacant by the deaths of the distinguished officers who held them. Congress in 1882 provided for a reduction of the active list to six rear-admirals, 10 commodores, etc.

S. B. LUCE.

Ad'miralty [from *admiral*]: the tribunal which has cognizance of maritime causes. This court was established in England about the time of Edward III., and was at first held before the Lord High Admiral or his deputy. At present, admiralty jurisdiction is there exercised by the judge of the admiralty, who holds an instance or a prize court by means of separate commissions; the former being the ordinary admiralty court, and the latter being a special tribunal instituted in time of war to take cognizance of matters pertaining to prizes. In the U. S. exclusive admiralty and maritime jurisdiction is by the Constitution delegated to the Federal courts.

It was for a long time an unsettled question whether the word as there used had the limited sense employed in the early English statutes of 13 and 15 Rich. II., restricting admiralty jurisdiction, or whether it had a wider signification. The latter view has finally prevailed, principally owing to the arguments of Mr. Justice Story; and the word embraces not only cases occurring on tide-waters, but on

navigable streams above tide-water, including the Great Lakes. It rests with Congress to determine upon what court the jurisdiction shall be conferred. It has accordingly vested it in the first instance in the district court. No distinction is taken here between the instance and the prize court.

Admiralty jurisdiction is either civil or criminal. Its civil jurisdiction embraces cases of maritime contracts (such as affreightment, repairs of ships, bottomry bonds, pilotage, seamen's wages, and salvage), general average, collisions, and maritime trespasses in general. The principles and course of practice of the court in civil cases are in the main derived from the Roman or civil law.

Revised by HENRY WADE ROGERS.

Admiralty: the office of Lord High Admiral of England, or the commissioners for executing the office of Lord High Admiral, commonly known as the Board of Admiralty. The head of the board, or minister of marine, is styled First Lord of the Admiralty.

Admiralty Islands: a cluster of islands in the Pacific, N. E. of New Guinea, forming part of the BISMARCK ARCHIPELAGO (*q. v.*). The largest is nearly 60 miles long, and is in lat. 2° S., lon. 147° E.

Admission of New States: See TERRITORY.

Admis'sions: in the law of evidence, acknowledgments or concessions by a person of the existence of certain facts. When they relate to the matter in dispute, they are admissible in evidence against the party making them. They may be made either by a party to an action or by some one identified with him, as by a partner. The admissions of an agent will affect his principal. Those made by a predecessor in interest will affect his successor. Thus the admissions of an ancestor will charge an heir. In form, an admission may be either direct or implied from conduct, or in some instances even from silence. The effect of an admission is usually only to raise a presumption against the party, which he may rebut; but some admissions are regarded as of so high a character that the law will not allow them to be contradicted. See ESTOPPEL.

Adol'phus (or **A'dolph**) of NASSAU: elected Emperor of Germany in 1292, as successor to Rudolph of Hapsburg. In 1298 the German princes transferred the imperial crown to Albert, but Adolphus refused to abdicate. A war ensued between these rivals, and Adolphus was killed in battle near Worms, July 2, 1298.

Adol'phus Fred'erick: Duke of Holstein-Gottorp and King of Sweden; b. May 14, 1710. He was elected Bishop of Lübeck in 1727, Crown Prince of Sweden July 3, 1743, and became king on April 5, 1751. The Swedish nobles continued their arrogance under him to the utmost, so that at last he threatened to resign. In consequence of this the Parliament revoked the restrictions of the royal prerogatives. D. Feb. 12, 1771.

Adol'phus, JOHN: an English historian and lawyer; b. Aug. 7, 1768. He was noted for eloquence, and practiced with great success in criminal causes. His defense of Thistlewood, accused of treason in 1820, was highly commended. His principal work is a *History of England from the Accession of George III.* (7 vols., 1802-45). D. in London, July 16, 1845.

Ad'onai [an ancient plural of Heb. אֲדֹנָי, Lord, with suffix denoting a pronoun of the first person; cf. Fr. *monsieur*]: a term applied in the Hebrew Scriptures to God. Owing to the veneration of the Hebrews for the most sacred name of the Deity, Jehovah (or Yahveh) was not pronounced in reading the Scriptures; but Adonai was read instead of it wherever it occurred. When the Hebrew text came to be vocalized, the proper pointing of Adonai, אֲדֹנָי, was given to יהוה, so that to the eye it reads Yehovah instead of Yahveh. See JEHOVAH.

Adon'ic (in Lat. *versus Adonius*): a measure consisting of a dactyl and a spondee, or rather of an irrational dactyl (see DACTYL) and a trochee. In classic poetry it is used only as a clausula. As an independent verse it is employed in the familiar Latin hymn:

Plaudite caeli,
Rideat aether.

Ado'nis (Gr. Ἄδωνις): a youth celebrated in ancient poetic legends as a model of youthful beauty and a favorite of Venus. Addicted to the pleasures of the chase, he was killed by a wild boar. An annual festival in honor of Adonis,

called Adonia, was celebrated in Asia Minor and other countries bordering on the Mediterranean. He was called Thammuz by the Hebrew writers.—ADONIS was also the name of a river which rose in Mt. Lebanon, and flowed through Phœnicia into the sea.

Adonis: a genus of herbaceous plants, of the family *Ranunculaceæ*, natives of Europe. Several species of this genus are cultivated for the beauty of their flowers.

Ad'onists: those biblical critics who maintain that the Hebrew vowel points usually written under the consonants of the word Jehovah are not the points which properly belong to that word, but those which belong to the words *Adonai* and *Elohim*.

Adop'tian Con'troversy: a controversy which originated in Spain near the end of the eighth century. Felix, Bishop of Urgel, and Elipandus, Archbishop of Toledo, advanced the doctrine that Christ was by nature and generation the Son of God only as regards his divine nature, but as to his human nature he was merely the Son of God by adoption. Those who espoused these views were called Adoptionists (in Lat. *Adoptiani*). They have been called the Nestorians of the West. No particular notice was taken of them so long as they confined the propagation of their opinions to Mohammedan territory, but when they undertook to spread the new doctrine in the Frankish empire Charlemagne promptly put a stop to it by convening two synods, one at Ratisbon (792), another at Frankfort (794), both of which condemned Adoptionism as heresy. Elipandus, who still adhered to his views, d. in 799. Felix recanted at the Council of Aix-la-Chapelle in 799. D. in 816.

Adop'tion [from the Lat. *ad*, to, for + *optio*, a choice]: in law, is the taking a child of other parents as one's own. The practice, which was common in ancient Rome, was recognized by the civil law, and is found in countries and states where that law and its modifications still prevail. In some other states the matter is regulated by statute. The parents, guardians, next of kin, or other legal representative of the child, must in general give consent after notification of the intent to adopt. Adopted children do not, in most countries, inherit property coming from collateral relatives of the adoptive parents. Adoption is usually authorized by a probate court or other established authority after due notice. The adoption of an adult person is known in the civil law as adrogation.

Ador'no, ANTONIO: a doge of Genoa, who was driven out and re-established three times in succession. By his persuasion the Genoese agreed to the treaty, signed Oct. 26, 1396, which rendered them subjects of Charles VI. of France.

Adour, a river of Southwestern France, rises in the Pyrenees and enters the bay of Biscay a few miles below Bayonne, which is on its bank. Length, about 200 miles. It is navigable to Dax.

Adowa: the capital of the Abyssinian province of Tigré; in lat. 14° 12' N., lon. 39° 3' E.; in a well-cultivated and populous plain 6,500 feet above the level of the sea, near the ruins of Aksum, the former capital of Abyssinia (see map of Africa, ref. 4-G). It is the most important commercial town of Abyssinia. Pop. 3,000.

A'dra (anc. *Abde'ra*): a seaport of Spain, in Andalusia, 46 miles S. E. of Granada (see map of Spain, ref. 20-F). Here are extensive lead mines. Pop. 11,320.

Adrain, ROBERT, LL. D.: b. at Carrickfergus, Ireland, Sept. 30, 1775; served as an officer in the rebellion of 1798; was badly wounded; escaped to the U. S.; was Professor of Mathematics in Rutgers College (1810-13), Columbia College (1813-25), and the University of Pennsylvania (1827-34). D. at New Brunswick, N. J., Aug. 10, 1843.

Adrar: See RIO DE ORO.

Adraste'a [Gr. Ἀδράστεια, deriv. of ἄδραστος, not to be escaped; ἀ-, not + διδράσκειν, escape]: a Greek surname or epithet for the goddess Nemesis, who administered retribution for iniquity.—Also a nymph of Crete, to whom, with Ida and the Curetes, Rhea intrusted the infant Zeus in the Dictæan grotto.

Adras'tus (Gr. Ἄδραστος): King of Argos, and a contemporary of Theseus; father-in-law of Polynices. He commanded the famous expedition called the war of the "Seven against Thebes," to restore Polynices to the throne of Thebes. This enterprise, which was not successful, was a favorite theme of ancient epic and tragic poets.

A'dria, or Ha'dria: an ancient town of Italy, situated between the Po and the Adige, in the province of Rovigo, 13 miles E. of Rovigo (see map of Italy, ref. 3-D). It was in ancient times a seaport on the Adriatic, but it is now 14 miles from that sea. Pop. (1881) 15,806.

A'drian: city and railroad center (for location of county, see map of Michigan, ref. 8-J); capital of Lenawee co., Mich., 30 miles W. of Toledo and 74 miles W. S. W. of Detroit, is intersected by the river Raisin, which furnishes water-power. The city has fine schools, the Central public-school building costing \$100,000. It has also a mineral spring, a Masonic temple, costing \$100,000, and an opera-house. Adrian College, a Methodist institution, is finely located on the western boundary of the city. Adrian has a variety of manufactures, among which may be mentioned railroad cars, furniture, electric appliances, canning-works, straw and felt goods, and brick and tile machines. Pop. (1880) 7,849; (1890) 8,756; (1900) 9,654.

EDITOR OF "TIMES AND EXPOSITOR."

Adrian, Emperor of Rome: See HADRIAN.

Adrian I.: a native of Rome; elected pope in 772. His dominions were invaded by the King of the Longobards, against whom Adrian was defended by Charlemagne. Under this pontiff Rome enjoyed more than usual prosperity. D. in Rome, Dec. 25, 795.

Adrian IV. (NICHOLAS BREAKSPEAR): the only Englishman who ever attained the dignity of pope; b. near St. Albans. He became Cardinal-Bishop of Albano in 1146, and was chosen pope in 1154. He was a strenuous asserter of papal supremacy. D. at Anagni, Sept. 1, 1159.

Adrian VI.: b. at Utrecht, Mar. 2, 1459; was a preceptor of the Emperor Charles V.; succeeded Leo X. in 1522. He favored reform, and was honest and virtuous. D. in Rome, Sept. 14, 1523.

Adria'ni, JOHN BAPTIST, or GIOVANNI BATTISTA: b. at Florence, Italy, in 1513. He became in 1549 Professor of Eloquence in the University of Florence, and held that office till his death; wrote a history of his own times (i. e. an. 1536-1574). D. in 1579.

A'drianists: disciples of Simon Magus, who flourished about A. D. 34. They were probably a branch of the Simonians, and named from some prominent disciple.

Adriano'ple (anciently *Adrianopolis*, or Hadrian's city; Turk. *Edreneh*): a large city of European Turkey, on the river Tundja near its confluence with the Maritza (the ancient Hebrus); 137 miles W. N. W. of Constantinople (see map of Turkey, ref. 4-D). The name is derived from the Roman Emperor Hadrian, who founded a city here. It was the capital of the Ottoman empire from 1361 until 1453. Here is the famous mosque of the Sultan Selim, which is said to be the finest Moslem temple extant, and has four lofty minarets. Among the other public structures are a palace, the bazaar of Ali Pasha, and an aqueduct by which the city is supplied with water. Here are extensive manufactures of silk, cotton, and woolen stuffs. Among the exports are opium, leather, wool, and attar of roses. Adrianople is the residence of the governor-general of the vilayet Edreneh, and of a Greek bishop. Pop. about 100,000.

M. W. H.

Adrian's Wall: See HADRIAN'S WALL.

Adriat'ic Sea (Lat. *Mare Adriaticum*): a portion of the Mediterranean, lying between Italy on the one hand and Illyria and Albania on the other. The name is derived from the town of Adria. It is about 500 miles long from N. W. to S. E., and has a mean width of about 100 miles. The N. W. part of it is called the Gulf of Venice, and at the S. E. end it is connected by the Strait of Otranto with the Ionian Sea. The N. E. coast is rocky and begirt with a great number of islands. The depth and extent of the Adriatic have been greatly diminished by deposits of sand and mud and by the formation of alluvial tracts along the shore. The encroachment of the land is most remarkable on the W. and N. W. coasts of the Gulf of Venice.

Adul'lam: a city of Judah; the seat of a Canaanite king, and evidently a very ancient place. Its site has been identified by Ganneau with 'Aid-el-Ma (the Arabic equivalent of Adullam), about 8 miles N. E. of Eleutheropolis (modern Beit-Jibrin), which is traditionally located 6 miles S. E. of Bethlehem. The famous cave of King David is in a hill about 500 feet high. The sides of the valley are full of caves.

Adulteration: defined by Hassell as the intentional addition to an article of any substance or substances the presence of which is not acknowledged in the name under which the article is sold, for the purposes of gain, deception, or concealment. Every civilized country has enacted laws to prevent and punish adulteration, and throughout Europe these laws are stringent and, for the most part, rigidly enforced. Although Germany protects her own citizens against adulteration, many articles manufactured there "for export" are specially exempt from the provisions of her adulteration laws. Nearly every article made by man for man's use is or has been debased by man for purposes of gain. Numerous excuses have been urged in defense of adulteration. Several of these bear so directly on the subject that they are worthy of mention. One is that popular taste and desire demand certain adulterations; for example, pickles and pease colored green with copper salts often find a readier sale than those uncolored. Another excuse is that the public demand cheapness, and to meet this demand competition forces on the market articles that are more or less spurious. A third excuse is that certain additions must be made to perishable foods to make them keep. These excuses are all plausible, but the answer to each is obvious. The substances employed for the different purposes of adulteration are numerous, and depend upon the object aimed at. Thus for increase of bulk or weight of a given article a cheaper inert substance is added. To increase attractiveness, coloring-matter is used. To add flavor, a cheap compound, usually made from essential oils or ethers, is utilized. Very commonly all three of these forms of adulteration are seen in one adulterated article. The adulteration for bulk so reduces the natural color and flavor that artificial coloring and the addition of some flavoring-essence are necessary to conceal the fraud.

The sanitary aspect of adulteration is its most important one. The adulteration of articles of food, drink, or drugs with substances that are in themselves harmless but inert effects harm by reducing the natural strength and properties of the adulterated article. The nourishing properties of the food or beverage are impaired, or the drug does not do the work intended by its prescriber. Poisonous or harmful adulterants are frequently used. The writer in numerous instances has detected manufacturers of food-articles adding to their products, for the purposes of adulteration, such substances as Paris green, chromate of lead, mercurial pigments, borax, salicylic acid, copper salts, poisonous aniline pigments, cocculus indicus, mineral earths, etc.

The most important and serious adulteration, however, is that practiced in connection with the milk supply. Milk is often the exclusive food of babes and invalids. Consequently its reduction means the robbing of these of their proper nourishment. Any deleterious substance added to it affects a class of individuals who are most susceptible to deleterious influences. It is very easy to adulterate milk, and the profits derived from the practice are enticing. The adulteration of milk at the present time is usually effected by the addition of water, coloring-matter such as annatto, turmeric, and antiseptics or antiferments, such as carbonate of soda, borax, etc., or by the removal of the cream, either wholly or in part. Such substances as calves' brains, gelatin, starch, or chalk are never used at the present time. The addition of water and, in some cases, the removal of the cream may be detected by means of the lactometer. The lactometer is a delicate hydrometer which indicates the specific gravity at a temperature of 60° F., between 1.00000 (the specific gravity of pure water) and 1.03480. On the scale the specific gravity of water is indicated by 0°, the specific gravity of 1.03480 by 120°, the space between 0° and 120° being divided into 120 equal parts. The 100° mark indicates a specific gravity of 1.02900. The results of many thousand tests with the lactometer have conclusively shown that milk from a healthy cow in normal condition will never show a specific gravity of less than 100°, at a temperature of 60° F. If, then, a sample of milk stands below 100° on the lactometer, at 60° F., the sample has been adulterated by the addition of water. The space between 0° and 100° being divided into 100 equal parts, each part indicates 1 per cent. If, therefore, the milk tested has a specific gravity indicated by 90°—that is, if the lactometer floats at 90°—it is safe to assume that at least 10 per cent of water has been added. It must be remembered that in average milk the lactometer will stand at points between 105° and 115°, at 60° F. From 5 to 15 per cent of water may therefore be added to average milk without bringing it below 100° on the lactometer. The

proper method of using the lactometer is as follows: The milk to be tested is thoroughly mixed by stirring, a sample taken, and the latter warmed or cooled, as the case may be, to 60° F. The lactometer is carefully placed in it, and the mark at which it floats noted. Now remove the lactometer, and observe the character of the film adhering to it. If this runs off readily, and is thin and bluish, and if the sample has a watery taste, the lactometer standing below 100°, it is certain that water has been added. If the appearance and taste are as above stated, the lactometer standing at some point higher than 100°, the milk has been skimmed, or skimmed and watered. As skimmed milk has a specific gravity much greater than whole milk, the cream, its lightest constituent, having been removed, it will stand high when tested by the lactometer, and will, of course, have a thin appearance and a flat taste. On the other hand, cream will stand at points much below 100° on the lactometer, but it is impossible to confound cream with milk, and much less with milk that has been watered. If the lactometer floats at some point greater than 100°, the appearance being whitish and the taste of the milk creamy, we may assume that the milk has not been adulterated by the addition of water or by the removal of cream. The removal of cream may be detected by means of the cream-gauge, which consists of a hollow glass cylinder divided into 100 equal parts. The milk is placed in it, the cream allowed to rise, and the amount noted. Each division, of course, represents the percentage of cream present. The removal of cream may also be detected by means of the lactoscope, that devised by Prof. Feser being a convenient form for use. This instrument is constructed on the principle that the transparency of a layer of milk is inversely as the quantity of fat in the milk. It consists of a hollow glass cylinder doubly graduated, one scale giving the number of cubic centimeters of water used for the dilution, the other indicating the percentage of fat. In the lower part of the cylinder a small cylindrical piece of opaque white glass is fixed, which is marked with black lines. In testing a sample of milk 4 cubic cm. are transferred to the apparatus by means of a pipette. Water is then gradually added, the mixture being thoroughly shaken after each addition, until all the black lines on the cylinder can be read, when the scale indicates the percentage of fat in the milk. Adulteration of milk by water from an infected source has frequently caused outbreaks of typhoid fever. The adulterator is not fastidious as to the purity of the water he adds. The writer has found frogs and small water-snakes in milk adulterated with water in New York city.

Malt beverages, ale and beer, are very commonly adulterated. The color of these drinks should be due solely to the degree of heat to which the malt has been subjected in the kiln, or to the ripeness and color of the hops used. To attain a perfect color great care must be exercised. Careless brewers, when they fail to attain it in the proper way, use burnt sugar. Beer is also flavored artificially by the addition of such bitters as *pieric acid*, *cocculus indicus*, and *strychnia*; also *quassia*, *wormwood*, and *gentian*. Drugs in great variety are used in the adulteration of ale and beer. In nearly every large city several so-called brewers' druggists may be found. Some of these drugs are used to give the beer an appearance of strength, and to make it froth or "head" well. For this purpose *alkalies*, *iron* and *salt* are employed. Occasionally *cream of tartar* is added to give the beer a hardness characteristic of age.

Wines.—The adulteration of wines is practiced in a variety of ways. Coloring-matter is added; commonly some coal-tar product, such as *fuchsine*; occasionally *Brazil-wood* or *logwood*. Wines are frequently fortified by the addition of *alcohol*, and flavored by means of various flavoring agents. The writer once detected a manufacturer of wine (so called) in the city of New York, who managed to produce a rather attractive-looking wine without the use of a single grape. His method was as follows: A decoction was made from dried peaches, which was carefully strained and fermented. After fermentation had reached a certain point it was stopped by heat and the addition of *salicylic acid*; a certain amount of *alcohol* and artificial flavor were then added, and a red color imparted to it by means of *fuchsine*. *Salicylic acid* is a common adulterant of wine, being added to insure against loss by souring. Very large amounts of this substance are frequently found in specimens of wine. This is in consequence of each person through whose hands the wine has passed, being afraid of its spoiling while in his possession, having added a little of the acid and being ignorant of the fact that it was previously adulterated.

Whisky, gin, brandy, rum, and the like are made by the following means: Proof spirits are reduced by the addition of water to a proper degree, and flavored with a flavoring-essence made of an etheric compound. *Vinegar* is adulterated by being reduced with water, and subsequently fortified by means of *sulphuric* or *hydrochloric acid*. The coloring-matter used is *burnt sugar*. *Cider* is usually adulterated with *salicylic acid* in order to make it keep.

Olive Oil.—Cotton-seed oil has become the almost exclusive adulterant used to debase olive oil, although mustard-seed oil is still used to some extent for this purpose.

Confectionery has been one of the most commonly adulterated articles. At the present time the manufacturers of candy are so closely watched that the practice is rare. Substances used to adulterate confectionery for bulk are *terra alba*, *starch*, finely powdered *asbestos*, *sawdust*, *Indian meal*, *glue*, etc. For color, nearly every poisonous pigment known to man has been employed.

Sugar.—The adulterants of cane-sugar are mainly *terra alba* and *glucose*. The latter substance, being *hygroscopic*, must be mixed with the cane-sugar very soon before sale, otherwise the admixture of the two will result in a solid mass. *Ground quartz* and *sand* have also been detected as sugar adulterants.

Honey.—Cane and grape sugar are very frequently added to strained or extracted honey and bee-bread used to strengthen the diluted flavor.

Tea and *coffee* are both subjects of the adulterator's art. Green teas are "faced" and "painted." This is done by shaking the leaves in pans and dusting over them powdered *soapstone* and *Prussian blue*. "Lie tea" is an example of Chinese dexterity. "Spent" tea leaves are rolled up by the nimble-fingered Celestials, who deposit in the center of each leaf a few grains of sand to add to its weight. The Chinese also sometimes add *sulphate of iron* to "spent" tea leaves to color the resulting infusion, and make it appear stronger than ordinary. Many kinds of leaves other than those of the tea-plant are added to tea; *rhododendron*, *chrysanthemum*, and *willow leaves* are examples.

Coffee.—The commonest adulterants of ground coffee are *chicory* and dried *blackstrap molasses*. *Roasted wheat*, *acorns*, *sawdust*, *Venetian red*, *pease ground* and *roasted*, and *beans* are also used. The unground coffee bean is frequently treated in a curious way: Mexican and South American coffees are made to resemble Java by putting the beans of the former into large boxes and causing them to swell through the medium of steam heat. After the berries have attained the size of those from Java, they are colored brown with *burnt umber* or some other brown pigment. Damaged coffee is painted by revolving it in large boiler-iron cylinders, while it is sprinkled with a mixture of *chromate of lead* or *turmeric* and *Prussian blue*, which restores its bright green color.

Bread.—The adulterants of bread are principally *alum* and *sulphate of copper*, added to effect whiteness.

Flour.—Damaged wheat flour is easily repaired by the addition of *alum* and *carbonate of soda*. This is done to harden the partially decomposed gluten and to correct acidity due to decomposition. Occasionally the hydrated *sulphate of lime* is added to flour. To increase the bulk *terra alba* has been used.

Mustard and *spices* are very difficult to obtain pure. Adulterants of the former are *turmeric* and *naphthaline-yellow*, and, for bulk, *wheat flour*. The spice adulterants may be purchased by the barrel of many wholesale spice firms, and are called by the slang term "P. D." As the adulteration of spices has little, if any, sanitary significance, the practice is practically unrestricted. "P. D." is made from *sawdust*, *ground nutshells*, and *ground olive pits*, colored with *mineral earths*, when color is necessary.

Butter.—*Annatto*, the only coloring-matter that can be used in connection with this substance, can hardly be considered as an adulterant, nor can the use of *oleomargarine* in its place when the latter is sold under its own name. *Starch* is said by some authorities to be an adulterant of butter. The writer has never been able to verify this statement. Foreign fats (i. e. fats other than milk fats), however, are frequently added to butter to increase its bulk.

Jellies and *jams* are adulterated in a very ingenious manner. To enable the jelly to "jell" with a minimum amount of *sugar*, *gelatin* or *glue* is added. The use of these substances also permits the manufacturer to utilize *glucose* in the manufacture of his wares. The compound of *glucose* and *glue* is colored with an *aniline dye*, usually *fuchsine*, and

a body is imparted to the mass by adding dried apples that have been stewed in water almost to solidity, and strained under pressure. Cider jelly is also used as a basis for the various fruit jellies. To convert the basis into any desired jelly, the manufacturer adds one of the flavoring-ethers and a red color, usually fuchsine, and the result is attained.

Flavors.—The various natural fruit flavors are all imitated and adulterated by means of the artificial flavoring-ethers. These are compounds of wine, wood, and potato ethers. Thus, for example, pineapple oil is made by combining wine ether with butyric acid and then dissolving the resulting product in alcohol.

Drugs.—The commonest adulteration of drugs is by means of damaged or "spent" drugs of the same kind as those adulterated. The essential oils are often reduced, the more expensive ones by admixture with essential oils of less cost. Thus, for example, the oil of peppermint is frequently diluted with the oil of pennyroyal. The fixed oils are also used to adulterate the essentials. This practice is easily detected by the fact that the boiling-point is reduced in proportion to the amount of the adulteration.

Tobacco is frequently adulterated by the addition of some flavoring agent. It is also colored by means of various pigments. For the former purpose hippuric acid and various fruit flavors and flavoring-ethers are used; for the latter, aniline pigments and lead chromate are utilized. Snuff, especially, is adulterated with this latter substance. Lime is also used very commonly to adulterate snuff.

The Detection of Adulteration.—Before proceeding to the examination of any article for the purpose of discovering whether it is adulterated or not, it is necessary to become thoroughly acquainted with the appearance and structure of the article itself. If the substance be in a state of powder, nothing more is necessary than to place a very minute portion of it upon a glass slide, add a drop or two of water, cover it with a microscope cover-glass, and place it under the microscope for observation. A sample of known purity of the same kind as the article to be examined can be observed side by side with that suspected. The difference will be obvious. If the substance be a solid one, it is necessary to make some thin slices of it, and proceed as in the first case. The microscope is specially fitted for the detection of organized structures and substances, whether animal or vegetable. The best method of detecting chemical adulterants and salts is by the use of chemical reactions and analysis.

CYRUS EDSON.

Adultery: sexual intercourse between two persons who are not husband and wife, and one or both of whom are married. This act has been punished by the laws of some nations with great rigor—among the ancients often with death. In English law the act is not treated as a temporal crime, but left to the cognizance of the spiritual courts. A civil action for damages may by common law be brought by a husband against one who has committed adultery with his wife. This is called an action "for criminal conversation." It is also a ground of divorce—at first partial, but now, by statute, total. In some of the States of this country adultery has been made a crime, while in others the English law in its substance still prevails, and only the civil proceedings are allowed.

Advancement: in law, is a provision of money or other property, made by a parent for a child in advance or anticipation of the estate or distributive share to which such child would be entitled on the parent's death. An expenditure for the education and maintenance of a child is not regarded as an advancement. It must be made with a view to a portion or settlement in life. The parent's intent is the main subject of inquiry. In the English law of real estate it only applies in case of several female heirs, who take the interest called coparcenary. In the American law of descent the subject is of general application. The effect of an advancement is to reduce the child's share to that extent, estimating the value as of the time of the receipt. An advancement differs from a debt in that the latter can be recovered by action, while the former can only be deducted from a distributive share. It is at the option of the person advanced to bring in to the general distribution the amount received or not. In the English law the act of bringing it in is termed hotchpot. The doctrine strictly applies only to cases of intestacy. There is a cognate doctrine termed "ademption," applicable to the case of property left by will. In this country the subject is often governed by statute, sometimes establishing distinct rules

for real and personal estate. The word "advancement" is also used in the law of trusts to indicate that a purchase of land made in the name of a wife or child or other person as to whom the purchaser stands in the place of a parent shall actually belong to such person, and shall not, by the fiction of a resulting trust, revert beneficially to the purchaser.

T. W. DWIGHT.

Advancement of Science: See AMERICAN ASSOCIATION FOR ADVANCEMENT OF SCIENCE, and BRITISH ASSOCIATION FOR ADVANCEMENT OF SCIENCE.

Ad'vent [Lat. *adventus*, from *ad*, to + *venire*, come, referring to the coming of Christ]: the period of four weeks preceding Christmas, with which the ecclesiastical year begins. Roman Catholics and many members of the Anglican communion observe Advent by abstaining from public amusements and nuptial festivities. The Greek Church lengthens the period to six weeks.

Revised by W. S. PERRY.

Ad'ventists: a body of Christians whose distinctive characteristic is a belief in the speedy advent or second coming of the Lord Jesus Christ. In 1833 William Miller (*q. v.*) was led by the study of the prophecies of the Bible to the belief that the second advent and the final judgment would occur in 1843. He had at one time about 50,000 followers; and notwithstanding the failure of this and other predictions fixing a definite date, there are, it is believed, about 70,000 members of the Adventist churches, who at present do not presume to foretell the period of the second advent, but live in expectation of that event. They are congregational in church government, practice immersion, and in general hold the orthodox views. With the exception of the Evangelical Adventists, they believe in the ultimate annihilation of the wicked, and in the sleep of the dead until the final judgment. They are divided among six denominations (the numbers are from the census of 1890), viz.: 1. EVANGELICAL ADVENTISTS: this is the original body, formed 1845; differs from all the other bodies in affirming conscious suffering of the lost in the middle state and the eternity of future punishment; they number 1,147 members; their organ is *Messiah's Herald* (Boston). 2. SEVENTH-DAY ADVENTISTS: formed 1845; consider observance of Saturday as the Sabbath and foot-washing obligatory; number 28,991 members; their organ is *The Advent Review* (Battle Creek, Mich.). 3. THE CHURCH OF GOD: a seceding branch of the preceding, formed 1866; denies the application of Rev. xiii. 11-17 to the U. S.; numbers 647 members; organ, *The Advent and Sabbath Advocate* (Stanberry, Mo.). 4. LIFE AND ADVENT UNION: originated 1848; organized 1864; numbers 1,018 members; has members in Great Britain; organ, *The Herald of Life* (Springfield, Mass.). 5. AGE TO COME ADVENTISTS: originated 1851; organized 1881; numbers in U. S. and Canada 4,000; organ, *Words of Cheer* (Brooklyn, N. Y.). 6. ADVENT CHRISTIANS: formed 1861; is found in all the States (25,816 members), Canada, England, Ireland, and India; organ, *The World's Crisis* (Boston, Mass.).

Revised by S. M. JACKSON.

Ad'verb [Lat. *adverbium*; *ad*, to + *verbum*, verb, a formal translation of Gr. *ἐπιρρημα*, *ἐπί*, to + *ῥῆμα*, verb]: one of the parts of speech in grammar. The adverb in all languages is indeclinable (though sometimes subject to the change of form known as comparison), and is used to express some modification of a verb, adjective, or other adverb, as to place, time, cause, manner, intensity, certainty, conditionality, quality, quantity, etc. The function of an adverb is often performed by a sentence or part of a sentence. Most English adverbs are formed by adding the suffix *ly* to an adjective or its root, though many are not thus formed.

Adverse Possession: See DISSEIZIN.

Advertisements (eccles.): certain statements of principles, rules, suggestions, and directions drawn up by the Elizabethan bishops, and issued for the guidance and direction of the Church. In the Folkestone ritual case (*Ridsdale vs. Clifton et al.*, Sir James Stephen, Q. C., contended that the "advertisements had not the force of law, but were a mere administrative act, done by the bishops of that time, not merely without the authority of the queen, but the queen expressly withholding her authority, for reasons still on record." The judgment of the Lords of the Judicial Committee of the Privy Council, on the appeal of *Ridsdale, clerk, vs. Clifton*, was that the advertisements of Queen Elizabeth issued in 1566 were a "taking of order" within the act of Parliament, by the queen, with the advice of the metropolitan.

W. S. PERRY.

Advocate [Lat. *advocatus*, one summoned to aid; *ad*, to + *voca're*, call]: in ecclesiastical and civil law courts, same as counselor or counsel in common law courts. The term by which the members of the bar in Scotland (following the civil law) are known is the Faculty of Advocates. In a popular sense, the word denotes a defender or protector generally, especially one who pleads for his client in open court.

Advocate, Lord: the public prosecutor of criminals and the senior counsel for the Crown in civil causes in Scotland. He is sometimes styled king's (or queen's) advocate, and is the first law-officer of the Crown for Scotland.

Advocate of the Church (Lat. *advocatus ecclesie*): in the Middle Ages, a canon or a layman, often a prince or baron, who assumed the protection of a bishop's see, a monastery, or a particular church. Sometimes the office was hereditary, when it appears to have implied the duty of defending the Church's rights by force of arms. Oftener, perhaps, it was held by an *advocatus causarum*, a person appointed by a prince to defend the Church temporalities in secular courts of law. They often administered justice in the name of the Church. They collected tithes and other revenues, and were frequently priests who enjoyed lucrative benefices. The people suffered so severely from their oppressions that Pope Urban III., in 1186, undertook to reform the abuse; but so great was the opposition of the Church and nobles that it was not for many years that the evil was modified.

Advocates, Faculty of: the associated members of the legal profession in Scotland. This society was formed in 1532.

Advocates' Library: the largest library in Scotland, belongs to the Faculty of Advocates, and is located in Edinburgh. It was founded in 1682 by Sir George Mackenzie, and contains about 200,000 volumes. It ranks as the fourth library in the number of volumes in Great Britain.

Advocatus Diaboli [i. e. the devil's advocate]: in the Roman Catholic Church, a person whose business is to magnify the faults or detract from the merit of those who are proposed to be canonized as saints. He is opposed by an *advocatus Dei*, or God's advocate.

Advowson [from O. Fr. *avoison* < Lat. *advocatio*, orig. the duty and right of an advocate or defender]: in English law, the right of presentation to an ecclesiastical benefice or a vacant living in the Church. The right of advowson is given by Blackstone in his commentaries as an instance of an incorporeal hereditament, of which no bodily possession can be had, but which exists solely in contemplation of law. Advowsons are of two sorts, *appendant* and *in gross*. The lord of a manor by building a church acquired the right of nominating the minister, and as long as this right continues annexed to a manor it is called an advowson appendant. When the advowson exists as a personal right, independent of any manor or land, it is said to be in gross. Most of the benefices of the English Church are presentative advowsons. Of nearly 12,000 church benefices, about one-half belong to the Crown, the bishops and other higher clergy, the universities, etc.; the remainder are in the gift of private persons. In most cases, however, the bishop has a right to reject the appointee if he chooses. They may also be either *presentative*, where the patron presents the parson to the ordinary; or *collative*, where the bishop is both patron and ordinary; or *donative*, where the patron puts the clerk in possession without presentation to the ordinary; or *elective*, as in the case of advowsons held by cathedral chapters or trustees and others.

Revised by W. S. PERRY.

Adyar: an aristocratic suburb of Madras (*q. v.*).

Echmal'otarch [Gr. *αἰχμαλωτάρχης*, from *αἰχμάλωτος*, captive + *ἄρχεω*, rule]: the title of the governor of the captive Jews residing in Chaldæa, Assyria, and the adjacent countries. He was called by the Jews themselves *roschgaluth*, chief of the captivity.

Ædile [Lat. *ædilis*, pertaining to buildings (*ædes*)]: a Roman magistrate who superintended the temples and other public buildings, the public games and spectacles, and performed various other duties. Two curule ædiles were annually elected. There were also "plebeian ædiles." Colonies and other towns had ædiles. This office was one of dignity and honor, though reckoned as a minor magistracy. See Schubert, *De Romanorum Ædilibus* (1828).

Ædon (Greek *Ἄδων*): in Greek mythology, a daughter of Pandareus of Ephesus. According to the *Odyssey*, she was the wife of Zethus, King of Thebes. Envious of Niobe, her brother Amphion's wife, she attempted to slay the eldest son of the latter, but by mistake killed her own child, Itylus. Zeus changed her into a nightingale, whose sad notes are the expressions of Ædon's woe. There are other and different traditions as to Ædon's crime and suffering, but in all she is transformed into the nightingale.

Æge'an Sea [Lat. *Ægæum Mære*; Gr. *Αἰγαῖον πέλαγος*, perhaps from *αἰγίς*, a squall, though other etymologies have been given], or **Grecian Archipelago**: the name given by the ancients to that part of the Mediterranean which lies between Asia Minor and Greece. Its length from N. to S. is about 400 miles, and its breadth about 200. It is very deep, and incloses numerous islands, several of which are of volcanic origin, while others are composed of white marble. Many of them rise to the height of 1,600 feet.

Ægidius Colou'na: an eminent schoolman; born at Rome in 1247 of an illustrious stock. He joined the order of Augustinian Hermits, and was a pupil of Aquinas and Bonaventura. In 1292 he became prior-general of his order. He went to France, where Philip the Bold made him tutor for his son, afterward Philip the Fair. In 1296 he became Archbishop of Bourges. For many years he taught with applause in the University of Paris, and was called *Doctor Beatus et Fundatissimus* and *princeps theologorum*. D. Dec. 22, 1316. He left a great number of writings, most of which are now in MS.

Ægilops: a genus of grasses, now united with *Triticum* (wheat), notable for containing *Æ. ovata*, of Southern Europe, which some botanists consider to be the wild state of wheat.

Ægi'na (Gr. *Αἴγινα*), **Egina**, or **Engia**: an island of Greece; in the Gulf of Ægina (*Saronicus Sinus*), 20 miles S. S. W. of Athens (see map of Greece, ref. 17-K). It is 8 miles long and nearly the same in width. It is of an irregularly triangular shape. Area, 33 sq. miles. The western half is a fertile plain; the remainder is diversified by mountains, hills, and valleys, which produce almonds, wine, olive oil, etc. This island is celebrated for its architectural remains. See **ÆGINETAN SCULPTURES**. Pop. 6,000. At the N. W. end of the island is the modern town of Egina. Mt. St. Elias, the highest point of the island, is in lat. 37° 42' N., lon. 23° 30' E. The island is difficult to approach.



Ruins in Ægina.

Ægina, GULF OF (the ancient *Saronicus Sinus*): a portion of the Ægean Sea lying between Attica and the Morea. It contains the islands of Ægina and Salamis.

Æginetan Sculptures, ee-jin-ee'tan: a collection of ancient sculptures discovered on two pediments of a ruined temple of the Doric order in the island of Ægina about 1811. They were removed in the same year and sold to the Crown Prince of Bavaria (afterward King Ludwig I.). By him they were placed in the Glyptothek at Munich. They have been much restored by Thorwaldsen, but are still of the greatest value as specimens of Greek sculpture of a period shortly before its culmination. RUSSELL STURGIS.

Ægir, ee'-gèr: in Scandinavian mythology the god that presides over the stormy sea. He entertains the gods splendidly every harvest and brews ale for them. The name still survives in provincial English for the sea-wave in rivers.

Ægi'ra (Gr. *Αἴγιρα*): one of the twelve cities of the ancient Achaean confederation in Greece. It probably stood near the sea and on the river Crius, though its site is not well known at present. It was famous chiefly for its temples of Zeus, Apollo, Artemis, and Aphrodite Urania (the "heavenly Venus," a goddess who was especially worshiped here), as well as of other divinities. This town is called *Hyperesia* by Homer.

Ægis: the shield of Zeus, from *αἴξ*, a "she-goat," so called because, in his contest with the Titans, Zeus wore the

hide of the goat Amaltheia, which had suckled him in his infancy, together with the head of the Gorgon.

Ægis'thus (Gr. Αἴγισθος): in classic mythology, a son of Thyestes, and an adopted son of Atreus. He seduced Clytemnestra while Agamemnon was absent, and was her accomplice in the murder of that king. He was killed by Orestes.

Ægium (Gr. Αἴγιον; now *Vostitza*): a city of ancient Greece. It belonged to the Achæan League, and after 373 was the chief city in that confederation, of which it was long the capital. It had a good harbor. Remains of its ancient buildings are yet to be seen. The modern town is a place of some importance (see map of Greece, ref. 16-J). It is surrounded by gardens. On Aug. 23, 1817, it was visited by an earthquake which destroyed two-thirds of the houses. Pop. (1879) 5,311.

Ægospot'ami (Gr. Αἴγος ποταμοί): a small river and a town in the Thracian Chersonese, where the Spartan Lysander defeated the Athenian fleet in 405 B. C. This victory ended the Peloponnesian war. A large ævolite fell near this place about 465 B. C.

Ægypt'us (Gr. Αἴγυπτος): a son of Belus and a brother of Danaus, became King of Arabia, and conquered the country which derived from him the name of Egypt. According to a legend he had fifty sons, who were murdered (except one) by the daughters of Danaus. See DANAIDES.

Ælian (*Claudius Ælianus*) of **Præneste**: flourished about 200 A. D.: an entertaining writer in spite of his peevish Greek style and his untrustworthiness. In the seventeen books of his *Nature of Animals* he gossips and moralizes about the ways of beasts. In the fourteen books of his *Miscellaneous Information* (Ροικίλη ἱστορία) the anecdotes deal chiefly with mankind. The *Rustic Letters* preserved under his name are not genuine. Ed. by Hercher (1864); the *Varia Historia* by Perizonius (1701); the *De Animalium Natura* by Jacobs (1832), in 2 vols. See W. Schmid, *Ælian* (1893).

Ælius Sti'lo, LUCIUS (surnamed also *Præconinus*): a Roman knight from Lanuvium, regarded as the most learned man of his time (about 100 B. C.), and the first Roman philologist; was the teacher of Cicero and Varro; and devoted himself to the criticism and interpretation of the early Latin poets, the laws of the Twelve Tables, and the Salian hymn. See F. Mentz, *De L. Ælio Stilone* (Leipzig, 1888). M. WARREN.

Æne'as (Gr. Αἰνέας): the hero of Vergil's *Æneid*, was, according to tradition, the son of Anchises and the goddess Venus. He was one of the most valiant defenders of Troy against the Greeks. According to Vergil, he, after many adventures and disasters, settled in Italy, and married Lavinia, the daughter of King Latinus. The origin of the Roman state is traditionally ascribed to him and his heirs.

Æne'id (Lat. *Æne'is*): the title of Vergil's great epic. See VERGIL.

Æo'lia (Gr. Αἰολία), or **Æo'lis** (Gr. Αἰολίς): a region of Asia Minor, so called from the Æolians, who settled there and founded several cities on different parts of the coast. It was more especially in Lesbos, and along the neighboring shores of the Gulf of Elea, that they finally concentrated their principal colonies and formed a federal union, called the Æolian League, consisting of twelve states and several inferior towns.

Æolian Harp: a simple musical instrument, the sounds of which are produced by the vibration of strings moved by wind. It is formed by stretching eight or more strings of catgut, tuned in unison, across a wooden box, which is placed in an open window. Athanasius Kircher (1602-80) was the inventor.

Æolians [so named from *Æolus*, a son of Hellen]: one of the primitive tribes of the ancient Greeks. They were the dominant race of Thessaly and Bœotia. They founded on the western coast of Asia Minor many states or cities, among which were Smyrna and Mitylene. The Æolic dialect was harsh, and approached the character of the Doric. It preserved the digamma for a long time. The fragments of Alcæus and Sappho present the typical Æolic language. See ÆOLIA.

Æol'ipile, or **Æol'ipyle** [Lat. *Æolus* + Gr. πύλαι, doorway]: an instrument that illustrates the expansive force of steam when generated in a closed vessel. It is said to have been invented by Hero of Alexandria (second century

B. C.), and consists of a hollow metallic ball, having two hollow arms in the same axis with their tips bent in opposite directions. When the ball is filled with water and heated, steam issues from the narrow orifices of the arms with sufficient force to cause the ball to revolve. It was thought to illustrate the origin of the winds; hence the name.

Æolus, ee'ō-lūs: son of Hellen, brother of Dorus, father of Sisyphus; ruled over Thessaly; reputed to be the founder of the Æolic branch of the Greek race. Often confounded with *Æolus*, the "god of the winds," who was the son of Hippotas and reigned over the Æolian islands. He was an astronomer, and the reputed inventor of sails.

Æ'on (Gr. αἰών): an age, a period of time; also eternity. The Gnostics used the word æons as meaning distinct entities or virtues that emanated from God before time began.

Æpi'nus, FRANZ MARIA ULRICH THEODOR: b. at Rostock, Dec. 13, 1724; studied medicine, physics, and mathematics; became Professor of Physics in St. Petersburg in 1757; was appointed teacher of physics to the Czarowitz Paul, and superintendent of the normal schools of Prussia. D. at Dorpat in Aug., 1802. He improved the microscope, invented the electrophorus, discovered the electrical polarity of tourmaline, and wrote *Tentamen Theoriæ Electricitatis et Magnetismi* (1759); *Réflexions sur la Distribution de la Chaleur sur la Surface de la Terre* (1762); *Description des nouveaux Microscopes* (1789), etc.

Æpyornis: See the Appendix.

Æra'rians (Lat. *ærarii*): a class of inhabitants of ancient Rome who did not belong to any of the tribes or centuries, and who had no civic rights except the protection of the state. Any citizen, no matter how high his rank, for bad conduct might be degraded to the rank of an ærarian by the censors, but the punishment was not in all cases a lifelong one. The Cærites seem to have been ærarians; at any rate, the disfranchisement of a citizen was sometimes called "*in Cæritum tabulas referri*," or "being placed in the list of Cærites." Persons declared infamous became ærarians. This class is also believed to have included a large number of small retail merchants, who came to Rome from the provinces without authority, and were received into no tribe. Ærarians paid a heavy tax, but were exempt from military duty.

Æra'rium: the public treasury in the temple of Saturn at Rome, in which money and the public accounts and archives were kept. Besides the regular treasure, there was an *ærarium sacrum*, or reserve, and later a military treasury. The fund belonging to the *populus*, or patricians, was called *publicum*, and kept in a separate treasury, though in the same building.

Æ'rated Bread [from the Lat. *ær*, air]: an unfermented bread, the ingredients of which are wheat flour, salt, carbonic acid, and water. The carbonic acid is thoroughly mixed with the flour and water in air-tight vessels by means of machinery especially adapted to this purpose, so that the bread is as light as the best fermented bread.

Æ'rated Waters: acidulous or alkaline waters impregnated with carbonic acid gas; they are extensively used to allay thirst in feverish conditions. The most common is *carbonic acid water*, incorrectly called soda-water, for it seldom contains soda. It is made by placing chalk or marble in a vessel with water and sulphuric acid, when the carbonic acid is evolved in the form of gas. The latter is afterward forced into water under pressure, so that the water dissolves about five times its own volume of the gas. It forms a brisk, sparkling liquid, with a pungent but pleasant taste. Leaden reservoirs for ærated water are dangerous. When copper lined with silver or tin is used, safety requires renewal of the lining at least once in two years. Carbonic acid water is, when iced, a most refreshing drink in seasickness and in many cases of disease. The effervescing draughts called *soda powders* and *seidlitz powders* are other forms of ærated beverages. In the former, bicarbonate of soda and tartaric acid are added to water in a tumbler, and a refreshing draught instantaneously prepared. *Seidlitz powders* contain tartrate of soda and potassa and bicarbonate of soda in one paper, and tartaric acid in the other; and when both are added to water, effervescence ensues, and the liquid is then taken. A more agreeable and useful *purgative* ærated water is the effervescing solution of citrate of magnesia in carbonic acid water, the invention of an American pharmacist. Ærated waters are also produced naturally. Water, as it comes from a spring, tastes different from the same water after being boiled; and this is due to the unboiled

water containing the gases oxygen, nitrogen, and carbonic acid—especially the latter—dissolved in it. Rain-water has a mawkish taste, chiefly because of the impurities dissolved in it; but when that rain water trickles down through the earth it is filtered and purified, and absorbs more or less air and gas. When it is dashed from ledge to ledge of rock, it becomes still more thoroughly aerated. A method is now in use for aerating the water-supply of a city, and the water is said to be much improved by the treatment. Many spring-waters are aerated in a peculiar way which confers upon them important medicinal properties. See MINERAL WATERS.

C. F. CHANDLER.

Aërial Perspec'tive: in painting, the art of giving due gradation to the strength of light and shade and the colors of objects, according to their distances; or the laws which regulate the apparent distances of bodies, as modified by the variations in the transparency of the air or in the brightness of the light.

Ærians: a heretical sect founded in the fourth century by Ærius, a native of Pontus. They were Homoiousians (i. e. they maintained that the Son was similar to the Father in essence, but not identical with him).

Aërodynam'ics [from Gr. *ἀήρ*, air, and *δύναμις*, power]: the dynamics of the air, and of gaseous bodies generally; the phenomena exhibited by gaseous bodies, whether at rest or in motion under the action of *forces*. The problems of aërodynamics are seldom treated independently; but are in part common to all fluids, gaseous or liquid. They present themselves in the consideration of innumerable questions in physics; e. g. the transmission of sound; the movements of projectiles; of the pendulum; of railway trains; also in pneumatics; in aëronautics; in the application of the force of the wind as a mechanical power; and to navigation, etc.

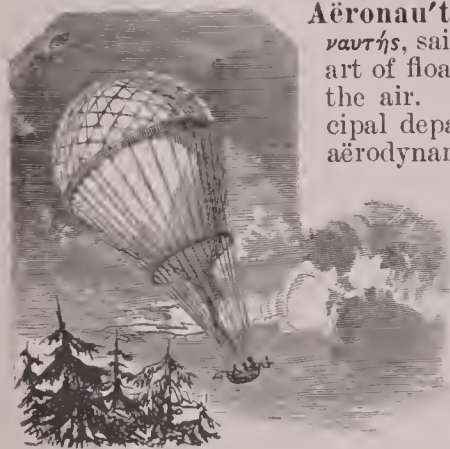
Revised by E. L. NICHOLS.

Aerøe, a'rø-e, or Arroë: a Danish island in the Baltic, 10 miles S. of Funen; 14 miles long and about 5 miles wide. It is fertile and well cultivated. Pop. about 12,400.

Aërolites: See METEORITE.

Aërom'eter [from Gr. *ἀήρ*, air, and *μέτρον*, measure]: an instrument formerly used to make the necessary corrections in pneumatic experiments to ascertain the mean bulk of gases.

Aëronau'tics [from Gr. *ἀήρ*, air + *ναυτής*, sailor]: the science or the art of floating in or of navigating the air. It involves the two principal departments, aërostatics and aërodynamics, of the branch of mechanics known as pneumatics, and also the subjects of fluid-friction and the resistance of a fluid to the motion of a solid body passing through its mass. It includes all forms of aërial navigation, whether by balloons, by flying-machines, or by any related forms of apparatus.



The machine or apparatus used in aëronautic practice is technically called an *aërostat*, and the science and the art of its application *aërostatics*. In recent times the subject has been distinguished definitely into two parts: aëronautics or aërostatics proper and *aviation* (from Lat. *avis*, a bird); the former comprehending the art and science of ballooning, the latter those of aviation, or flying like birds. *Aëronauts* pursue the first, *aviators* the second, of these methods in their attempts to navigate the air.

In the history of air navigation, aviation comes first in point of time. The art of ballooning is now about one century old; that of flying dates from a prehistoric geological age, when the birds succeeded the reptiles as the highest types of animal life. Prof. R. H. Thurston, writing in the *Forum* (Jan., 1890), thus speaks of the aërial motions of birds:

“This great problem was first solved during that act of creation the seven periods of which, according to the geologists, occupied unnumbered centuries; and the fish of the sea and the fowls of the air came into existence before their appointed ruler or any of his four-footed subjects. The pterodactyle, the great flying lizard, a giant even for that time, preceded the birds, and, like the flying animals accompanying it in the old triassic and liassic formations and in

the later deposits of geological history, illustrates the fact that every essential *datum* and principle of aëronautics must have been brought into a system of successful aërial navigation in times far antedating even the epoch of man's appearance on the globe. That the intervening periods have been periods of progress can hardly be doubted when the wonderful performance of contemporary birds is considered. The vulture is said to fly, at times, at the rate of above 100 miles an hour; the wild goose and swallow in their migrations make 90 miles an hour, according to Haswell; and the carrier pigeon has certainly flown long distances at rates of speed ranging from 60 up to 80 miles an hour, and for many hours together. The common crow ordinarily lounges across country at the rate of 25 or 30 miles an hour, the speed of a railway train.”



Pilatre de Rozier's first ascension in a fire-balloon, 1783.

The art of ballooning originated in the year 1783, with the experiments of Messrs. Charles and Robert, who improved upon those of Montgolfier, of a few weeks earlier, by the substitution of hydrogen for heated air in the filling of balloons. Stephen Montgolfier sent up his first balloons in June, 1783, after unsuccessful attempts in the autumn of the preceding year. In August of 1783 Charles and Robert



Charles' balloon, 1783.

sent up a balloon inflated with hydrogen, and in November Pilatre de Rozier successfully ascended in a Montgolfier “fire-balloon.” All these first attempts at aërial navigation were made at or near Paris. The interest then awakened in all departments of aëronautics has continued unabated down to the present. It still remains uncertain, however, what may be considered the most promising direction of improvement, looking to ultimate success in the rapid, safe, and commercially practicable navigation of the atmosphere. Thus far man has succeeded only in sustain-

ing himself in the air by buoyant floats, balloons; but the indications are that the weight and volume of machinery needed to impel, at any reasonable speed, the fragile and bulky mass required for its support in the air render it absolutely improbable that success will ultimately crown that system. On the other hand, the claims on the part of the aviators that, since birds and other much larger and heavier animals have been flying at enormous speeds and over thousands of miles in a single voyage since the days of the pterodactyle, the science and the art of aviation are established, and that therefore man has but to follow nature and imitate her forms of construction and adopt her proportions on a larger scale, are met by the statement that no form of motor has been, or can reasonably be expected to be, produced by man, having the small size and weight needed for the successful propulsion and support of a real flying-machine; while the problem of application of such power, even if once secured, is one of such delicacy, intricacy, and danger that its final solution must be taken as entirely beyond the limits of the vaguest probability. The facts are that the balloon has been made successful in raising and supporting aëronauts and their impedimenta, and that it has been found practicable to obtain a moderate speed, and to secure fair directing power, by the use of familiar systems of propulsion; but nothing that can be considered a success has yet been reached by man in the construction of aviatory machines.

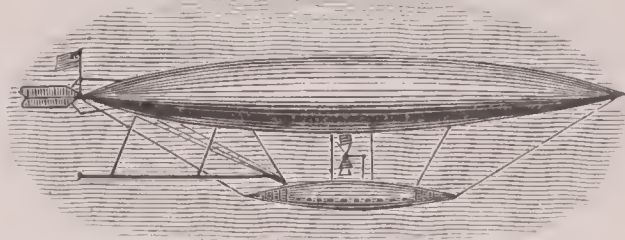
Balloons have sometimes been of great size. This is necessary for elevation of any considerable weight, as the inflation of the balloon with common illuminating gas is the only commercially practicable system, and this gives a lifting power of but 1 lb. for each 30 cubic feet. Hydrogen gives a buoyancy of twice this amount. The earlier balloons were small, and useless for any practical purpose. Their magnitude grew with success, and Giffard built one at Paris, in 1878, 118 feet in diameter, containing 882,925 cubic feet, and capable of lifting a total of 55,120 lb., or, deducting weights of balloon and accessories (30,536 lb.), a net weight of 24,584 lb.*

Blanchard, who was the first to take up ballooning as a vocation, died in his bed in 1809, after having made sixty-six ascents without accident. His widow, however, who had served an apprenticeship with him in the new art, was killed in Paris in 1819 by a fall from a great height. Many ascents have been made in the cause of science; and the names of the brothers Godard; of Green, who made over 1,400 ascents; of John Wise, who made the distance from St. Louis, Mo., to Jefferson co., N. Y., 1,200 miles, in twenty hours; of Gay-Lussac and Biot, who, in 1804, made a most valuable series of meteorological and physical observations at the height of 19,000 feet, and thus made the first determination of the method of variation of temperature of atmosphere with altitude; of Glaisher, who rose to 37,000 feet with the aëronaut Coxwell, gaining still more accurate figures, at the risk of death from cold, as well as from the usual dangers of ballooning; of Flammarion; of De Fouville; and especially, recently, of the brothers Tissandier—these are familiar to all.

A remarkable letter containing anticipations of later inventions was written as early as May 24, 1784, by Francis Hopkinson, and addressed to Benjamin Franklin. In this letter it is suggested that the balloon be made, not spherical, but oblong or spindle shaped, and driven by a wheel at its stern. "This wheel," said the writer, "should consist of many vanes or fans of canvas, whose planes should be considerably inclined with respect to the plane of its motion, exactly like the wheel of a smoke-jack." Nearly three-quarters of a century later this idea came into actual application.

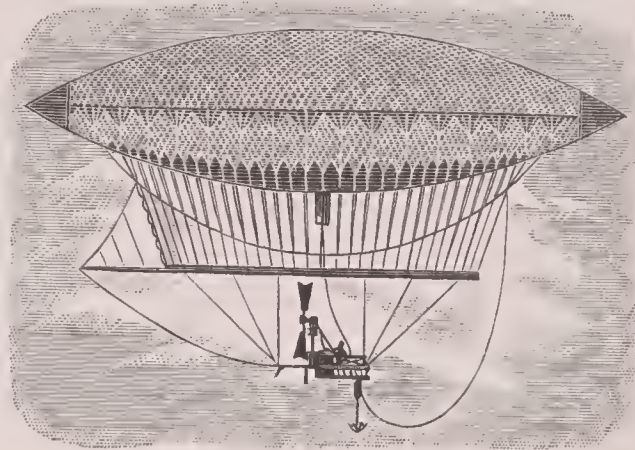
Balloons impelled by the power of men, or of machinery, exerted usually through a screw at their extremities, have been often made, and in some cases, even at an early date, with some degree of success. Many patents have been issued to inventors for such contrivances, but none have as yet been found applicable to commercial purposes. One of the most promising of the earlier inventions of this character was that of Rufus Porter (of the U. S.), devised about 1820, and built as a model about 1833. One of these machines was on exhibition at New York about 1835-40, and another at Washington. This was a cigar-shaped balloon, sustaining a car for passengers and machinery, and driven by a screw. This machine is reported by the newspapers at the time as flying rapidly, and sustaining itself for consider-

able periods of time. Later the same inventor built a much larger apparatus, its balloon being 160 feet long and 16 in diameter; but it proved a failure.



Rufus Porter's aëroport.

Balloons, self-impelling and dirigible, thus represent the latest and most effective devices of the aërostats, as distinguished from those of the aviators. These are all spindle-shaped balloons, driven by a screw, actuated by either man or steam power, or other form of energy, as electricity. In 1852 the inventor and engineer, Henri Giffard—especially famous as the discoverer of the curious instrument now



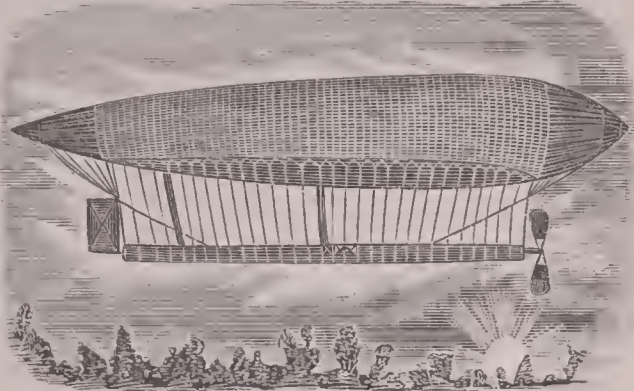
Giffard's aërial steamer, 1852.

familiar to all, the "Giffard injector"—constructed a balloon which he propelled by a steam-engine actuating a screw, and succeeded in obtaining so much speed as was necessary to give steerage way, thus producing the first dirigible balloon and air-steamship. He employed a balloon of ellipsoidal form, 3.66 diameters in length, a high-pressure engine, a small boiler, a screw having plane blades, and a very light system of construction. This experiment will always be famous as the first of its kind in the annals of aëronautics. Just twenty years later M. Dupuy de Lôme, the distinguished naval architect and engineer, employed man-power in the impulsion of a balloon of such size that he could carry ten or fifteen men, and actually applied the power of seven men to the work. He probably considered it imprudent to use a steam-engine in close proximity to a large mass of hydrogen gas; while the constantly varying weight, as fuel is consumed, is also an objection. The ideal motor is one which has constant weight, is free from danger from fire, and which concentrates large power within small compass and weight. The first two difficulties were overcome in the now celebrated experiments of the brothers Tissandier, and of Messrs. Renard and Krebs. Long anterior to this date (in 1833) Rufus Porter, already mentioned, had constructed a model 22 feet long and 4 feet in diameter, which, impelled by a steam-engine of compact design, had actually been driven at a somewhat rapid rate in exhibitions both at Washington and at New York.

M. Gaston Tissandier, the aëronaut, adopted the electric storage-battery, coupled with a dynamo-electric machine, as a source of power. He constructed for the exhibition of 1881 a model, 11 feet long and 4 feet in diameter, filled with hydrogen, and drove it at the rate of about 10 feet per second (about 7 miles an hour), as a maximum. With his brother, M. Albert Tissandier, he built another, over 90 feet long and 30 feet in diameter, fitted with a Siemens dynamo, driving a screw nearly 10 feet in diameter, and supplied with a current from an accumulator of their own invention weighing about 400 lb. This machine, carrying the two inventors, made at various times from 7 to 9 miles an hour for an hour or two together. Messrs. Renard and Krebs, experimenting, like their rivals, at Paris, also constructed a somewhat similar machine, 165 feet long and 27½ feet in diameter, impelled by a battery invented by M. Renard, a dynamo, and a screw 7 feet in diameter. This apparatus at

* With hydrogen the weight raised is $W = 0.0392 D^3$; where D is in feet.

various times in 1884 went from 12 to 15 miles per hour. The motor gave out about 5 horse-power, and the machine was able to take any course desired in a calm, and even to contend against a light breeze. This balloon made a number of voyages, occasionally to distant points, sometimes returning to its point of departure. Its car and impelling machinery constituted one of the most interesting of the exhibits of the French Government at the Paris Exposition of 1889.



Renard and Krebs' balloon, 1884.

These travels in the air of the bold French aëronauts have furnished data relating to the supporting-power, the resistance, and the force required for propulsion of such structures, which have been made by Mr. William Pole, the veteran English engineer, the basis of computations showing that it is apparently possible to-day to build an air-ship, 400 feet in length, which will attain a speed of 25 miles an hour. But it is usually considered by engineers familiar with the subject that at least double this speed must be reached before a satisfactory solution of the problem will be obtained.

It is obvious that to attain high speeds we must have low resistances and light weights, small loads, great power concentrated within the smallest possible compass, and the least possible weight per horse-power. The structure must be small, light, and well formed to pass rapidly through the air. The spindle shape adopted by the later aëronauts is the best of all known forms for this purpose.

Capt. Renard, in reporting on his experiments in the development of his balloon for purposes of war, states that he obtains the following formulas for resistance, R , and power, U , at varying speeds, the diameter, D , and speed, V , being given, all in metric measures:

$$R = 0.01685 D^2 V^2;$$

$$U = 0.01685 D^2 V^3;$$

$$U' = 0.0326 D^2 V^3;$$

where U' is the work on the screw-shaft. He computes that a speed of 22 miles an hour would demand for his balloon, if of 33 feet diameter, about 45 horse-power. It is supposed that speeds of 25 miles an hour or more have been attained; but the work is done by and for the Government, and no recent data are allowed to be published. Mr. Chanute gives the following table of those obtained and published to date, with his own computation of the power which each would require at 25 miles an hour in calms:

SCHEDULE OF NAVIGABLE BALLOONS.

DATA.	Giffard, 1852.	Dupuy de Lôme, 1872.	Tissandier, 1883.	Renard and Krebs, 1884-85.
Length, out to out.....ft.	144.3	118.47	91.84	165.21
Diameter, largest section..... "	39.3	48.67	30.17	27.55
Length to diameter...proportion	3.67 to 1	2.43	3.04	6
Cubic contents.....ft.	88,300	120,088	37,439	65,836
Ascending power.....lb.	3,978	8,358	2,728	4,402
Weight—Balloon and valves.. lb.	704	1,255.5	374	812
“ Netting and bands.. “	330	396	154	279
“ Spars and adjuncts.. “	660	1,316.5	75	170
“ Rudder and screw.. “	...	165	...	193
“ Anchor and guide-rope..... “	176	308	110	...
“ Car complete..... “	924	1,287	220	995
“ Motor in working order..... “	462	2,000	616	1,174
“ Aëronauts..... “	154	310	330	308
“ Ballast and supplies.. “	567.6	1,320	849	471
“ Total apparatus.....lb.	3,977.6	8,358	2,728	4,402
H.-P. of motor.....	3	0.8	1.5	9
Weight of motor per H.-P....lb.	154	2,500	410	130
Speed obtained...miles per hour	6.71	6.26	6.71	14
H.-P. required 25 miles per hour.	155	52 (?)	77	51
Motor pounds per H.-P.	3	38 (?)	8	23

By improvements in varnishing and rendering the tissue of the balloon impermeable to gas; giving the spindle-shaped vessel a form of minimum resistance; improving the construction and proportions of the screw, and of the steering-gear; securing stability and stiffness sufficient to permit the carrying of machinery; to permit driving at high speeds against the resistance of the air, and to turn and to land safely; and especially by securing some light and enormously powerful motor unimpeded by the embarrassments now met with in the storage of energy, the use of fire, or the dangers of high pressures, very considerable advances seem to be possible in this direction; but the general impression among engineers, as well as aëronauts, is that the practical limit will still be found within that which would constitute this apparatus a commercially valuable means of transportation of even passengers alone. Scientific investigations and the military art may find place and purpose for the dirigible balloon; but as yet there seems no probability of its coming into permanent employment for other purposes. If speeds of 25 or 30 miles an hour are to be attained and maintained for any appreciable time, balloons must be built of great size and at considerable cost. So much, however, it does seem safe to expect. Mr. Chanute gives the following estimate of the size and proportions of such a balloon, taking it as similar to La France, one of the best of the French constructions:

PRINCIPAL DIMENSIONS.	La France.	Double size.
Length, out to out.....ft.	165	330
Diameter, largest section..... "	27.5	55
Contents of gas.....cubic ft.	65,836	526,688
Lifting-power.....lb.	4,402	35,216
Weight of apparatus..... "	2,451	9,804
“ cargo and aëronauts..... "	779	1,500
“ machinery..... "	1,174	23,912

This air-ship would need a motor of about 180 horse-power, and the speed might be made, assuming a weight of the same as that of Renard, 130 lb. per horse-power, about 11 meters (36 feet) per second, or 25 miles an hour. The construction of a light motor is the great desideratum. It is stated that electric motors have been made of as little as 20 lb. weight per horse-power, and steam-engines have been built of less than 10 lb. weight per horse-power, including boiler.

It seems not at all impossible to construct balloons 1,000 feet (410 meters) long, 100 to 150 feet (31 to 46 meters) in diameter, which shall carry two or three tons weight at 35 to 40 miles an hour—in other words, aërial vessels as large as an ocean steamer of our day, but carrying two thousand times less weight of passengers and cargo. Maximum speeds must be high for success, since minimum speeds of 25 to 30 miles must be given to meet even ordinary winds. Navigable balloons, having speeds of 50 and possibly 75 miles an hour, seem desirable from this point of view, and it is impossible to say that they may not be ultimately obtained by continued development in the directions in which so much has already been accomplished.

Aviation is a branch of aëronautics which, as has been seen, dates back in nature to an early geological period, but one which is only now, after centuries of thought and many years of endeavor, taking such form as to lead authorities in science and in engineering to recognize the fact that an actual beginning has been made in the solution of some of the essential elements of the problem, as in the determination of the laws involved in the support and impulsion of properly shaped bodies in the air, the measurement of resistances, and the production of light and powerful motors. Within a comparatively few years societies have been formed in nearly every civilized country, composed of those who consider aviation a more promising line of invention and research than ballooning, and these societies, and individuals of similar views, have done much to determine the facts and laws prerequisite to intelligent design, construction, and operation of the flying-machine.

The flight of birds, and of animals of other kinds, is always presumed to involve the same principles as must any artificial flight by means of machinery. Early legends indicate that artificial flight was regarded as a possibility by the ancients, and previous to 1660 claims were advanced, as by Roger Bacon and by Robert Hooke, that flight could be and had been effected. Borelli, about 1680, however, proved that the skeleton of man is not suited for flight like that of the birds, and that his muscular system was unequal to the task of aviation by its own energy. Dr. Wilkins, the

ingenious Bishop of Chester, of the time of Cromwell, said: "I do seriously and upon good grounds affirm it possible to make a flying chariot, in which a man may sit and give such a motion to it as shall convey him through the air." Again: "It is not impossible, perhaps, that a man may be able to fly by the application of wings to his own body; as angels are pictured, and as Mercury and Dædalus are fained, and as hath been attempted by divers."

Elmerus, a monk of the thirteenth century, is said to have succeeded in imitating the flying squirrel, in partial self-support. Besnier, a locksmith of the seventeenth century, is also said to have passed over considerable distances, and over houses and rivers, gradually descending from a high starting-point; and the story is told, perhaps apocryphal, of the flight of a prisoner at Vienna, in the jail-yard, to a height of 50 feet or more. Many similar attempts are known to have been made in later times; but no one case of even approximate success is as yet recorded.

The earliest profitable studies in this field have been those relating to the methods of bird-flight, and their powers of lifting and of impulsion. Pettigrew, Marey, and De Luey have studied the motions of the wings of birds and insects, have learned the laws of fluid-resistance, and have paved the way to a real advance. The theory of propulsion has been long studied, and in some directions well established. It has been shown that weight is probably not objectionable in aerial navigation, but actually a necessity; not weight but volume constitutes the impediment. A bird is a heavy but compact structure, of which the essential characteristic is that it incloses great power within small volume. De Lucy's measurements of various flying creatures show an irregular, but still unmistakable, general direction of variation of wing-surface with size of animal. Comparing the ladybird and the stag-beetle, the pigeon and the stork, the sparrow and the crane, we find the area of wing per unit of weight carried to be nearly as the cube root of their weights. Taking as a fair figure that obtained from the larger bird, I find that a man of the ordinary weight should be able to fly with wings having an area of only about 40 sq. feet (nearly 4 sq. meters). De Villeneuve states that a bat having the weight of a man would need wings only 10 feet (3 meters nearly) long. Hastings makes the surface of each wing from 5 to 10 times $\frac{2}{3} \sqrt{W}$ where the area is measured in square centimeters and weight in grammes.

From the above it is seen that the required areas of wing-surface per unit of weight decrease rapidly with increasing size. As the writer has elsewhere remarked: "Thus the insects flutter wings of enormous area in proportion to their weight, at the rate of 200 or 300 vibrations per second; while the pelican makes but one per second, the area of surface employed being a minute fraction of that needed by the smaller creature, per unit of its own weight. The vulture is 100 times as heavy as the swallow, but its wings are only fifteen times as large. The Australian crane weighs 3,000,000 times as much as the gnat, while the latter has 150 times as much wing-surface per unit of weight. But the *power* demanded is very exactly proportional to the weight carried, and the muscles of the birds' wings weigh more than all the rest of the muscles of their bodies together. M. Hannel, from these facts, computes the spread of wing required by a flying man at about 20 feet, or about 150 sq. feet area. For a machine weighing 3.5 tons he makes the spread of wing demanded about 80 feet; and the writer has computed a still smaller figure."

The few experiments recorded on the lifting-power of birds and flying animals, as far as they go, indicate a limit at about one-half more than their own weight. The contemporary soaring birds have a maximum at about 30 lb. (14 kilog.), and the prehistoric eretaceous pterodactyles, gigantic reptiles, in some cases had weights approximating that of a man, and wings spreading 15 and 20 feet (7 to 9 meters). No natural limit is as yet known in this direction.

As an essentially important line of research, many experiments have been made to determine the lifting-power of planes sliding through the air at angles slightly inclined to the horizontal. The most extensive and fruitful have been those of Langley, at the Allegheny Observatory, and at the Smithsonian Institution at Washington. These researches were undertaken with a very elaborate and ingenious apparatus, including a whirling mast, turned by a powerful steam-engine, capable of driving the suspended plane in a circle of 60 feet diameter up to nearly 100 miles an hour peripheral speed, and a set of autographic measuring instruments for time, speed, lift, and resistance. It was promptly

shown that the time of fall of a horizontal plane is less when moving horizontally than when falling vertically, and that the rate increases as the lateral motion increases—a result of the inertia of the increasing weights of air affected by it—and leading at once to the conclusion that the rate of fall may be made insensible by sufficiently high speeds. This involves the proposition that at some very high velocity its behavior would be that of a body resting on a solid surface. Another singular but indisputable fact thus revealed is that such a plane may require actually less expenditure of energy to move it at high speeds than at low, where supporting itself by inclination to the horizon, the power demanded for its support diminishing faster than the resistance to forward motion increases. The "soaring speed," as that velocity is called at which the body is just sustained at its initial height, was determined for a variety of size and proportion of planes; and the forms as well as the speeds of the plane were found to have important influence. The final and most striking conclusion of the investigator is that, so far as power simply is concerned, mechanical flight is possible with such engines as we already possess, since one horse-power can sustain 200 lb. at 45 miles per hour (20 meters per second), and more at higher speeds, friction of the machine neglected—and this constitutes a large margin; engines now being in existence of but a fraction the specified weight. The best angle of the plane is always a very small one, usually between one and two degrees from the plane of its path, and is the less as the speed is greater. M. Drzewicki, at the Congress of Aëronauts and Aviators held at the Paris Exposition of 1889, presented formulas and computations indicating that an aëroplane, at an angle of $1^{\circ} 50' 45''$, meets sensibly the same resistance (simply as a plane) at all speeds, and that the work done is thus proportional to weight and speed; that aëroplanes proportioned for small velocities need comparatively large surfaces and small weights; that areas may be reduced as speeds increase; and that the less the area the greater the required speed and power. These conclusions, which had been anticipated in part by Mr. Octave Chanute, were shown to be corroborated by the known proportions of birds' wings, and hence it is to be expected that, where large bodies and heavy weights are to be dealt with, as in air-ships, very small areas per unit of weight will be necessary. He computes the power at about 5.87 horse-power per ton. Mr. Chanute figures the actual power exerted by a flying pigeon at about 10 horse-power per ton, at the same assumed speed, 25 miles an hour. These expenditures are less than are required at the same speeds in the propulsion of the dirigible balloon, and are, nevertheless, greater than are indicated as probable by Langley, who has shown the power demanded for flight to be but about 2 per cent of that computed on the earlier theories by Navier and others, and that air-friction may be neglected as comparatively small, while the weight of the supporting planes may be but a small fraction of the total weight they are capable of sustaining.

As a final conclusion, it may, perhaps, be asserted with some degree of confidence that at low speeds balloons promise the best results, and at high speeds, aviatory machines.

As was first shown by Mr. Curtis, the fact that conditions may be found under which high speeds are more economical of power in the support and propulsion of aëroplanes by the action of the air, as they pass through it, may be proved mathematically in the following manner:

Let the relations of power expended, resistance, and velocity be represented by the equation

$$T = R V; \\ = V W \tan a;$$

where W is the weight of the plane. Then we have, differentiating,

$$\frac{dT}{dV} = \left(W \tan a + V \sec^2 a \frac{da}{dV} \right);$$

in which $\tan a$ is very small and the sign of dT/dV is therefore controlled by that of da/dV . But experiment shows that V increases for best effect as a diminishes, and the sign of da/dV being negative, the term in which it is found is negative, and T thus decreases with increasing velocities of the plane. This deduction obviously is applicable not to a bulky mass moving at high velocity through the air, but only to the aëroplane, a thin, sharp-edged or wing-shaped plane. Where the aëroplane carries a load, a speed of maximum effect must be found at some comparatively low speed, since the resistance of the sustained body, however well shaped for such purpose, must vary

nearly as the square of its velocity. Air-resistance is very small, however, and it seems probable that this speed of best effect may be very high as compared with those attainable on land or on water. Speeds of 50 miles an hour and upward are apparently anticipated by the best authorities on this subject, assuming the mechanical difficulties completely overcome.

Flying-Machines, as already remarked, antedate balloons by geological periods, the first flying-machines having been the animated mechanisms of the reptile aviators of the cretaceous or earlier periods and of the birds. The flying-machine differs from the balloon in the fact that it is not only propelled but is also supported by its own actively exerted energy. The attempts of inventors to imitate this method of self-support and of flight by human power have been numerous but unsuccessful, and, as indicated by Borelli long ago, are not likely to prove successful. The skeleton and muscular system of man are not adapted to use in flight; nor has he the endurance needed for prolonged exertion of such intensity. The inventor is now seeking ways of making heat-engines or other motor machines serve his purpose in this direction. As the writer has elsewhere remarked, "The researches of Langley have shown the power demanded for flight to be about 2 per cent of the amount once supposed a minimum; we know that nature's energy can be directly converted into useful power through the production of electricity, as in the gymnotus, and possibly in all animal mechanisms; we know that the modern storage batteries are of ten times the weight that science indicates to be the limit of perfect efficiency; both steam-engines and electric accumulators have been made light enough and powerful enough to raise their own weight, with something to spare; the flying lemur, the flying squirrel, the rude sustaining-membranes that inventors have constructed, have sustained their heavy weights in drifting many yards." (*Forum*.) Man has thus every reason to assume at least the possibility of solving this problem, the last and most tantalizing of all presented to the inventor in the field of transportation. In this study the researches of Langley lend great encouragement. It is also true that encouragement may be found in other directions.

The operation of the animal machine teaches many lessons, some of which should prove profitable to the engineer in his endeavor to solve this problem. It illustrates a combustion without high temperature, and yet with very high efficiency—quite in opposition to the accepted ideas of thermodynamic transformations. This may mean some as yet unknown system of modification of heat energy; or it may indicate a production of electricity, rather than heat, from the chemical union of foods with oxygen; or it may lead to discoveries of methods of transformation of energy and of their useful application as yet undreamed of by our philosophers. This animal energy, however developed, is applied with great effectiveness to these as yet unsolved problems of the engineer. The great secret which our own most original inventors and physicists are endeavoring to penetrate lies there for study and test. It is to-day easy to predict the power required to give to any well-shaped body any stated velocity in the air; it remains to ascertain how that power may be produced as economically, and as concentrated in volume and weight of mechanism, as nature produces it.

The fact that man has surpassed nature in transportation on land and on the sea may be fairly taken as giving reason to assume the possibility of his similarly succeeding, once he has entered upon this new path, in aerial navigation. Although the animal machine is, as shown by Hirn and by Ruhlman, more efficient as a dynamic motor than any heat-engine, rising to 0.29, it is not to be expected that artificial flight, by use of wings and man's own muscular power, will ever prove successful. In seeking to construct flying-machines, capable of transportation of merchandise and passengers on some comparatively large and effective commercial scale, the machine consists of some equivalent for the wing of the bird, as the aeroplane tested by Langley and others, and a car or vessel, carrying machinery and load, the resistance of which must be allowed for at a rate approximating, if well formed, by Pole's formula: $R = 0.000195 d^2 v^2$, in pounds, feet and seconds being the units. This corresponds to the comparatively slight density of air: $\frac{1}{800}$ that of water. The size of wing, x , required for a given load, y , will bear some close relation to that observed in the birds, in which, by Hannel's formula, $x = y \log. 500$, nearly, in which x is in kilogrammes and y is the width of wing in meters.

Langley's experiments confirm for normal pressures the formula of Duchemin or Bossut, making the magnitude of

that pressure a simple function of the normal pressure when moving transversely to its own plane; but he shows that, although the form and aspect of the plane have little effect when moving normally, they become important when the plane is inclined to its path. Chanute's investigations confirm the conclusions of Langley, and numerous experiments with an immense variety of flying-machines have thrown some light upon the subject, but have thus far revealed but little real progress in application.

These machines are variously constructed to secure support and propulsion by means of wings, by screws, and by screws combined with aeroplanes. The most successful have recently been impelled by the energy stored in twisted threads of rubber. Pichancourt has made such "birds" capable of flying 50 to 100 feet; and many experimenters have employed the last-named combination. Of these, the most successful has been M. Penaud, or possibly M. Dandrieux, who makes a remarkably perfect imitation of the butterfly. None of these are more than toys, however, and usually support themselves but a few seconds. Mr. Lawrence Hargreaves has presented to the Royal Society of New South Wales accounts of more than a dozen self-propelling machines of his own construction, some of which have flown considerable distances, the driving-power being, in the best of them, compressed air operating a Brotherhood engine. His Nos. 13 and 14 flew at the rate of 10 to 12 miles an hour, and covered distances of 125 to 312 feet in 8 to 20 seconds. The inventor estimates that "400 lb. of tin tubing, silk, and steel wire would serve to carry one man 500 yards at 17 miles an hour." The motor constitutes one of the most difficult problems.

Marine steam-engines, with their boilers, weigh several hundred pounds per horse-power, while it is estimated that a successful aerial motor must weigh less than 50, and that it is desirable that it should even be much lighter than that. The lightest machinery yet built for continuous operation is that of the modern torpedo-boats, weighing sometimes less than 60 lb. per horse-power, and in occasional instances below 50. Stringfellow built an engine for aeronautic experiments weighing 13 lb. per horse-power, and Mr. H. S. Maxim has described one weighing less than 5,000 lb. to develop 300 horse-power.

Gas and inflammable vapor engines have been proposed for use in aeronautics; but they are as yet even heavier than the lightest steam-engines, and offer no promise of value. The best work thus far has given, as its product, gas-engines employing the vapor of petroleum and weighing between 80 and 100 lb. per horse-power. Electric power gives better results, and M. Trouvé has constructed such of moderate size, weighing about 20 lb. per horse-power, and in one case, in which aluminium was freely used in construction, about 8 lb. Commandant Renard employed a dynamo in his balloon which weighed 26.4 lb. per horse-power. The primary battery used with it weighed 66 lb. per horse-power, and the whole thus weighed 130 lb., a weight still much too great to be suitable for any self-supporting and self-impelling machine.

The most elaborate and instructive experiments with solid bodies driven through the air at high speeds were made by Mr. Maxim, whose work on aeroplanes corroborates that of Langley completely. He found the resistance due to friction of the surfaces of the body thus driven was imperceptible, and might be neglected as unimportant. He concludes that a motor weighing less, as a total, than 100 lb. per horse-power would, so far as that goes, make aerial navigation possible. His own steam-engine with a pressure of 250 lb., weighing with its accessories about 4,500 lb., is rated at 300 horse-power, or 15 lb. per horse-power. The machine is mainly of steel, this metal being found, as used, much lighter and stronger than similar parts made of aluminium.

Present indications seem to be, in the opinion of many aeronauts, that the use of the dirigible balloon will lead to the perfecting of the motor, and that ultimately the flying-machine, without supporting gas-bag, may come into use for speeds which can not be approached by the former. The dirigible balloon is so far perfected as to-day to constitute an important part of the equipment of every great army organization. French inventors have, as has been seen, constructed such machines capable of attaining about 15 miles an hour in calm weather, and it is supposed that they have, in later and unpublished plans, secured a much higher degree of efficiency. The German army is said to have similar machines in use in reconnoissance; and other nations now, and all must in time apparently, make use of this new

method of transportation for such purposes. "Captive" balloons are in use also in the French navy for purposes of reconnoissance, and it is found that they can be towed, by the ship of which they form a part of the equipment, at moderately high speeds.

Useful Results in Aërostation have, up to the present time, been hardly commensurate with the time, talent, risk, and actual loss of life and money, given to this development of the attractive, though still unpromising, scheme. Biot and Gay-Lussac, as early as 1804, ascended to the height of 23,000 feet in one case, and Messrs. Glaisher and Coxwell, in 1862, as already stated, attained a height of above 35,000 feet, and the former, in various ascents, secured much interesting and some important meteorological information and data. Mr. Glaisher sees no reason to anticipate any great improvement in the construction and operation of the balloon, and thinks it can only be expected to be of service where it can be employed in calms. Armies using the balloon for their special purposes have sometimes, as is said, found it valuable. The battle of Fleurys is said to have been decided largely by this advantageous use of the balloon (1794). In sieges, as at Mayence and Ehrenbreitstein (1799), they are said to have been used to advantage. The Austrians used them in 1849 before Venice, and the French in 1859 in the Italian campaign. In the U. S. the balloon was used by a balloon-corps attached to the Army of the Potomac, with results accounts of the value of which are contradictory. In the siege of Paris more than fifty balloons were used in transporting mails and other light material from the beleaguered city—a total of about 2,500,000 letters, weighing about 10 tons. Return mails were usually brought in by carrier pigeons taken out by the balloons.

The flying-machine, in the restricted sense of the term, has not as yet reached even the experimental stage of application. The difficulties which have seemed hitherto so formidable, not to say unconquerable, are now apparently disappearing in the light of exact investigation, and the man of science is taking the place of the ignorant inventor and schemer in the promotion of this work. A larger number of engineers and men of science now think it possible that the limits of human skill and inventive talent are set outside this latest and greatest of the problems of transportation and of aerial navigation. Many minds are constantly at work on the problem, and it seems not at all unlikely that real advances may be effected in the immediate future. This problem constitutes one of the greatest confronting the mechanic and the scientist. An immense amount of information, much exact data, and some knowledge of the laws involved in its solution, have already been acquired. As remarked by Pettigrew, "The land and the water have already been successfully subjugated. The realms of the air are alone unvanquished. These, however, are so vast and so important as a highway for the nations that science and civilization equally demand their occupation. . . . If the difficulties to be surmounted are manifold, the triumph and the reward will be correspondingly great. It is impossible to overestimate the boon which would accrue to mankind from such a creation. . . . If this day should ever come, it will not be too much to affirm that it will inaugurate a new era in the history of mankind, and that, great as the destiny of our race has been hitherto, it will be quite outlustered by the grandeur and magnitude of coming events."

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Aërostatic Press: a machine for extracting by atmospheric pressure the coloring principle from the raw material—wood, leaves, insects, etc.—used for the purpose of dyeing. The material is placed in a vessel between two horizontal partitions, both perforated with small holes. Liquid is poured on over the upper partition, and the air is drawn off from the bottom by means of a suction-pump. By this means the liquid is compelled by the pressure of the atmosphere at the top to force its way through the material, carrying with it in solution the required dye.

Aërostatics: that department of the science of mechanics which treats of the weight, pressure, and equilibrium of aëriiform fluids, and of the equilibrium of bodies sustained in them. It differs from *Aërodynamics*, another branch of the science, in being confined to the relations of forces acting in or upon such fluids when no motion results, while the latter refers to the phenomena observed when forces acting within or upon such fluids produce motion. *Pneumatics* (*q. v.*) covers both these departments. Aëronautics belongs properly to the first of these divisions. See AËRONAUTICS.

Æs'chines (Αἰσχίνης): Greek orator, and rival of Demosthenes (*q. v.*). B. at Athens in 389 B. C., he had a varied experience as a magistrate's clerk, as a soldier, and a brave one, and as a not oversuccessful actor. By his knowledge of the law, his native gift of eloquence, his distinguished appearance, he rose to prominence in public life. Sent to Philip of Macedon as a member of an embassy in 342 B. C., he went over to the peace-at-any-price party and to Philip, and after his return to Athens was accused of high treason by Timarchus and by Demosthenes. Both his adversaries were foiled. In 330, however, Æschines, who had been an active partisan of the Macedonians, brought a charge of illegality against Ctesiphon for proposing to reward Demosthenes with a golden crown, and the contest ended in a crushing defeat for Æschines. He was compelled to withdraw from Athens, and betook himself to Rhodes, where he is said to have opened a school of oratory. He died in exile, 314. We have three speeches of his, called in antiquity *The Three Graces*, which enable us to understand his high rank as an orator. Two of them may owe their special interest to the comparison with Demosthenes, but even if "they have more flesh, less muscle," they are full of life and grace. Edited by Bremi (1823), Benseler, with German translation (1858), Franke (1860), Schultz (1865), Weidner (1872).

B. L. GILDERSLEEVE.

Æs'chylus (Αἰσχύλος): in a certain sense creator of Greek tragedy; b. of a noble family at Eleusis, in Attica, in 525 B. C. The eldest of the three great tragic poets of Greece, he was at once the most sublime genius and the severest artist of the three. He fought bravely at Marathon (490 B. C.), Salamis, and Platea, and seems to have been prouder of his prowess than of his art. It was not until 485 that he gained the first prize in tragedy. He composed over seventy pieces and gained thirteen prizes. In 468, however, he was defeated by Sophocles, and soon afterward went to Sicily, where he was honored by Hiero of Syracuse. He died at Gela in 456, two years after his brilliant success with the *Oresteia*. According to tradition, he was killed by a tortoise, which an eagle let fall on his bald head, a story that is variously interpreted. Of his tragedies, which were brought out in sets of three—"trilogies"—only seven are extant: *Prometheus Bound*; *The Seven against Thebes*; *The Persians*; *The Suppliant Women*; *Agamemnon*; *The Choëphori* (Libation-bearers); and *Eumenides*. The last three form the only complete trilogy that we have; the *Oresteia*, or Story of Orestes, one of the most powerful and consummate works of art in all literature. Each play is an act: The Murder of Agamemnon, The Vengeance of Orestes, The Redemption from Bloodguiltiness. It is a plea for the Areopagus (*q. v.*), but it is much more. Critical editions by Dindorf, Hermann (1852), Kirchhoff (1880), Weil (1884), Wecklein (1885); with English notes by Paley (1870). Elaborate edition by Verrall has been begun (*Seven*, 1887, *Agamemnon*, 1889, *Choëphori*, 1893). English translations by Blackie, Browning (*Agamemnon*), Campbell, Fitzgerald (*Agamemnon*), Morshead (*House of Atreus*), Potter, Plumptre, Swanwick.

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Æscula'pius (in Gr. Ἄσκληπιός): in classic mythology, the god of medicine; a son of Apollo. The poets feigned that he raised the dead to life—that he thus offended Pluto, who complained to Jupiter, who killed Æsculapius with a thunderbolt. He was afterward worshiped as a god, and a temple was erected to him at Epidaurus. According to Homer, he had two sons, Machaon and Podalirius. His descendants were called Asclepiadae.

Æsculin, or **Esculin** (C₁₅H₁₆O₉): a crystalline fluorescent glucoside obtained from the bark of the horse-chestnut and other trees of the genera *Æsculus* and *Pavia*. It possesses a bitter taste, and is converted by boiling a hydrochloric or dilute sulphuric acid into glucose and a bitter crystalline substance called asculetin, C₉H₆O₄, C₁₅H₁₆O₉ + H₂O = C₆H₁₂O₆ + C₉H₆O₄.

Æsir, ā'sir [the plural of Norse *As*, god, being]: the general name of the beneficent deities of the Norsemen. The principal Æsir are Balder, Frey, Freyia, Frigga, Heimdall, Odin, Thor, Tyr, Vali, and Vidar, which will be noticed under their respective heads.

Æsop (Lat. *Æsopus*; Gr. *Αἴσωπος*): a celebrated fabulist; b. about 620 B. C.; supposed to have been a native of Phrygia. He was a slave in his youth at Athens, but afterward obtained his freedom in consideration of his wit. Æsop became a generic name, and it is impossible to discern the original Æsopic fables. The current Greek Æsopic fables, edited by C. Halm, *Fabulæ Æsopicae*, Leipzig, 1852, are, in the main, prose paraphrases of BABRIUS (*q. v.*). For bibliography and further details, see BEAST-FABLES.

Æsopus, CLAUDIUS: a famous Roman tragic actor; a friend of Cicero; flourished about 75 B. C. His action was grave, dignified, and impassioned. He retired from the stage in 55 B. C.

Esthesiometer: See RECORDING APPARATUS, PSYCHOLOGICAL, in the Appendix.

Esthet'ics [Gr. *αισθητικός*, pertaining to the perception by the senses; *αισθῆσθαι*, perceive by the senses]: etymologically, the philosophy of perception. In modern philosophy the term is used to denote the scientific classification of the faculties through which we apprehend the beautiful and the sublime, and which give us the experience of the resulting emotions. It involves also the statement and discussion of the laws which should preside over and condition all forms of artistic production, the application of these general laws to the special branches of the fine arts in respect to criticism, and the history of the development of these laws in practice. The principles of aesthetics were in ancient times discussed by Plato, Plotinus, and St. Augustine; and in their application to poetry by Aristotle and Horace; and in relation to eloquence by Quintilian, and to style by Longinus. The term was first used in its modern sense in the eighteenth century by Alexander Gottlieb Baumgarten, Professor of Philosophy at Frankfort-on-the-Oder. He taught that there is in the mind a power or faculty for the appreciation of the beautiful—a power whose existence is not dependent on that of the intellect, though the latter may be necessary in order properly to direct and develop the æsthetic faculty. Psychologists have classed the operations of the mind under three general heads—namely, the intellect, the sensibilities, and the will. The proper object of the first is truth; of the second, beauty in its various forms, including harmony; and of the third, good or virtue. Æsthetics would consequently come under the second division, relating as it does to objects or qualities which appeal at once to the sensibilities, without any direct reference to the intellectual power.

There may be said to be two distinct schools, which differ radically respecting the true principles of æsthetic development and culture. The one, starting with the standard works of art, or with the most perfect models which nature offers us, and selecting from each what appears most pleasing or graceful, seeks, by means of these, either by direct imitation or indirect suggestion, to create a new work, which shall combine as many as possible of the elements of the original models. It is obvious that the merits of such a work can not in any case rise above the aggregate of the merits of the productions after which it has been copied. The other school, recognizing the fact that it is possible for transcendent genius to create forms of beauty which shall not only excel in their combined effect, but in their individual elements, everything that has ever been seen in nature or in art, seeks to cultivate the faculty of ideal conception, using the works of nature or the models of the great masters simply to improve the art of expression; or, in other words, the power to translate, as it were, our ideal conception into forms which can be understood and appreciated by the common mind. Those of this school would say that such works as the Apollo Belvedere, or Dannecker's celebrated statue of Christ, could never, in the first instance, be formed from actual nature—that, in fact, the very power of selecting the most beautiful forms, or the most beautiful elements of any particular form, implies the existence of an ideal faculty; for if the mind has not some standard in itself, but is wholly dependent on what it sees for its conception of beauty, why should it not copy the faulty as well as the beautiful? It is, in fact, by trying what it sees by the ideal standard in itself that it knows how to select the one and reject the other.

Æsthetics can not yet be considered a complete and sys-

tematically developed science, though several of the best minds of the last and present century have done much to investigate and explain its principles. Among the most important works on this subject are the following: Friedrich Theodor Vischer's *Æsthetik, oder die Wissenschaft des Schönen*; Hegel's *Æsthetik*—Bénard's French translation of this work was crowned by the French Academy; a second part of this work, devoted to the history of art in its three phases of symbolic, classic, and romantic (or Oriental, Greek, and Christian art), has been translated into English, and published in the *Journal of Speculative Philosophy*, while Hegel's introduction, containing a discussion of the nature of art, has been translated by Bernard Bosanquet; Cousin's *Le Vrai, le Beau et le Bon* (The True, the Beautiful, and the Good); Weisse's *System der Æsthetik* (2 vols., Leipzig, 1830); Jouffroy's *Cours d'Esthétique* (Paris, 1842); Ruge's *Neue Vorlesung der Æsthetik* (1837); Zimmermann, *Geschichte der Æsthetik* (Vienna, 1858); Dippel, *Handbuch der Æsthetik* (1873); Alison, *On Taste* (1784); Burke, *The Sublime and Beautiful* (1756); J. Baseom, *Æsthetics* (1862); H. N. Day, *The Science of Æsthetics*; J. S. Kedney, *Hegel's Æsthetics*; and especially Kant, *Kritik der Urtheilskraft*.

Revised by W. T. HARRIS.

Æstiva'tion [from the Lat. *æsti'vo*, *æstiva'tum*, to spend the summer, to retire for the summer season]: in botany, the manner in which the parts of a flower are folded in the bud before it has opened. The various forms of æstivation are called *valvate*, *imbricated*, *contorted*, *induplicate*, *reduplicate*, etc.

Æthelstan: See ÆTHELSTAN.

Æt'ians: the followers of Ætius, who was in the fourth century a deacon, and afterward a bishop. He was an Arian, but was considered a heretic by both orthodox and Arians. His doctrine, which briefly was that Father and the Son were entirely unlike in all respects, and followers were condemned in 359 A. D.

Æt'ius (sometimes incorrectly written Ætius): Roman general; b. in Moesia before 400 A. D. As commander of the Roman army in Gaul he gained important victories over the Visigoths, Huns, and other barbarians about 425–430 A. D. Ætius and Theodoric commanded the army which in 451 checked the victorious hordes of Attila the Hun, and defeated him in a great battle at Châlons. He was suspected of treachery by the Emperor Valentinian III., who killed him with his own hand in 454 A. D.

Æto'lia (Gr. *Αἰτωλία*): a state or country of ancient Greece; bounded N. by Thessaly, E. by Locris and Doris, S. by the Gulf of Corinth, and W. by the river Achelous. It was intersected by the river Evenus, the modern Phidaris or Fidaros. The surface is partly mountainous, the scenery magnificent, and the climate delightful. The range of Mt. Pindus extends along the northern part. The ancient Ætolians were a warlike, barbarous, and rude people in the age of Pericles. Ætolia now forms, conjointly with Acarnania, a nomarchy of the kingdom of Greece. See ACARNANIA.

Æfana'sieff, ALEXANDER NIKOLAIJEVITCH: b. in the Russian government of Voronezh, July 23 (11), 1826; studied at the university of Moscow; was secretary to the council of magistrates there. In 1863 he published a collection of Russian popular tales in 4 vols. (2d ed. 1873), and in 1869 a representation of the views of nature entertained by the ancient Slavs (3 vols.). D. Oct. 5 (Sept. 23), 1871.

Affida'vit [literally he made oath, or stated on oath; perf. third person sing. of Late Lat. *affidare*, to state or give on oath]: an oath in writing made before some person who has authority to administer an oath; a statement in writing signed by the party making it, and sworn to before some authorized officer, who appends and signs an official statement to that effect, termed a "jurat." By an extension of its original meaning it is made to include also cases where an affirmation, authorized by law, is taken instead of an oath. An affidavit is made *ex parte* and without cross-examination. It is much used in making various motions in court, and in proving conveyances executed before subscribing witnesses, so as to have them recorded. An affidavit is called *extra-judicial* when, though taken before an officer authorized to administer oaths, it is not itself required or authorized by law.

Affin'ity: in law, the relationship contracted by marriage between a man and his wife's kindred, and between a wife and her husband's kindred. In Great Britain marriage is forbidden between persons who are within the third degree

of relationship by affinity, and this prohibition is considered to be based on the law of God.

Affinity, CHEMICAL: a name given to that which holds the constituents together in a chemical compound. Thus water consists of hydrogen and oxygen held together in chemical combination. What holds them together we do not know, nor do we know in what condition they are; but it is convenient to give a name to the unknown cause, just as it is convenient to give a name to that which causes a body thrown into the air to return to the earth. As is well known, we call this unknown cause the attraction of gravitation, without thereby explaining what it is. The expression chemical affinity is coming to be used in a somewhat different sense from the above, but this more refined use can not be explained here.

IRA REMSEN.

Affirma'tion: in law, a declaration made by a witness as a substitute for an oath in a court of justice. This formula is used by Quakers and others who have conscientious scruples against oaths. In the U. S. the use of affirmations instead of oaths has become very common, experience seeming to have shown that the value of evidence and the force of obligations are not diminished thereby.

Affre, DENIS AUGUSTE: Archbishop of Paris; b. at St. Rome-de-Tarn, Sept. 27, 1793. He became vicar-general at Paris in 1834, and archbishop in 1840. During the insurrection of June, 1848, he made a generous effort to end the carnage by a personal appeal to the insurgents, but while he was speaking to them hostilities were renewed between the insurgents and the military, and he was mortally wounded by a ball, and died June 27, 1848. He left an *Essay on the Egyptian Hieroglyphics* (1834), and other works.

Afghanistan, aaf-gān-is-taan' [a name of Persian origin. The people call their country *Ca'-bul* (the valley of the Cabul river) and *Khorasan*, the rest of the country vaguely]: a country of Asia; lying between 30° and 38° 20' N., and the meridians 60° 30' and 74° 30' E. Its boundaries are largely political, and were settled on by Russia and Great Britain. On the N. lie the Turkoman desert, Bokhara (with the Oxus as boundary line), and the Pamirs. On the E. the boundary is in general that of British India. On the S. it is bounded by Baluchistan, and on the W. by Persia. Its form is roughly rectangular, but it has a long projection to the N. E., N. of the Hindu Kush mountains, and including Badakshan. The total area is about 257,000 sq. miles (about that of Texas), and the population is estimated at 5,000,000.

Topography.—It is for the most part a series of elevated table-lands, diversified by mountains. Only the valley of the Cabul river and a part of the southwest angle are below 4,000 feet above the sea, while a not inconsiderable part is above 7,000 feet. The Hindu Kush mountains enter in the N. E., and extend, under various names and at lower altitudes, along and near the northern boundary. The eastern border along the Indus valley is formed by the Suliman range, and from the head-waters of the Cabul river broken ranges extend finger-like S. and southwestward. The altitudes of the mountain peaks here are not so great as in Thibet and the Himalayas. The highest mountain is probably that north of Cabul, to which the name Hindu Kush is especially applied. It is probably 20,000 feet high, and the Kushan Pass near it rises to 15,000 feet. Westward the elevations do not surpass 17,000, and the Suliman peaks 13,000.

The most important and best known river is the Cabul (anc. *Kophes*). It rises in the Hindu Kush and its westward extension, and after a course of 250 miles for the Cabul proper, or 370 if its principal tributary, Kashkar—really the principal stream—is taken, it falls into the Indus at Attok. The Helmand (anc. *Etymander*) is but little known. It rises not far from the sources of the Cabul, and after a southwesterly course of 615 miles, 300 of which are unknown, it empties into the great Persian marsh or lake called Leistan. The Harut (245 miles long) also empties into this marsh. The Lora (200 miles long) is the most southern of the Afghan rivers. Its waters are usually exhausted in irrigation. The Hari-rud rises to the W. of Cabul, and flowing first W., then N., is lost in the Turkoman desert after a course of about 500 miles.

Climate.—The variety of climates is great, varying from the tropical climate of the Indus valley to the Alpine ones of the higher plateaus. At Cabul the traveler can pass in a day's journey from where the snow never falls to where it never melts. The summers are generally hot and the skies

clear. The rainfall is small, averaging less than 10 inches annually, except about the mountains. The melting of the heavy snows on the latter furnishes the streams with supplies which are extensively used for irrigation. The summer monsoons of India do not pass westward of the Suliman mountains, and what rain falls is generally confined to winter. Dust and sand storms are common, and sometimes assume the character of the Saharan simoon. Intermittent and remittent fevers, bowel complaints, rheumatism, stone, hæmorrhoids, and syphilitic diseases are common, the latter in their most repulsive forms.

Productions.—Northern Afghanistan is said to be rich in minerals. An excellent quality of iron is manufactured. Copper, lead, and gold are found in many places, the latter so far in small quantities. Badakshan has been famous for its precious stones. The native fauna and flora are poor. Agriculture is generally practiced with the aid of irrigation. There are two crops yearly. The one sown in autumn and reaped in summer consists of wheat and barley; the other, sown in spring and reaped in autumn, of rice, millet, and maize. The castor-oil plant, madder, and asafœtida abound. Vast quantities of the latter find their way to the Indian market. Among the fruits are the apple, pear, peach, apricot, pomegranate, grape, and fig. These form a large part of the food of much of the population, and they are exported in large quantities. The manufacture of silks, felts, carpets, dressed skins, and rosaries forms important industries.

Inhabitants.—The Ghilzais are the most numerous and the bravest of the Afghan clans. The political ascendancy is in their hands, and they at one time possessed the throne of Ispahan. They occupy the country between Herat and Kandahar. Certain large tribes speaking the same language and having the same customs, but living along the Suliman range, are rejected by the Ghilzais and called Pathans. The Hazaras are of the Mongol type, and occupy the mountains of the N. W. The Tafiks are probably the aborigines. They are a subject race, quiet, industrious, and frugal; speak a dialect of Persian, and are scattered over the whole country. There are also many modern Persians called Kizilbashs, who are chiefly to be found in the towns as merchants, doctors, and scribes, and are justly looked up to as a more educated and superior class. Their emigration began with the time of Nadir Shah (1737). There are also representatives in smaller numbers of other races. The Kizilbashs and the Hazaras are Suni Mohammedans; the others are Shiachs.

Government.—The government is monarchical and hereditary, but feudal in character, and the power of the prince depends much on his personality and fortunes. The country is divided into four provinces—Cabul, Turkestan, Herat, and Kandahar, and the districts of Badakshan and Wakhan in the extreme N. E. Each province is under a governor, under whom the nobles dispense justice in a feudal fashion. The laws in force are those usual in Mohammedan countries, and are fairly equitable, but exaction, spoliation, and embezzlement are all but universal.

The ameer is said to have had at the beginning of 1890 a regular army numbering 50,000 men. He has regularly embodied his foot levies, and he can call on his nobles and other important vassals for their mounted retainers. The artillery branch of the army is weak, and there are no trained engineers. The people are very turbulent and seem more fond of discord, alarms, and bloodshed than of quiet under a settled government. The hold of the ameer on the different parts of the country is always weak, and over the more distant parts it is rarely more than nominal. The revenues are subject to great fluctuations. In 1871-76 they were estimated by one of Shere Ali's ministers to average \$500,000 per year.

History.—What is now called Afghanistan is a mass of heterogeneous elements which have rarely been held together in one government. The Afghans themselves claim descent from King Saul. The name is first found in the history of Sultan Mahmud, of the eleventh century. Alexander the Great reached India by the Cabul river. The *Ariana* of Strabo corresponds roughly with the Cabul province, overpassing it on the W. and S. The ancient Greek kingdom of Bactria included the Cabul basin, and probably extended at times over the most of modern Afghanistan. The Indo-Seythian dominion occupied the country at about the beginning of our era. Various barbaric dynasties succeeded each other, among which appears a notable monarch, Kanishka, whose traditions can be traced for a thousand years afterward. About the end of the tenth century the country fell

into the hands of a powerful Mohammedan dynasty, certainly of Turkish and probably of Afghan race proper. To this family belonged the celebrated Sultan Mahmud of the eleventh century. In the latter part of the fourteenth century Afghanistan fell under the rule of Timur or Tamerlane, and remained with sovereigns of Mongol descent until its conquest by Persia (1642). Early in the eighteenth century control was wrested from the Persians by the native Ghilzais, who eventually conquered Persia itself, and held it for a few years. Nadir Shah recovered both Persia and Afghanistan, but he was assassinated in 1747, and succeeded by a noble Afghan, Ahmed Khan, who was the first to create Afghanistan as it is now known. He extended the boundaries of the country by extensive conquests, but anarchy soon followed his death. The next prominent figure in Afghan history is Dost Mohammed, who permitted a British resident at his court, with the result of losing his throne by a British invasion in 1838-39, but he regained it two or three years after, and retained it until 1863. He was succeeded by his son, Shere Ali Khan. In 1878 war was declared against him by Great Britain, and resulted in his deposition and the acknowledgment of his son, Yakub Khan. Riot and turbulence followed, until 1880 found Abdul Rahman Khan, a grandson of Dost Mohammed, in possession of the supreme power. During the armed struggle of Great Britain with the Afridi and other border tribes of northwestern India, in 1898, the Ameer with difficulty maintained a neutral position.

Large cities are not numerous in this country, and their population is fluctuating. The principal cities are Cabul (50,000 to 60,000 inhabitants); Kandahar (30,000); Herat (20,000 to 30,000); Istalip (18,000). The trade between Afghanistan and Bokhara is large; that between it and India is annually about—imports, \$1,500,000; exports, \$2,500,000. The rupee is the common silver currency; the gold is Russian or Bokharan. Shere Ali struck off a limited number of 6-rupee pieces. The roads are good, and trade is conducted on the backs of camels and horses. The rivers are not navigable.

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MARK W. HARRINGTON.

Afghan Language and Literature: (1) *The Language:* *Afghan* (*Pushtū*, *Pashtō*, or *Puxtū*) is the language of the mountainous region of Eastern and Southeastern Afghanistan and of the N. W. borderland of British India. The name *Afghān* is the Persian designation of the speech, and is a word of uncertain origin; the people call themselves *Pushtūn* or *Pukhtūn*; they designate their language as *Pushtū* (*Pashtū*), or *Pukhtū*. There are two dialects recognized in the speech: the N. dialect, or *Pukhtū*; the S. dialect, or *Pushtū*. These two are distinguished, as in their respective names, *Pukhtū*, *Pushtū*, by the use of *kh* in the N. for *sh* in the S. dialect. The northern or *Pukhtū* dialect also has *g* where the southern, or *Pushtū*, has *zh*.

The Afghan language has been shown by its phonology to be a genuine Iranian tongue, and is now so accepted. It bears the same relation to the language of the AVESTA (*q. v.*) that the modern Persian does to the speech of the ancient Persian inscriptions. The geographical position of the Afghan has led to its receiving borrowed elements, (1) from Persia, (2) from the Hindustani of India, (3) from the Arabic. In phonology the Afghan presents many analogies to Avestan, but the Afghan has no *f*; it substitutes *p* for this letter. It has no aspirates, but has spirants. The Afghan has borrowed cerebrals from India. The Arabic alphabet is used in writing the language. In its inflections the Afghan shows greater signs of antiquity than the modern Persian. The noun declension has preserved the notion of grammatical gender and of an inflectional stem; the verb system distinguishes voice, mode, tense. There is little evidence of grammatical influence exercised from India. See IRANIAN LANGUAGES.

(2) *The Literature.*—The literature of the Afghans is partly written, dating from the fifteenth century, and partly oral. It all belongs to the eastern region near India, and it is not inconsiderable in extent. According to tradition, the oldest written work is a history of the conquest of Swāt (A. D. 1413-24) by Shaikh Malī, a chief of the Yūsufzais, and himself a leader in the campaign. Tradition also tells of a similar

history by Khān Khajō (1494), a successor of Shaikh Malī. There are some fragments of an Afghan writer, Bāyazīd Ansārī (A. D. 1550), called *Pir Rōshan*, "the master of light," the founder of a heretical sect. These fragments are chiefly preserved by being cited in the works of his orthodox opponent, Akhūn Darveza. The latter wrote more than fifty works; most of them are still unedited.

Besides the historical and theological writings the Afghan literature is rich in poetry. The oldest poetical works preserved are those of the Sufi, Mīrzā Ansārī (first half of the seventeenth century), who is imbued with the mystic and religious element. The warrior poet Khushāl Khān (1613-91), a prince of the Khatakas, was a favorite secular writer; while his contemporary Abdul Rahmān, from the neighborhood of Peshawar, was the most popular of the mystic poets. The elements of prince, warrior, and poet were also united in Ahmad Shāh (1724-73), the founder of the Durāni empire. The real poetry of the Afghans, however, is the ballad poetry, on legendary, romantic, amatory, political, or religious themes, sung by the *dum*, or wandering minstrel. A valuable collection of these has lately been made by the French scholar Darmesteter.

The best book for reference is J. Darmesteter's *Chants populaires des Afghans* (Paris, 1888-90), containing historical sketch, grammar, texts, and translation. Other useful works are Trumpp's *Grammar of the Pashto* (London, 1873); F. Müller's *Abhandlungen* (1863, ff.); the anthology of Raverty, *Gulshan-i-Roh, or Selections of Afghan Poetry and Prose* (London, 1861); Dorn, *Afghan Grammar* (1840); *Afghan Chrestomathy* (1847). A. V. WILLIAMS JACKSON.

Afium', or **Afium-Kara-Hissar** (black castle of opium): a city of Asia Minor, in Anatolia, 53 miles S. E. of Kutaieh (see map of Turkey, ref. 5-E). It is on a mountain side, is the residence of a pasha, and has a large trade in opium, whence its name. Here are numerous mosques, a citadel, and manufactures of carpets, arms, saddlery, etc. Pop. estimated at 50,000.

Afrago'la: an Italian town, in the province of Naples, noted for its manufactures of straw bonnets (see map of Italy, ref. 7-F). Pop. 19,000.

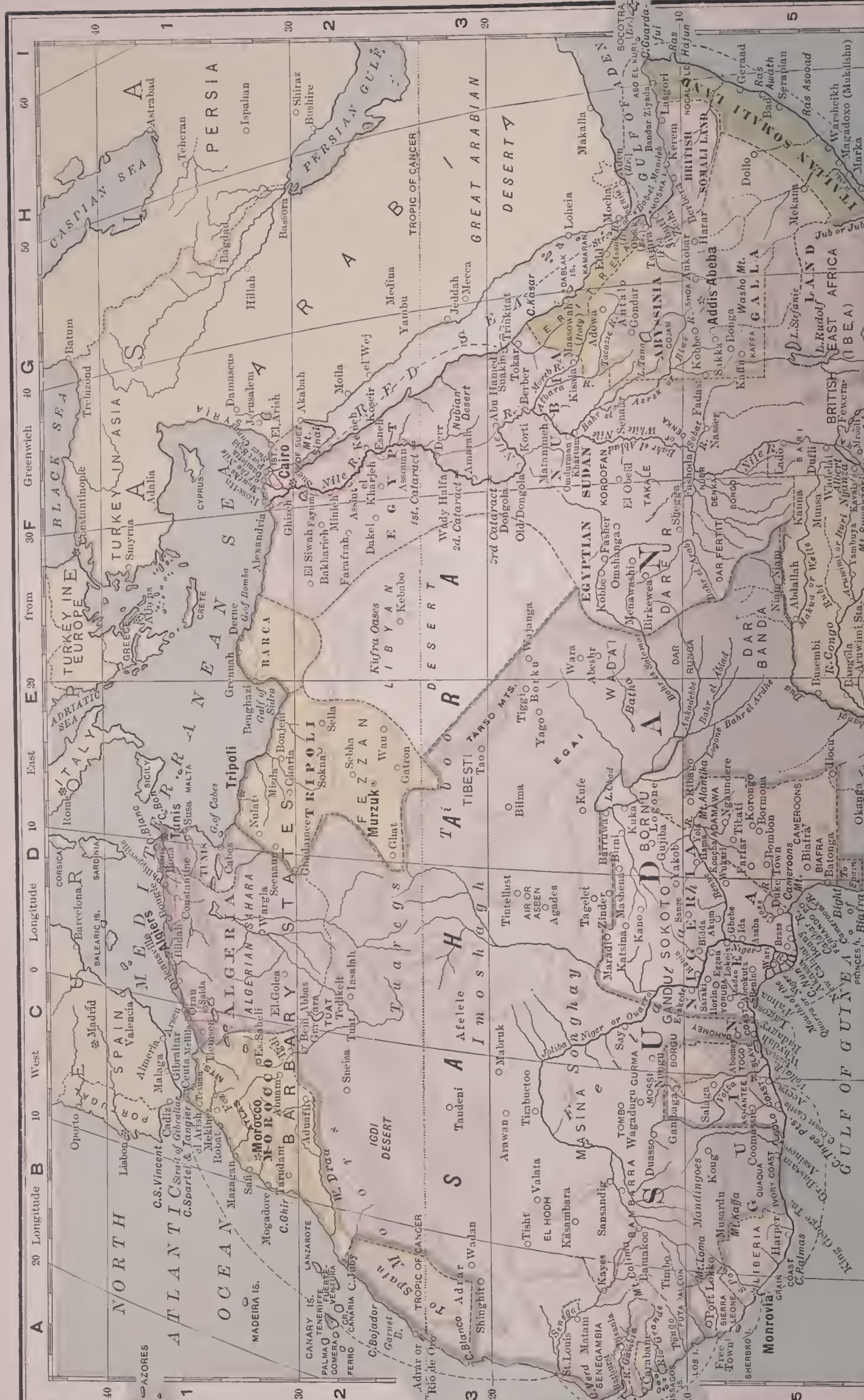
Afrancesa'dos, a-fran'-thā-saa'dō: a name given to those Spaniards who supported the French cause, or recognized Joseph Bonaparte as king, in 1808-13. They were proscribed or treated with severity by Ferdinand VII. after he was restored to the throne.

Afra'nus, LŪ'CIUS: Latin poet; b. about 150 B. C.; regarded by Quintilian as the leading representative of the *Fabula Togata*—i. e. comedy with subjects drawn from Roman life. His style shows the influence of Terence, and he admitted having borrowed much from Menander. More than forty titles and over 400 verses of his comedies have been preserved. See O. Ribbeck, *Comicorum Romanorum Fragmenta*, pp. 164-222. M. WARREN.

Africa [probably from the Carthaginian *Afrygah*, a colony, referring to Carthage, but gradually extended over the entire continent]: the most tropical and least known of the continents; extending from the northern point of Tunis, in lat. 37° 25' N., to the southernmost point of Cape Colony, lat. 34° 50' S., and from the vicinity of Cape Guardafui, lon. 51° 21' E., to Cape Verde, 17° 33' W. The true African islands extend still farther W.—to 28° W. in the Cape Verde islands. The length of the continent is about 5,000 miles, the breadth somewhat less.

PHYSICAL FEATURES.—Africa was formerly connected with Asia by the narrow isthmus of Suez, but since the completion of the Suez Canal (1869) it is entirely surrounded by water. It is separated from Southern Arabia by the narrow Straits of Bab-el-Mandeb, and from Spain by those of Gibraltar. The enormous coast-line is uniform and monotonous, seldom presenting mountains on the coast, and marked by few indentations. Good harbors are rare. The great Gulf of Guinea is merely an angle of the Atlantic Ocean between the western and southern extensions of the continent. At its bottom lies the Bight of Biafra, and on its northern margin the Bight of Benin, both only shallow depressions in the coast-line. The Greater and Lesser Syrtes form a broad extension southward of the Mediterranean Sea. (See SYRTIS MAJOR and SYRTIS MINOR.) The Gulf of Aden lies between the eastern angle of Africa and the south coast of Arabia. Delagoa, Algoa, False, St. Helena, Walvisch, Great Fish, and other bays are relatively small indentations of the coast.

The surface of the continent falls into two fairly well-



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A NORTH ATLANTIC OCEAN MADEIRA IS. CANARY IS. LANZAROTE TENERIFE PALMA FUERTE GOMERA GRAN CANARIA FERRO C. Bojador G. de S. Paulo G. de S. Pedro G. de S. Miguel G. de S. Tiago G. de S. Antão G. de S. Jorge G. de S. Maria G. de S. Vincent G. de S. Tomé G. de S. Príncipe G. de S. João G. de S. Paulo G. de S. Pedro G. de S. Miguel G. de S. Tiago G. de S. Antão G. de S. Jorge G. de S. Maria G. de S. Vincent G. de S. Tomé G. de S. Príncipe G. de S. João

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B SPAIN LISBON MADRID VALENCIA MALAGA CADIZ C. S. Vincent Strait of Gibraltar C. S. Partel & Tangier C. S. Ceuta Melilla Ceira el Arish Tetuan Meknes Rabat Mazagan Mogadore C. G. H. Laridam Abunm C. BARRABRY BEIRUT SAIDAH EL GOLEA W. ARGIA SCENAPPE TUAT TUAT TEGHKEIT SNEISA TUAT IASALAH

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C ALGERIA SAHARA ALGERIA ORAN BORDJ CONSTANTINE TUNIS CAHES GHADAMET TRIPOLI NULAT MISRAH BONJEH G. of Cubes

C ALGERIA SAHARA ALGERIA ORAN BORDJ CONSTANTINE TUNIS CAHES GHADAMET TRIPOLI NULAT MISRAH BONJEH G. of Cubes

D LIBYAN DESERT KAFIRA OASES FARAFRAH ASSABT EL KHARJEH ESNEH KOSSEIR EL WEJ MOILA DAMASCUS HILLAH BAGHDAD TEHERAN ISPAHAN SHIRAZ BUSHIRE

D LIBYAN DESERT KAFIRA OASES FARAFRAH ASSABT EL KHARJEH ESNEH KOSSEIR EL WEJ MOILA DAMASCUS HILLAH BAGHDAD TEHERAN ISPAHAN SHIRAZ BUSHIRE

E EGYPTIAN DESERT WADY HALFA DERR AMARAH DESERT 1st. Cataract 2d. Cataract 3rd. Cataract DOUGOLA OLD/DONGOLA KORTI

E EGYPTIAN DESERT WADY HALFA DERR AMARAH DESERT 1st. Cataract 2d. Cataract 3rd. Cataract DOUGOLA OLD/DONGOLA KORTI

F SUDAN KORDOFAN TAKALE DIAREUR BORN'U GANDU'U SOKOTO MASINA SONGHAY

F SUDAN KORDOFAN TAKALE DIAREUR BORN'U GANDU'U SOKOTO MASINA SONGHAY

G GREAT ARABIAN DESERT ADEN SOCOTRA ABO EL KURU BANDAR ZIYALAH MASARA MOCHA KAMARAN LOHEITA

G GREAT ARABIAN DESERT ADEN SOCOTRA ABO EL KURU BANDAR ZIYALAH MASARA MOCHA KAMARAN LOHEITA

H BRITISH EAST AFRICA (I.B.E.A.) DAR BAND A DAR FERITIT BONGO KAFFA WASHO MT. ADDIS ABEBA HARAR

H BRITISH EAST AFRICA (I.B.E.A.) DAR BAND A DAR FERITIT BONGO KAFFA WASHO MT. ADDIS ABEBA HARAR

I AUSTRALIA TASMANIA VAN DIEMEN'S LAND SOUTH AUSTRALIA WEST AUSTRALIA NEW SOUTH WALES QUEENSLAND

I AUSTRALIA TASMANIA VAN DIEMEN'S LAND SOUTH AUSTRALIA WEST AUSTRALIA NEW SOUTH WALES QUEENSLAND

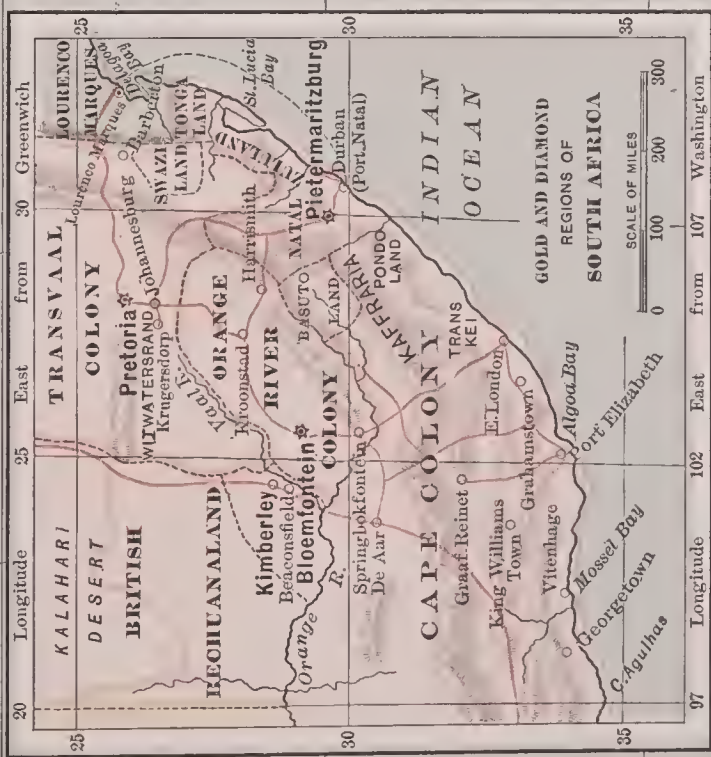


AFRICA

SCALE OF MILES
0 100 200 300 400 500

EXPLANATION OF COLORS

 British	 Portuguese
 French	 Italian
 German	 Spanish
 Turkish	 Railroads



A 57 B 67 C 77 D 87 E 97 from 107 F Washington 117 G 127 H 137

marked divisions, the northern table-lands and the central and southern plateaus. The first comprises the desert of Sahara, and consists of table-lands separated by "wadys," or dry water-courses, and margined by plains and depressed areas. The culminating point, as indicated by the wadys which radiate from it, is to the S. of Algeria and W. of Fezzan, in about lat. 25° N., lon. 5° E., and is called Imoshagh. There is on the N. a large table-land, fringing the desert and bordering the Mediterranean, extending from Morocco to Tunis. In South Algeria and Tunis are shallow salt-marshes (*shotts*), 100 feet or less below sea-level. In the Libyan waste are three small areas, Siwa, Sittra, and Birket el-Qarum, 80 to 141 feet below sea-level. No other areas in Africa, except Lake Assal, are known to lie below sea-level. South of Imoshagh, and extending to the Senegal and the Atlantic, is the desert proper, an irregular belt of shifting sands about 2,000 miles long, and from 100 to 200 miles broad. The wadys usually come to an end in this belt. The Sahara is diversified with hills and mountains, and contains many small oases or relatively fertile regions. Larger fertile areas are usually groups of oases along the wadys, as Air or Asbun in the center of the Sahara; Adrar, near the Atlantic; and Fezzan, S. of Tripoli.

The great plateau which occupies the most of Central and Southern Africa begins to the N. of Abyssinia. The eastern edge is the higher, and extends in a line which is but little broken to Mts. Kenia and Kilimanjaro, Lake Nyassa, and southward into Cape Colony, where it comes near to the coast. Turning northward from Cape Colony, it runs at lower elevations, but on the whole nearer the coast, to the Benue river, a tributary of the Niger, where it turns eastward and joins the wedge which extends northward over Abyssinia. The Western Sudan appears to be a lower extension of this plateau, culminating in the region of the upper Niger and Senegambia. The average height of the great plateau is probably about 3,500 feet. It averages highest in Abyssinia and lowest on the Gulf of Guinea. The great rivers generally take their rise within it, and show a series of falls or gorges where they leave it, as the cataracts of the Nile and the falls and gorges of the lower Congo. A large part of the southern portion of the plateau is occupied by an arid region, having about the same S. latitude as the Sahara has in the N. This is the so-called Kalahari desert, which is, however, not incapable of a successful grazing industry.

Rivers.—These present many features of interest. Some of them are among the greatest in the world, but these are all difficult of navigation in their lower course, because of bars at the mouths, cataracts, and gorges at no great distance inland, and there are other impediments, such as the enormous development of vegetation which bars the White Nile. The Nile is the first in historical interest, and also the longest. It was the nurse of Egyptian civilization, and yet its source was not known to moderns until the latter half of the nineteenth century. It rises in the feeders of the Victoria Nyanza, and, flowing northward, empties into the Mediterranean after a course of about 4,000 miles. Its basin includes upward of 1,000,000 sq. miles. On its course lie the Albert, Albert Edward, and some smaller lakes, and on its eastern branch Lake Tana in Abyssinia. It has few great tributaries, the chief one on the W. being the Bahr-el-Ghazal, and on the E. the Bahr-el-Asrak, or Blue Nile, and the Atbara. From the latter to the mouth, a distance of about 1,000 miles, there is no tributary with continuous flow. The lower Nile decreases in volume of water, because of excessive evaporation in the dry region through which it flows. The inundations, on which the prosperity of Egypt depends, come from the heavy equatorial rainfalls on the upper river.

The Congo is the second river in point of length (2,900 miles), but first in area drained (1,600,000 sq. miles) and in volume of water at its mouth. Its course strikes an enormous curve through the center of the continent, and its sources are less than 400 miles from the Indian Ocean. Next comes the Niger, which is also remarkable for the curve in its course; then the Zambesi, with its remarkable falls; the Shari, which waters the inclosed basin of Lake Chad; the Orange, and the Limpopo.

Lakes.—The great lakes in the interior of Africa were apparently known to the ancients, but to the moderns they were known only from the references in the classics until about the middle of the nineteenth century, and their exploration was not complete in general outline until the beginning of the last decade of that century. The lakes lie, for the most part, along the eastern rim of the great African

plateau already mentioned. The most remarkable series is on the upper waters of the Nile. The uppermost of this system and the largest African lake is the Ukerewe, or Victoria Nyanza (*Nyanza* is a native word meaning "lake" or "water"), lying just S. of the equator in lon. 32° to 35° E. It is roughly circular, about 180 miles in diameter, with an area of about 27,000 sq. miles, with many islands and fertile and populous shores. It is 3,800 feet above sea-level. Numerous lakes also belong to the Congo basin. The most remarkable and largest is lake Tanganyika, in lon. 30° E., and between lats. 3° S. and 8° S. It occupies a deep longitudinal basin running N. and S., and surrounded by mountains. It is about 400 miles long, but not more than 50 miles broad at its broadest part, averaging about 20 miles. Its elevation above the sea is 2,665 feet. Tanganyika has a small drainage basin and is semi-independent, the drainage into the Congo through the Lukuga being only occasional and apparently new in a geological sense. Belonging to the drainage system of the Zambesi is Lake Nyassa, which lies S. E. of Tanganyika and is parallel and similar to it. It is 1,570 feet above the sea, about 350 miles long and 40 broad, with an area of about 14,200 sq. miles. Lake Chad is the drainage center of an independent basin in the Central Sudan. It is a shallow lagoon, very variable in extent, thickly studded with islands, and is about 820 feet above sea-level. The waters are sweet and clear, and the overflow is carried off into the desert. Salt lakes are not uncommon. The most remarkable is Lake Assal, E. of Abyssinia, lying in a depression 571 feet below the Red Sea, and comparable to the Dead Sea.

Mountains.—The mountains of Africa do not form continuous chains except as they make a part of the ramparts of the great plateau, with the single exception of the Atlas mountains on the Barbary coast, and these form a rampart for the Saharan table-lands. The chief group of mountains disconnected with these systems is the Cameroon mountain with lower outliers, all volcanic, on the E., extending to the Bight of Biafra and thence, as a submarine range, rising above the surface in the islands of Fernando Po, Principe, St. Thomas, and Annobón. Few very lofty mountains are known in Africa. The main mountain mass occupies Abyssinia, but the highest point there is Buahit, estimated at only 16,000 feet; Mt. Kenia, E. of Victoria Nyanza, is about 18,350 feet high; and Mt. Kilimanjaro, S. of Kenia and the highest known point, is 19,750 feet high. The Barbary mountains are 6,000 to 14,500 feet. The Cameroon mountain has a height of 12,989 feet. The elevations are usually less than 10,000 feet in Africa. No lofty mountains exist S. of the Central Sudan, where earlier geographers placed the mountains of the Moon; but this name is now thought to belong to the little known Ruwenzori mountains, which lie near the equator and just N. of the Albert Edward Nyanza. They are said to reach an elevation of 16,500 feet. The well-known Table mountain is only 3,550 feet high.

Islands.—Africa is poor in islands as compared with the other continents, except Australia. The great island of Madagascar lies off its S. E. coast, from which it is separated by the Mozambique channel, 230 miles wide in its narrowest part. It is 980 miles long and 350 miles across in its broadest part. The other islands are small, and arranged along the coast or in groups. Of the former, Fernando Po and Zanzibar are the most important; of the latter, the Comoros (in the Mozambique channel), the Cape Verde islands, the Canaries, and the Madeira islands. The Azores are sometimes classed as African, but are more properly Atlantic islands. The Seychelles and Mascarenes, though far out in the Indian Ocean, are properly African, as they are connected with the Comoros by relatively shallow waters. Several of the great interior lakes are studded with islands.

CLIMATE.—The climate of Africa is essentially tropical, but is much modified by the extensive arid tracts to the N. and S. and by the elevation of the interior. The hottest region for the year is over the Sudan, where over an area 3,000 miles long; by 1,000 broad the mean annual temperature is 86° or more. The hottest region in summer is just N. of this, over the Sahara, where the mean July temperature is 97°. This is the largest hot region on the earth, and is only approximated by much smaller regions in Central India and Western Mexico. At the same time the daily temperature changes are here very great, and heat which in the afternoon makes the soil like fire and the wind like a flame may sink toward morning perilously near to frost. The mean temperature of the rest of the continent is from 75° to 80°—about that of Brazil—while for a narrow strip of coast extending from

Angola around to Natal the mean temperature is that of the Southern States. The aridity is severe over the northern third, and less so over the southern third, of the continent. Over the Sahara the precipitation varies from 5 inches annually to nothing. Over the Kalahari desert it is generally greater, ranging from 5 to 25 inches, or about that of the Missouri valley. In the central regions the rainfall is greater, and it is greatest over a large region between Kordofan and the Nile lakes, along the coast about the Bight of Biafra, and over the Sierra Leone coast. Here the annual rainfall is from 75 inches upward, and at Monrovia it reaches 130. In the tropical regions there are two rainy seasons. The first is in early summer. It is followed by a short relatively dry season, after which comes a rainy autumn. The winter and spring are dry. On each side of this area, and adjacent to the arid regions, there is but one rainy season, which occurs in middle and late summer. Near the Cape the rains occur in spring and autumn, with a dry season in late summer. Thunder-storms are common. Dangerous desert winds frequently occur, but Africa is free from hurricanes, except over the eastern island groups and about the Gulf of Aden.

GEOLOGY.—This is known only in fragmentary form, and the work of individual explorers at points widely separated is pieced together here with the greater difficulty because of an apparently independent order of geological events in this continent. In general, the massive crystalline or oldest rocks appear only along the rim of the great plateau already described. The tropical lakes lie in or near the eastern line of these rocks, and the Nile runs over or parallel to the long axis of their exposure. In the W. they are found close to the coast, and they extend along the N. shore of the Gulf of Guinea. The Paleozoic rocks are relatively scanty, while the Mesozoic are abundant. The Tertiary occurs over a large area in Egypt and Barca, and the Quaternary over the deserts, in the heart of the continent, and along the Gaboon and Sierra Leone coasts. The general outlines of the formations and the topography of the continent indicate that it has been relatively little disturbed in geologic times. In Abyssinia and Shoa, and E. of the Ukerewe, are large areas of recent eruptive rocks. Elsewhere they are few and their areas are small. The only active volcano known is Kirunga Gongo in the great lake region N. of Tanganyika. Earthquakes occur along the western Mediterranean coast.

FAUNA AND FLORA.—Both the plants and animals of Africa have characteristic features. The date-palm forms this feature for the north. In the south are miniature woods of heaths, some reaching the height of 12 or 15 feet. The cactuses of America are replaced by leafless, fleshy, and thorny euphorbias and similar plants. In the central regions there is a varied and rich flora, above the lower forms of which often rise the baobab, the oil and sago palms, the cotton-trees, and many other giants. The swamps are often covered with the papyrus, a tall aquatic plant, from the stem of which was formed the material which anciently took the place now occupied by paper. It is very abundant, especially on the upper Nile, where in some places it bars the navigation of the streams. Recent discovery has shown that Africa, like South America, possesses an enormous interior forest. It lies just to the W. of the northern part of the lake district, and runs apparently from lat. 5° S. to 3° N., with an average breadth of between 400 and 500 miles. This would give it an area of about 250,000 sq. m. This forest is almost unbroken; the trees rise to all heights up to 200 feet, and stand so close together that the direct rays of the sun are shut out from the traveler below. Traveling through the forest is very difficult, and Stanley's party were 160 days in crossing it. The population within the forest is very sparse, and consists in part of tribes of the dwarfish races.

In larger animal life the continent is especially rich. Among quadrupeds are the gorilla, chimpanzee, baboons, and mandrills. It is the chief home of the lion, and has many other representatives of the cat tribe. The bear, however, and the wolf and fox are almost entirely lacking. The elephant, rhinoceros, and hippopotamus are abundant. The antelope family here receives a remarkable development both in number of species and individuals. The quagga and zebra are characteristically African; while the horse apparently can not be acclimatized over the eastern tropical part of the continent. The giraffe is one of the most remarkable of existing animals, and is characteristically African, ranging from Cape Colony to Nubia and the Sahara. The birds are remarkable for the brilliancy of their plumage and the singularity of their habits. The largest living bird is the

African ostrich. Venomous reptiles are relatively few. The most important of the reptiles is the crocodile. The fly is extremely abundant and a great plague. One species, the "tsetse," is very destructive to cattle and sheep, but harmless to man and wild animals. The white ants form a scourge to the country, in that they occur in large numbers, and in their migrations devour everything that falls in their way.

ETHNOLOGY.—The most notable feature of the ethnology of Africa is that it is occupied by the Negro, Ethiopian, or black race. The original Negro domain seems to have occupied all Africa S. of the Sahara, and an extension eastward covering a large part of India and the most of Malaysia and Australasia. Whether the race was originally continuous or not, it is now divided into two distinct parts—the eastern or Papuan of the eastern archipelagoes from the Philippine islands to Australia, and the western or Negro proper occupying Central and Southern Africa and some of the African islands. The typical features of this race are the blackish velvety skin; the distinctly woolly hair, the individual hairs being not round but elliptical or flat in section; the bright, expressive, and lively black eye; the thick lips and flat nose; the projecting jaws, and the thick cranium, the sutures of which are said to close early in life. These features are most marked in the Guinea Negroes, and vary through many gradations in various tribes. The true African race is not so simple and uniform as might be expected, but, like the other great races, shows infinite complexity on closer study. Wave after wave of immigration and conquest seems to have swept over one portion or another of the continent, leaving sometimes patches of distinct tribes side by side or one inclosed in the other, ruling and subject peoples sometimes in the same territory, sometimes an intermixture of tribes, which, with the lack of historical data, make a problem the details of which still await resolution. And not only have the Negro sub-races and tribes undergone this intermixture, but branches of other races have taken part in it from the dawn of history, as the Carthaginians, Vandals, Arabs, Jews, and Turks. Through this maze of races and tribes the principal guide has been found to be the languages, and physical characters play a less important part. Guided by these, the following ethnological outline may be given as approximately correct.

1. *The Bantu family*, occupying the most of South Africa and extending to the equator and beyond. It includes the Zulus and Kaffirs, the Bechuanas and Basutos, the Swahili and Machinga, the Waganda, Ovambo, Basongo, Aduma, and numerous other tribes falling into several groups. On the west coast they extend as far N. as the Cameroons. They are dark, but not always black. In many of them, as in the Kaffirs, the Negro characteristics are so altered that they are sometimes called Negroid rather than Negro. Their common characteristic is to be found in the similarity of their languages, which all belong to one clearly distinct and remarkably homogeneous linguistic family. These languages are characterized by the simplicity and harmony of the syllables, each of which begins with a consonant and ends with a vowel, while consonantal juxtapositions are rejected; by alliterative concord in the words; and by a wonderful development of verbal inflexion, both initial and final. These features make the languages both very euphonious and very rich in capacity for expression. There are indications that the diffusion of this family of languages over South Africa is comparatively recent, and is due to the intrusion of a foreign element from the north.

2. *Dwarfish tribes* have been attributed to Africa from the earliest times, but the accounts of the classical writers were considered apocryphal until rediscovery vindicated their substantial accuracy. The earliest settlers in South Africa found among the larger and stalwart representatives of the Bantu family two groups of small men, whom they called Hottentots and Bushmen. Recent exploration brings to light, sparsely scattered in Central Africa, other tribes of still smaller men, who are undoubtedly the modern representatives of the pygmies of the ancient geographers. These tribes are generally supposed to be the aborigines; and while they undoubtedly find the warfare between them and their larger neighbors an unsuccessful one for them, on the whole, yet their smaller physical powers are in part compensated for by unusual activity and cunning and an especial skill in the manufacture of the poisons with which they tip their arrows and spears. The Hottentots dwell in the extreme south of Africa. Tradition points to their having formerly occupied a much larger territory than at present. They are small, but

not properly dwarfish. Their color is rather leathery brown than black. They are mild, social, and ingenious, and under British rule some are prosperous and civilized. A striking peculiarity of their language is the number of clicks and guttural sounds which it contains. The Bushmen are nearly allied to the preceding, but are of smaller stature, and lower in the scale of civilization. They are found over the arid region of South Africa, from Northern Cape Colony to Lake Ngami and the Ovambo river. The dwarf races of the north are still smaller, and more sparsely scattered. Dr. Schweinfurth discovered the Akkas in the N. E. Congo basin; Du Chaillu, the Obongo in the W. equatorial region; De Compiègne, a dwarfish people on the Ogowe river (1874). They have since been found by many travelers, but it was Stanley, in the account of his journey (1887-89), who made the world best acquainted with them. He found them in the great equatorial forest. He gives their height as between 3 feet and 4 ft. 6 in., and found one girl of seventeen years of age who was only 35 inches high. Wissmann measured forty Batua and got an average height of 4 ft. 7 in. Dr. A. Donaldson Smith (1895) found the Dume, or Doko, N. of Lake Stephanie. See ΡΥΘΜΥ.

3. *The Central African groups*, extending from the Bantu family on the S. to the Sahara on the N., present a confusion of tribes not yet unraveled. There is abundant evidence of commingling with the non-Negro tribes to the N. Several distinct stock languages have already been determined, and many more are believed to exist. The Abyssinians are a mixed race, with distinct Arab characters. To the S. of Abyssinia, in Kaffa, Galla, and Somali lands, the race is clearly Negroid, the language non-Negroid. The Tubus of the Eastern Sahara have apparently impressed their speech on many Negroid tribes to the S. and S. W. The Fulahs of West Sudan and Fans of Lower Guinea are distinctly non-Negro.

4. *The Berber race* occupies the Western Sahara and almost the entire Mediterranean coast. The name Berber is applied to the inhabitants of Northern Atlas. Elsewhere they are called by other names, as Shulu, Kabyle, and Tuareg. They are athletic, well formed, strong featured, brave, industrious, and are distinctly non-Negro, though their racial relations otherwise are still in dispute. Their language is peculiar, and is perhaps Hamitic. Many tribes have lost their original language, and now use Arabic. The Berber is an ancient race. The ancient Mauritanian and Numidian names by classical authors can be interpreted in Berber. The Moors are of mixed Berber and Arab descent. The Berbers seem to have been the aboriginal family of Northern Africa.

5. *The Copts* are believed to be the modern representatives of the ancient Egyptians. They are found in Egypt, where they make 5 or 6 per cent of the population. They are of medium size, dark complexion, with soft, woolly hair, oblique eyes, high cheek-bones, and thin beards. They are Christians of antiquated sects, and are extremely bigoted, sullen, avaricious, and untrustworthy. The Coptic language is now dead, being understood by few and replaced by Arabic. Other Hamitic languages are found along the Red Sea E. of Abyssinia, and in the inland Galla region. Several of the Sudan tribes are suspected of being more or less purely Hamitic.

6. *The Arabs* have undoubtedly exercised influence in Northeastern Africa from the earliest times, but the first historical wave of invasion occurred in the first century after the Hegira. In 640 Amru, a Mahomedan general, invaded Egypt, and by 706 the whole of North Africa, from Egypt to the Atlantic, had been conquered. This has been followed by wave after wave of Arab invasion, or Mohammedan religious revival, until Africa N. of 10° N. lat. is now Mohammedan. At the same time the rest of Africa has offered a favorable field of trade for the Arabs, who have extended their influence in the eastern half of Africa as far S. as the Zambesi river.

7. Of the *many other races* which are found on African soil little need be said. The Carthaginians have left hardly a trace, and the same is true of the Gothic tribes who once controlled parts of the northern coast. The Dutch are now numerous in inland South Africa, where they are known as Boers. The British occupy Cape Colony and Natal, and control some neighboring states. The Portuguese and Spaniards have occupied some of the islands and the Portuguese large areas on the mainland. The French have passed in great numbers over to Algeria, especially since the Franco-Prussian war, and the recent colonial revival has brought

many of these and other Europeans sparsely into other parts of the continent. The Jews have also spread in Africa, and at one time a Jewish dynasty ruled Abyssinia. On the east and south coasts are many Hindus.

All forms of government and all stages of civilization may be found on this continent. The feudal type still exists here in entire purity in many places. Cannibalism is practiced by many tribes—some of relatively high development, as the Fans—often as a ceremonial observance, but very often too as a means of obtaining food.

POLITICAL DIVISIONS.—As the native political divisions of Africa were for the most part unknown, the earlier divisions used by writers were geographical. These are still quite generally employed, but are gradually being replaced by the colonial designations which have followed the partition of Africa among the European nations. Among the geographical divisions such names as the Sahara, the Cape (of Good Hope) region, the Niger, Congo, and Mozambique regions, the Delagoa and other bay districts, and Guinea coast need no explanation. The Sudan is the district S. of the Sahara and N. of lat. 5° N., extending from the upper Niger to the middle Nile; the Lake district is that containing the principal great lakes of inner Africa; the Grain, Ivory, Gold, and Slave coasts are the divisions of the coast in order from Sierra Leone to the Niger delta; the Gaboon is the region about and to the S. of the Gaboon river; the Horn of Africa is the eastern Somali extension, terminating in Cape Guardafui. The names given by travelers for interior districts are often the names of chiefs or tribes, and are so often changed that the next traveler is likely to give quite a different set.

The following are the divisions recognized on the authoritative maps (1897): In the districts assigned to different colonies, as British East Africa, Portuguese Angola and others, the territory covered is that recognized in treaties between European nations, but not necessarily by the natives actually included. The foreign influence is only in small part that of an effective government, but mostly that of a protectorate or "sphere of influence." It is probably true that in many cases the natives are yet unaware that they are in such protectorates or spheres of influence.

Egypt is on the lower Nile, and extends up to Old Dongola. Before the Mahdist rebellion Egypt had been extended over Nubia and much of the upper Nile, the latter forming the "Equatorial Province" of which Emin Pasha had charge. Nubia is in large part under Egyptian control, while the Equatorial Province is a part of British East Africa.

Abyssinia occupies the northeastern angle of the great plateau, and is separated from the Red Sea by the Italian colony of *Eritrea*, which is in part a colonial government, in part a protectorate. Abyssinia is an independent government. Inland from Abyssinia to Lake Chad are, in order, *Darfur*, *Wadai*, and *Bagirmi*, which are independent sultanates.

The *Eastern Horn* is under French and British protection along the most of its north coast, and Italian elsewhere. The protection is only nominal even along most of the coast. S. of this, along the coast from the river Juba to near lat. 5° N., and extending inland past Victoria Nyanza nearly to Kordofan and Darfur, is *British East Africa*; S. of it, to the Rovuma river on the S. and Lake Tanganyika on the W., is *German East Africa*; S. of this and extending along the coast to about lat. 26° 30' S. (just beyond Delagoa bay) is Portuguese territory, the part N. of the Zambesi being called *Mozambique*, that S., *Gazaland* or *Lourenço Marques*. Mozambique is bounded on the W. by a somewhat irregular line, of which Lakes Nyassa and Shirwa form part. Gazaland is bounded on the W. by an irregular line, which begins on the Zambesi near where the meridian of 30° E. crosses it, and ends near the coast in about lat. 26° 30' S. To the S. and along the coast come *Amatongaland* and *Zululand*, under British protection; then the larger *Natal*, a British colony, just N. of Cape Colony. W. of Natal is the native *Basutoland*, in the mountains, a British crown colony. Inland from the coast states, from Gazaland to Natal, are the two Boer republics called the *Transvaal*, or *South African Republic*, and the *Orange Free State*. S. of Natal, Basutoland, and the Orange river is *Cape Colony*, which has a large British population. Inland, from the Orange river northeastward to Lake Tanganyika, is an enormous territory claimed by Great Britain, and known as *British Bechuanaland*. It extends from the N. boundary of Cape Colony to the Zambesi, and from the Transvaal and

Matabeleland on the E. to the confines of German S. W. Africa on the W., and is administered by the British South Africa Company. N. of the Zambesi, but S. and W. of Lake Nyassa, lies the British Central Africa Protectorate.

On the Atlantic coast, passing northward, the first district is *Damaraland*, claimed by the Germans, beginning on the coast at the mouth of the Orange river, and extending northward to the mouth of the Kunene river. It is bounded on the E. by Bechuanaland and the Chartered Company, the latter boundary being for the most part on meridian 21° E.; the northern boundary is near the parallel of 17° 30' S. Next comes Portuguese *Angola*, which extends on the coast to the mouth of the Congo, and eastward nearly to the meridian of 25° E. The *Congo Free State* occupies an enormous territory in the interior of equatorial Africa, and reaches the Atlantic coast by a narrow strip about 100 miles wide and 200 miles long, near the parallel of 5° S. It includes most of the basin of the Congo to the point where it is joined by the Ubangi. The northwestern boundary is formed by the Ubangi and Congo rivers. It was formed by a European agreement and placed under the patronage of the King of the Belgians, who willed his rights to Belgium. N. and W. of the Congo Free State is *French Congo*. It extends from the coast to the Ubangi and behind the Cameroons, along the Shari to Lake Chad. N. of this is the German *Cameroons*. Its coast-line extends along the Bight of Biafra to the point where the coast turns westward. From here the boundary runs northeastward, and a narrow neck of it extends to Lake Chad.

The *British Niger Territory* extends along the coast from the Cameroons to the colony of Lagos. Inland it occupies the lower Niger basin nearly to the Sahara, and northeastward to the large independent kingdom of *Bornu*, which lies S. W. of Lake Chad. Then westward comes *Dahomey*, under French protectorate, a N. and S. strip about 200 miles wide; then German *Togoland*, with a narrow strip of coast; then the *Gold Coast*, a British crown colony, and the Ivory Coast which forms the *French colony of the Gold Coast*. Liberia occupies the southwestern angle of the western extension of Africa. It extends along the "Grain" or "Pepper" coast, and inland for about 200 miles. N. W. and adjacent is the British *Sierra Leone*, extending along the coast about 200 miles, and inland about as far. The *Bisagos* islands, with the adjacent coast and interior, are claimed by Portugal. The territory along the Gambia river for about 200 miles forms *British Gambia*. The remainder of this coast to Cape Blanco, and inland over the basins of the Senegambia and Senegal rivers and that of the upper Niger, is claimed by France. She also claims a protectorate over the Western Sahara from lon. 13° E. to 8° W., except in the N. W., where it is claimed by Morocco. By this area of desert territory her enormous possessions in Southwest Africa are connected with Algeria, and French Africa surpasses British Africa in size.

From Cape Blanco to Cape Juby, Spain claims the Saharan coast, and inland to the French line. For some years Great Britain claimed the territory around Cape Juby where some of her subjects settled, but they were harassed by the desert nomads, gave up the experiment, and the British now assert no interests there.

The kingdom of *Morocco* occupies the northwestern angle of Africa. Her coast-line extends from about lat. 29° N. to Tangier, and hence eastward on the Mediterranean to about lon. 2° W. Her eastern boundary runs irregularly S. S. E. from this point, while the southern is in the Sahara and indefinite. Next E. is French *Algeria*, extending on the coast to about lon. 8° E., then *Tunis*, under French protection, occupying the angle of which Cape Bon is the apex, and extending southward nearly to lat. 30° N. Between Tunis and Egypt, on the coast, are the Turkish provinces of *Tripoli* and *Barca*, and S. of the former is Turkish *Fezzan*. South of Barca is the Libyan desert, the very sparse population of which is nominally under Turkish rule, but actually independent.

Of the islands, Zanzibar, Pemba, Socotra, and Mauritius are British; Madagascar, the Comoro islands, and Réunion are French; Madeira, Cape Verde islands, St. Thomas, and Prince's island are Portuguese; and the Canaries, Fernando Po, and Annobon are Spanish.

AREA AND POPULATION.—The table in the next column gives the estimate of area and population by Ravenstein, an acknowledged authority on this subject. The figures should be viewed simply as the nearest approximations possible with our present knowledge.

ESTIMATE OF AREA AND POPULATION.

COUNTRIES.	Area in sq. miles.	Population.	Inhabitants to a sq. mile.
British Africa.....	2,570,926	40,764,100	16
French Africa.....	2,902,624	23,788,000	8
Portuguese Africa.....	841,025	5,416,000	6
Spanish Africa.....	203,767	437,000	2
German Africa.....	822,000	5,950,000	7
Italian Africa.....	602,000	6,300,000	10
Congo State (Belgium).....	865,400	15,600,000	18
Boer republics.....	162,640	888,000	5
Swaziland.....	6,370	61,000	10
Liberia.....	37,000	1,000,000	27
Turkish (Egypt and Tripoli).....	836,000	7,980,000	10
Unappropriated.....	1,584,398	*22,000,900	14
Great lakes.....	80,350	.....	..
Total.....	11,514,500	130,185,000	11

* Unappropriated Africa includes Morocco (219,000 sq. miles, 5,000,000 inhabitants), Bornu, with Kanem (80,000 sq. miles, 5,100,000 inhabitants), Wadai (172,000 sq. miles, 2,600,000 inhabitants), Bagirmi (71,000 sq. miles, 1,500,000 inhabitants), etc.

The opening of trade and preparation for supremacy by the aid of great corporations, as was done by the East India Company for India, is also practiced in Africa. The British East Africa Protectorate was controlled by the Imperial British East Africa Company, which gave to it the name "Ibea," from its initials, until July 1, 1895. The most of the Niger territory is under the Royal Niger Company. The immense territory of Nyassaland, now officially known as the British Central Africa Protectorate, is under the control of the South Africa Company, with the exception of the eastern portion immediately about Lake Nyassa, which is administered directly by the imperial Government. Damaraland is under the German Southwest Africa Colonial Company, and German East Africa under an imperial company of the same name. There are also some great companies which are auxiliary, but not trusted with governmental powers. Such is the *Deutsche Plantagengesellschaft* in the Cameroons.

COMMERCE.—Agriculture is imperfectly carried on in Africa, except in the extreme N. and S., so that the export products of the continent are largely natural ones. Slaves have from time immemorial been the chief product, but the slave trade is now nearly suppressed. The next best known and most characteristic product is ivory, and this still reaches the coast in the equatorial regions in great quantities. Among the natural products are also palm-oil and palm-kernels, ostrich feathers (from the south), caoutchouc, rubber, gums, sesame seeds, cloves, orchilla, skins, and ebony and other woods. The agricultural products from South Africa are cattle, hides, wool, cereals, including maize, while sugar is exported from both North and South Africa, from the Mascarene islands and from Liberia. Coffee is a very promising production of Liberia and the adjacent regions. This republic also produces cocoa, attempts at the production of which, as well as of bananas, are being tried in the Cameroons and elsewhere, in plantations on an extensive scale. Wines are furnished by Algeria, Tunis, and Cape Colony. Olive oil is produced on the Mediterranean coast. Algeria produces large quantities of cereals and wool. Tunis has a considerable production of sponges. Egypt is a leading producer of cotton and cottonseed.

MINERALS.—The mineral products are relatively small. The best known is the diamond in the Kimberley district in Northern Cape Colony, close to the boundary of the Orange Free State, which is one of extraordinary richness. In 1895 over \$23,000,000 worth of diamonds were exported from Cape Colony. The total of the officially known exports from the discovery of the field in 1867, to 1890 amounted to \$262,000,000. Cape Colony mines much copper, and exported \$3,500,000 worth of the ore in 1890. Gold is found in many places, and is extensively mined in the gold-fields of the South African Republic, which are fully described in the article WITWATERSRAND in the Appendix to the eighth volume of this cyclopædia. The product of these fields naturally makes its way to the coast through Natal and Cape Colony, from which \$45,335,760 worth was exported in 1894. Coal is extensively mined in the Orange Free State, and to some extent in the South African Republic, and has been found in many other places.

The imports into Africa are almost entirely manufactured products, and include textile fabrics, hardware, machinery, iron and copper wire, beads and trinkets; also large amounts of spirits and other drinks.

There is considerable interior trade, considering the means

of communication. Ivory makes its way from the depths of the interior to the coast, usually on men's backs. The trade along the southern edge of the Sahara is particularly brisk, and some of the races of Western Sudan adjacent to the desert have developed considerable manufacturing capacity, especially in cotton and other fabrics, and leather and saddlery. Salt is an active object of interior trade, being abundant in a few places, but generally wanting. It is in some parts so highly prized that it is used for money. Ivory tusks and cowry shells also serve for large and small change. European coins are not valued generally except on the coast, but the Maria Theresa dollar, an Austrian coin, has gained general confidence throughout Central and Northern Africa. It was first struck in 1780, and, to retain the African faith in it, its coinage is continued without change.

COMMUNICATION.—Modern means of communication are rapidly developing. In 1894 Cape Colony had 2,253 miles of railway; Algeria, 1,961; Egypt, 1,170; Natal, 340; and shorter lines were in existence elsewhere, while many long ones were projected. The British East Africa Company is surveying one from the coast to the former Equatorial Province of Egypt, and the coastal part is now (1897) constructed. Another is under construction, 270 miles in length, from Matadi, on the Congo, to Stanley Pool. Cape Colony had 5,973 miles of telegraph in 1894; Algeria, 4,443; and Egypt, 3,168. Regular communication is kept up by steam and sailing vessels on the lower Nile, the lower Niger, and the lower and upper Congo. The African Lakes Company of Scotland keeps a regular line of steamers on the Zambesi and the Shiré, and another on Lake Nyassa. Exploring and mission steamers occasionally navigate Tanganyika and Victoria Nyassa.

HISTORY AND EXPLORATION.—Egypt was ancient in the time of the Roman and even in that of the Greek classical authors. The beginning of its historical era is uncertain, but probably dates at about 5000 B. C., or earlier. In Egyptian pictures the Negro face and figure can be found, and are not essentially different from those known to-day. About 1000 B. C. the Phœnicians established colonies on the Mediterranean coast of Africa, and Carthage had time to rise, flourish, and fall before Rome reached her zenith. Necho or Neku II. (611–595 B. C.) is said by Herodotus to have sent his Phœnician sailors to circumnavigate Africa, a task of which they asserted, on their return, the accomplishment. If true, it has left no other traces to modern times. Perhaps fifty years later, Hanno, a Carthaginian, is said to have fitted out a large expedition, which coasted the western coast of Africa from the Straits of Gibraltar to a point southward, variously assigned from Sierra Leone to the Bight of Benin. The Carthaginians have left us no knowledge of the interior of Africa. In 525 B. C. Cambyses conquered Egypt. The allusions and second-hand tales of the classical authors give occasion to believe that the Egyptians were acquainted with the upper Nile, but they have themselves left nothing behind them on this subject. Egypt was conquered by Alexander the Great in 321 B. C., but though his successors in Egypt—the Macedonian dynasty—were intelligent patrons of the arts and sciences, they have left no indications of additions to the knowledge of Africa. When, however, the Romans came into possession of this country, explorations were extended to Fezzan on the W., and to Abyssinia and the upper Nile on the S.; and before the time of the geographer Ptolemy they had a fair knowledge of the east coast of Africa as far S. as Zanzibar.

Ethiopia, now Abyssinia, at least in part, was also a very ancient country, perhaps as ancient as Egypt. The Queen of Sheba, who visited Solomon about 1000 B. C., is claimed by the Abyssinians as one of their sovereigns. About the time of the Captivity many Jews took refuge in this country, where they acquired great power at one time, and their descendants remain to the present day. About the beginning of the Christian era this kingdom, then known as Auxume, became one of great power, culminating a century or two later.

The modern knowledge of Africa begins with the irruption of the Arabs in the first century after the Hegira. They conquered the entire Mediterranean coast and Abyssinia, and they explored the west coast as far as the mouth of the Gambia, and the east to Sofala in about lat. 20° S. In the fifteenth century the Portuguese, under the enlightened patronage of Prince Henry the Navigator, explored the western coast of Africa, pushing farther and farther S., until in 1486 (and after Prince Henry's death) Diaz rounded the Cape of Good Hope, and in 1497–98 Vasco da Gama completed the circumnavigation of Africa. Accounts of a Christian ruler

named Prester John stimulated discovery in the direction of Abyssinia, and Covilham entered it in 1490. The discovery of America created the slave-trade of the west coast of Africa, and gave rise to a familiar acquaintance of, and some settlements on, the coast from the Gambia to the Gaboon.

Here African exploration practically rested until the formation of an association for the exploration of inner Africa, which was founded in London in 1788. The coast was then known throughout its whole extent, but of the interior only Egypt; Abyssinia, Tunis, Morocco, Senegambia, the Gold Coast, and the Cape were known; and here acquaintance extended over only a strip on the coast less than 150 miles wide, except in the case of the first two. The first scientific journey, properly speaking, had been that of James Bruce (1768–73), who had travelled from Massowah to the upper waters of the Blue Nile, thence to Sennar, thence back to Egypt. The African Association undertook the work of systematic observation. In 1831 it broadened its field by becoming the Royal Geographical Society.

The first problem of which the solution was undertaken was that of the Niger, and connected with that was the discovery of a famous but mysterious Timbuctoo. In 1795–97 Mungo Park entered the Niger district by way of the Gambia, reached the upper course of the Niger, descended it some distance, and returned. In 1805 he again entered this country, and embarked on the Niger to descend it to its mouth, but was killed by the natives at Bussa, below Timbuctoo. Several travelers afterward reached the Niger, Timbuctoo, or Lake Chad, some of whom lost their lives, and it was not until 1830 that the two brothers Lander added to the knowledge of the river by tracing it to its mouth. It was not until Lieut. Hourst floated down the Niger from Timbuctoo to its mouth (1896) that the whole course of the river was revealed and surveyed.

In 1830 France began the conquest of Algeria, and she has continued to push to lower latitudes until its southern boundary has reached the Gulf of Guinea. In 1845–46 Richardson journeyed through the Libyan desert and Tripoli, with the view of opening a trade route over the desert to the mid-Sudan. Barth followed (1850–55) with extensive journeys through the Sudan itself, exploring the regions E., S., and W. of Lake Chad, and extending his journey to Timbuctoo, returning safely to carefully edit his collection of facts concerning this unknown center of Africa. He was followed by Vogel (1853–56), Rohlfs (1865–67), and Nachtigal, who was sent in 1869 on a diplomatic mission to Bornu.

The Egyptian expedition of Napoleon Bonaparte (1798–1801) was a noteworthy beginning of the modern investigation of the Nile basin. The French savants were especially devoted to archaeological research, but geography was not overlooked. The eyes of the world were once more turned to the land of the Pharaohs. The impulse continued under the intelligent Mehemet Ali (1805–48), Khedive of Egypt. He not only invited the learned men of Europe to continue their Egyptian work, but also pushed his conquests through Nubia and Sennar, opening the road for the merchant and missionary, and taking with him European scientists. Cailliaud and Letorzek, who accompanied his army in the conquest of Sennar, were the first Europeans to see the junction of the Blue and White Nile (1821–22).

The development of an exact knowledge of the Abyssinian branches of the Nile (the Atbara and Blue Nile) is due to many different explorers, among whom stand pre-eminent Salt, who accompanied the British Abyssinian expedition of 1810, Burckhardt (1814), Lefebvre (1839–42), Beke (1840–43), Raffray (1873–74, 1881), and Rohlfs (1868, 1880–81). It is, however, the exploration of the White Nile, or main river, which has attracted the most interest and given its results with the greatest difficulty. Linant de Bellefonds was sent out in 1827 by the African Association to explore the upper Nile, but did not get farther S. than lat. 13° N. After other failures, Mehemet Ali conceived the idea of increasing the glory of his reign by rediscovering the sources of the Nile. He sent out two expeditions; the one in 1840 reached 6° 30' N. lat.; that of 1841, 4° 42' N. Petherick discovered the Bahr-el-Ghazal, the chief western branch of the Nile, in 1858, and in 1860 Miani followed the main river up to 3° 34' N. lat. This ended the advance from the N. until after the discovery was made from the S.

The lakes of Central Africa seem to have been known to the ancients. In 1518 the report was brought from Mozambique that a great lake existed to the westward of that place. Cooley collected these reports carefully from 1835, in order to fix the lake with all possible exactitude on his

charts (1845, 1853), and to him is due the introduction of the name Nyassa. On succeeding maps this lake was increased somewhat in size, when the discovery in 1849 of Mt. Kilimanjaro, by Reimann, and Mt. Kenia, by Krappf, led to renewed attention to that region, and brought news of a Lake Ukerewe (now called Victoria Nyanza). Spurred by these reports, Burton and Speke in 1858 struck westward from the Zanzibar coast. Both reached Tanganyika, Speke alone the Ukerewe. In 1862 Speke perfected his work of the previous expedition, and was able to announce that the outflow of the Ukerewe was through the Nile. In 1864 Baker added the Albert Nyanza to the group. Later Stanley discovered the Albert Edward Nyanza, and this is now known to belong to the same group. The Tanganyika has been found to be independent of the Nile, with occasional overflow into the Congo. In 1859 Livingstone discovered the Nyassa and Shirwa lakes of the Zambesi basin. In 1867 he found the Moero, and in 1868 the Bangweolo, lakes of the Congo system. With these discoveries the Central African system of lakes was fully laid open.

In South Africa the Portuguese made no permanent settlement after the discoveries of Diaz and Vasco da Gama. The Dutch followed the Portuguese in the E., and in 1652 the Dutch East India Company formed a colony at the Cape. The colony was weak, but it had some additions to its numbers from other European nations from time to time, notably, in 1686, French Protestant refugees after the revocation of the Edict of Nantes. From 1795 the colonists attempted to gain their independence, but their insurrections were suppressed by the aid of Great Britain, to whom the territory was formally ceded in 1815. In 1835-36 the love of independence among the Boers had become so great that they migrated in a body beyond the limits of the colony, to the N. of the Orange river, and later spread eastward to the coast, in what is now Natal. In 1842 the latter were reduced under British rule, which in 1848 was extended over the Orange Free State. Again the more independent of the Boers journeyed to the wilderness to find independence, and crossing the Vaal to the northward they founded the Transvaal Republic. In 1852-54 Great Britain yielded her claims to sovereignty over the sturdy republicans of both the Orange Free State and the Transvaal. In 1877, however, she took the occasion of disastrous wars between the Boers and natives to announce the annexation of the Transvaal. This was followed by a revolt of the Boers so serious and well sustained that in 1884 the Transvaal was again recognized as independent.

The South African War.—A conference held at Bloemfontein, May 31, 1899, between Sir Alfred Milner and the presidents of the two Dutch republics, to consider the grievances of the outlanders, adjourned without coming to an agreement. Negotiations were continued throughout the following summer, Great Britain urging upon the Transvaal the propriety of granting to the foreign-born residents such privileges as she asserted were due to them as a matter of common justice, that certain monopolies that pressed heavily upon the miners in the Rand be abolished, and that the suzerainty of Great Britain over the Transvaal receive some official recognition. The suzerainty proposition President Kruger flatly rejected as inconsistent with the treaty of 1884, by which Great Britain relinquished her right to interfere in the internal affairs of the republic, and at the same time he offered to submit the other demands to arbitration. Meanwhile, the Orange Free State decided to support her sister republic in the outcome of the dispute. In the latter part of September, while negotiations were still pending, the British Government called out the reserves; troops were sent from England and India; and the troops already in South Africa were massed on the Natal border at Ladysmith and Glencoe. In answer to this, a part of the burgher militia was called out, and on Oct. 9 President Kruger sent his ultimatum to the British Government, demanding the withdrawal of troops from the borders, the removal of all re-enforcements that had arrived since June 1, and that British troops then on the high seas should not be landed in South Africa. An affirmative answer was demanded within forty-eight hours; otherwise, the action of the British Government would be considered a virtual declaration of war. The British Government replied that the conditions were such as they deemed impossible to discuss.

The war actually began at 5 p. m. Oct. 11. The following day the Boer army was in motion. Commander-in-chief Piet Joubert moved with the Transvaal forces into Natal, and Gen. Cronje directed operations in the west. After

serious engagements at Glencoe, Oct. 20, Elandsplaagte, Oct. 21, and Rietfontein, Oct. 24, the British under Gen. White were forced to fall back upon their base of supplies at Ladysmith, where, after an ineffectual sortie, Oct. 30, they were surrounded and their communications cut off by the Boers under Joubert, Nov. 2.

Meanwhile, the London War Office was hurrying an army corps to Cape Town under Sir Redvers Buller as commander-in-chief. The first transports reached Cape Town Nov. 9. The investiture of Kimberley and Mafeking, both garrisoned by small British forces, was complete by Oct. 15, and commandoes of the Free-State Boers crossed Orange river into Cape Colony. Early in November Lord Methuen, with 10,000 infantry and 1,000 cavalry, moved to the relief of Kimberley. He drove the Boers from strong intrenchments at Belmont, Nov. 23, and at Enslin (Gras Pan), Nov. 25, and on Nov. 28, after a bloody fight, forced the passage of Modder river. On Dec. 10-11 he lost more than 1,000 men in an unsuccessful attempt to dislodge the Boers, now re-enforced and heavily intrenched at Magersfontein. Coincident with this disaster, Dec. 10, came the repulse of Gen. Gatacre, who was drawn into an ambuscade at Stormberg, in northern Cape Colony, and only by a masterly retreat saved his command from annihilation. Dec. 15, Gen. Buller, with 22,000 men, moving to the relief of Ladysmith, met with a serious defeat in his attempt to cross the Tugela river at Colenso, losing eleven guns and more than 1,000 men. Dec. 18 Lord Roberts was ordered to assume supreme command in South Africa, and he chose Lord Kitchener as his chief-of-staff, and arrangements were made to increase the field force to nearly 200,000 men. Lord Roberts reached Cape Town Jan. 6, 1900, and Feb. 12 the invasion of the Free State was begun. Meantime the Boers were repelled in a general attack on Ladysmith, Jan. 6, and Buller had made two more unsuccessful attempts to cross the Tugela: Jan. 23-25 taking and abandoning Spion Kop, and Feb. 5-9 executing a similar movement on the Val Krantz Hills; finding both positions untenable after he had occupied them. Gen. Roberts directed his movements against Cronje at Modder river, moving directly on Bloemfontein and Pretoria. Gen. French relieved Kimberley Feb. 15, and on Feb. 20 Cronje and the rear guard of the retreating Boers were surrounded at Paardeberg, where, re-enforcements being unable to reach them, they surrendered, Feb. 27. The withdrawal of troops to the assistance of Cronje enabled Buller to force his way into Ladysmith, Feb. 28. On Mar. 27 Gen. Joubert died. The siege of Mafeking was raised May 16. The relief of Kimberley and Ladysmith, and the surrender of Cronje and his deportation to St. Helena, were the beginning of the end. Lord Roberts occupied Bloemfontein Mar. 13, and after reorganizing his transport moved on Pretoria May 3. At the request of the Transvaal Government, May 10, the United States offered to act as mediator, but the offer was declined by the British Government. Kronstadt, the temporary capital of the Free State, was occupied May 13, Johannesburg May 31, and Pretoria June 5, all after very little resistance. President Kruger sailed for Europe on a Dutch cruiser from Lorenzo Marques. Throughout the year Boer commandoes under Generals Botha and De Wet carried on guerrilla warfare with a great degree of success. Lord Roberts proclaimed the Free State, May 28, and the Transvaal, Sept. 1, colonies of the British Empire, and on Dec. 14 Sir Alfred Milner was appointed to their administration. Lord Roberts sailed from Cape Town Dec. 12, leaving Lord Kitchener in full command. The British losses to Mar. 1, 1901, were: killed and died from wounds, 14,728; missing, 775; unfitted for service, 2,189.

The development of our knowledge of the Congo basin is the most recent of the great events in the history of African exploration. Cameron (1873-75), in his journey across the continent from E. to W., was able to show the outflow of Tanganyika to the westward, but he left uncertain the relations of the Congo to the numerous northward-trending streams he crossed on his new path to Benguela. Numerous explorations followed, but the thread with which to unravel the Congo system was not found until Stanley's journey of 1874-77, when he succeeded in defining the sources of the Nile, and in showing that the upper Congo was to be found in the Luapula, which connects the lakes Bangweolo and Moero. With the discovery, by Grenfell (1884-85), of the identity of the previously known tropical and interior river, the Welle Makua, with the Ubangi, the principal northern tributary of the Congo, the delimitation of the Congo basin was complete in general outlines.

The exploration of the Congo system was accompanied by a remarkable series of political events. In 1876 the International African Association was founded under the presidency of the King of the Belgians, Leopold II., and the International Association of the Congo in 1878. The latter, in 1879, founded two stations on the Congo, and in 1881 a third. In 1884 the association was recognized as an independent territorial government, and in 1885 an international conference gave limits to the Independent State of the Congo, and affirmed its permanent neutrality, the freedom of its commerce, and the abolition of the slave-trade within its borders. The new state covers the most of the Congo basin.

Another political episode, originating in a different quarter, has given occasion for further exploration of the Congo basin. A Mohammedan revival in upper Egypt, called the Mahdist rebellion, culminating in the fall of Khartum in 1884, disorganized the government of this region, and left the more southern Equatorial Province cut off from the civilized world. Its governor was a German scientist, there called Emin Pasha. The attention of Europe was eventually directed toward his relief, and an expedition for this purpose was headed by Stanley in 1887. After an adventurous journey from the west coast and through the Congo basin, Stanley succeeded in finding Emin, returning in 1889.

With the international conference in 1885, the partition of interior Africa was begun. The various possessions on the coast had been already delimited, at least approximately, and the limitations to be decided on were the interior ones. This has steadily proceeded, until in 1897 it is complete for Southern Africa to the equator, and for much of Western Africa. Elsewhere the interior lines are still indefinite. In general, it may be said that in 1897 heathen Africa had been partitioned, while Arab Africa was almost completely assigned. The divisions have been made by international agreement and are usually undisputed, but in unassigned districts an occasional clash occurs, as, in 1892, in Uganda to the N. of the Ukerewe. A result of the partition is to be found in the remarkably increased activity in exploration since 1885.

MARK W. HARRINGTON.

African Languages: The languages spoken in Africa may be arranged in six families or groups,* viz.: the Semitic, the Hamitic, the Nuba-Fulah, the Negro, the Bantu and the Hottentot-Bushman. The Semitic family occupies the western third of the Sahara and a strip of about 500 miles wide along the north coast and up the west bank of the Nile to the Negro field 300 miles above Khartum. The Hamitic occupies the Somali peninsula, most of the region E. of the Nile, more than a third of the Sahara (in the central part), and overlaps the Semitic family in Northwest Africa. For a description of Semitic and Hamitic languages, see EGYPTIAN, BERBER, ETHIOPIC, COPTIC, etc.

The Nuba-Fulah group is found in the territories of the Kwafi and Masai, E. of Lake Nyanza, each larger than Ohio; several extended areas in the upper Nile basin, especially in Kordofan and Darfur; 250,000 sq. miles in the northern part of the Congo basin (Nyam-Nyam, Krej, and Monbutto languages); and several smaller isolated areas in the Lake Chad, Niger, and Senegal basins.

The Negro group occupies (1) the Sudan (Senegal, Niger, and Lake Chad basins), an area extending 2,500 miles E. and W., and 700 miles N. and S.; (2) most of the upper Nile basin (500 miles square); (3) the eastern third of the Sahara (800 miles square). There seems to be considerable phonetic unity, such consonantal combinations as *kp* and *gb*, for instance, occurring in languages scattered through all parts of the Negro field. But in vocabulary there appears thus far to be utter diversity. The words for "one" and "I" appear in Dinka (upper Nile), Kanuri (Lake Chad), Efik (lower Niger), Grebo (on coast W. of Niger), and Bullom (extreme west coast), respectively, as follows: *tok, ghén; lasqe, wu; kiet, ami; dō, mò; bull, yang*. Nor do any of the other numerals or pronouns show resemblance. The Negro languages are mostly "agglutinative" but no structural unity can be affirmed, nor can families be decided upon till the grammars already appeared and fast appearing are carefully compared. Relation to Bantu, however remote, seems already completely disproved. The vast, fertile, and populous basins of the Nile, Lake Chad, and Niger promise to make these languages of great importance to trade and missions (though the Negroes have now become Mohammedans), and hence give the many linguistic problems offered a more than

theoretical interest. Koelle describes the Kanuri, the language of the great Bornu empire, around Lake Chad, as very rich, especially in verbal forms, and possessed of a fully developed and far-reaching system of euphonic laws. Abstract nouns are formed from all concrete ones, and from all adjectives and verbs. There are 5 cases, 2 numbers, no grammatical gender, 6 personal pronouns, 3 demonstratives, 4 interrogatives, 6 possessives, and 18 indefinite pronouns. Various agglutinative suffixes applied to both nouns and verbs give rise to (1) possessive and (2) participial adjectives; to adjectives of (3) nationality, (4) occupation and productivity, (5) agent, and (6) rank and office; to (7) patronymies, (8) personal adjectives, and (9) adjectives meaning "pertaining to," "applied to," etc. Numerals are (1) cardinal, (2) ordinal, (3) multiplicative, (4) adverbial, (5) indefinite. Counting is carried beyond 1,000,000,000,000. Verbs can be derived from substantives, adjectives, or other verbs, and include (1) denominatives, (2) causatives, and (3) frequentatives or intensives. Voices are (1) radical (or simple), (2) relative (or applied), (3) reflective (or middle), (4) causative, (5) relative-reflective. "Tenses" are, first, indefinite (or timeless), including (1) the durative or frequentative, (2) the momentary or solitive; second, time tenses, including (1) aorist, (2) perfect, (3) future. Moods are (1) indicative, (2) imperative, (3) negative, (4) conjunctive, (5) participial, (6) infinitive. Transitive verbs superpose an objective pronominal inflection upon all the above inflections, showing by the form of the verb the person of the object. Adverbs, besides fifty that are original, are formed from the nominative, instrumental, locative, and dative cases of substantives, from adjective pronouns, from the dative of numerals, by composition, and sparingly from the verbs and the four postpositions. There are many conjunctions, both original (which may be simple, compound, or correlative) and derived, but only four interjections. Different varieties of clauses, etc., are used, as in English. As to syntax, the uses of the various cases, moods, tenses, suffixes, etc., are very fully developed.

The Bantu family of languages is for trade and missions the most important in Africa, because the area in which these languages are spoken is, on the whole, greatest in natural resources, and the people speaking them are superior in natural endowment. Cust divides the family into three branches and eight sub-branches, but this classification, while very useful as a point of departure, is purely geographical; e. g. Kongo in the western branch, Zulu in the southern, and Swahili in the eastern, resemble one another more than Zulu resembles Chuana in the same branch. The Bantu field occupies all of Africa S. of the Negro and Nuba-Fulah fields (excluding, of course, the Hottentot field), an area of some 2,500 miles square. Its remarkable linguistic unity was first announced by Liechtenstein at the beginning of the present century, and has since been established by numberless proofs. For instance, the words for "one," "five," "I," "son," and "man," are in Kongo, *-mosi, -tanu, -ami, mv-ana, mu-ntu*; Mpongwe, *-mâri, -tyanu, -am, onw-ana, ono-mi*; Mbundu, *-mosi, -tanu, -ami, mona, mu-tu*; Herero, *-mue, -tano, -ami, omu-na, omu-ndu*; Kikulu, *-omo, -tanu, -emi, bo-ana, bo-ntu*; Ganda, *e-mu, -tano, -ange, mv-ana, mu-ntu*; Swahili, *-moja, -tano, -angu, mv-ana, m-tu*; Yao, *-mo, m-sanu, -angu, mv-ana-che, mu-ndu*; Chinyanja, *-modzi, -sanu, -anga, mv-ana, mu-ntu*; Chuana, *ñue, faev, -me, ñu-ana, mo-thu*; Suto, *-mong (ngue), tlanō, -na, ngu-ana, mo-thō*; Zulu, *-nye, -hlanu, -na (-ami), ndod-ana, umu-ntu*; Xosa, *-nye, -hlanu, -am, uny-ana, um-ntu*.

These languages are remarkable for their far-reaching euphony, perfect regularity, compass, flexibility, and power. Their dialectic divergencies clearly conform to the "wave theory" which has been applied to Indo-European. Since they are in grammatical structure even more homogeneous than in vocabulary, an account of the Kongo may serve for all. Bentley's *Kongo Dictionary and Grammar* (from which the following abstract is mainly taken) defines 10,000 words, excluding most derivatives. Every syllable consists either of a vowel alone, or of one consonant (which may be preceded by a nasal) followed by one vowel. The result is absolute freedom in composition, and regularity in inflection. The language is agglutinative—i. e. every inflectional element retains everywhere its own distinct form and meaning. The case system of Indo-European languages is more than replaced by the alliterative concord, which prefixes to nouns nineteen classes of singular and plural prefixes, and attaches the noun prefix to all the adjectives, nouns, verbs, prepositions, and phrases that belong to it, so that the reference of every word is perfectly unambiguous. There are twenty

* The word group is used where the languages classed together are not known to be generally related to each other.

classes of derivative nouns representing actor (active and middle), agent, instrument, means, recipient, place, action (active, middle, and passive), manner or accessory circumstance, cause or occasion, process, essential quality, accidental quality, diminutives, collectives, "anti-collectives," and accompaniments. Both prefixes and suffixes are used in forming these derivatives, but the prefixes alone concern sentence structure. Adjective forms are (1) primary (attributive and predicate), (2) secondary (absolute), (3) verbal excessives, (4) participial. Adjective phrases and clauses and possessive nouns are treated with the noun prefix, like the ordinary adjective. The native numerals go to 1,000,000, and are (1) cardinal, (2) ordinal, (3) partitive or distributive, (4) alternative, (5) multiplicative. Pronouns are (1) personal, (2) emphatic personal, (3) possessive, (4) interrogative, (5) demonstrative, (6) emphatic demonstrative, (7) relative, (8) indefinite, (9) adverbial, prepositional, and conjunctive, (10) locative. Adverbs are (1) original, and also formed from (2) locatives, (3) pronouns, (4) nouns (a large number), (5) verbs, (6) adjectives. Prepositions are simple and compound, but few in number, since the prepositional idea is usually included in the meaning of verbs. Conjunctions are some fifty in number, besides compounds of these. A large proportion of these are particles like the Greek *ὄμως*, *δήπου*, etc.

Verbs.—Suffixes indicate voice, "form," and "aspect." Voices are (1) active, (2) passive, (3) middle, (4) passive middle. Forms (superposed on each of the voices) are (1) simple, (2) applied (e. g. Eng. *strike for*, *with*, *at*, etc., are applied forms of *strike*), which may be single, double, triple, quadruple, etc., (3) causative, (4) indirect causative, (5) reciprocal, (6) repetitive, (7) persistent repetitive, (8) reverse, (9) potential, and about thirty-five combinations of these. Aspects (superposed both upon voices and forms) are (1) indefinite, (2) continuative, (3) perfect, (4) perfect continuative. (These aspects are the *timeless* distinctions found in Greek participles.) There still remain a considerable number of verbs having *apparent* suffixes with no definite shade of meaning. Doubtless others like these formerly furnished the raw materials for the magnificent voice and form system of the Kongo verb.

Prefixes indicate moods, tenses, person of the subject and person of the object. The infinitive mood is in aspect either simple or continuative, but has no tense. The indicative has ten tenses (counting aspect modifications of tenses as separate tenses), the subjunctive four (all different from those found in the indicative), the imperative two, and the participle three. Both for subject and object prefixes there are four "persons"—first, second, third and neuter.

In addition to the above verb system, there are twenty-four auxiliary verbs. These include such words as *φθάνω* and *τυγχάνω* in Greek; *venir de* and *se mettre à* in French; *can*, *let*, and *keep on* in English.

The subject must always be the most important topic in the sentence, which requires as free a use of the passive and middle voices as of the active. The sentence has a regular order—subject, its attributes, verb, and its attributes—but this is without ambiguity freely departed from for purposes of emphasis. By the use of the prefixes appropriate, any part of speech may become any other part of speech where thought admits of the change—adjectives, verbs, and clauses may become nouns, nouns and adjectives may become verbs, etc.

The Hottentot-Bushman family extends from Cape Town and Port Elizabeth in a strip 500 miles wide for 1,000 miles along the west coast, and mingles at 20° S. lat. with Herero (Bantu). Wallmann speaks of Hottentot and Coptic as closely allied. Bleek gives a comparative view of the pronouns in the two languages, which shows a remarkable similarity throughout. This family includes Khoi-Khoi, Bushman, Namaqua, Koranna, Griqua. Cust also reckons in various subjugated or fugitive remnants of tribes occupying small, isolated areas to 5° N. lat., and speaking languages totally distinct from those of their conquerors. Chief among these tribes are the pygmies of the upper Congo, spoken of by Stanley. Hottentot has grammatical gender, uses suffixes and postpositions, and four clicks and three tones. The clicks are used mostly as consonants, and resemble smacking, elucking, chirruping, and audible swallowing. These languages are being replaced, at least in the south, by Dutch.

Besides the languages above described, some non-African languages have been brought into Africa, and have in many quarters influenced native dialects. They are: Arabic (though this has now practically become African), in the

Sudan, on the Nile, and along the east coast; Portuguese, in Mozambique and Angola; Dutch (corrupted), in South Africa; Hindustani and Gujarati, on the east coast; Malagasi (Malayo-Polynesian), spoken in Madagascar; English, spoken in Liberia, and used for trade on and near the Niger and in South Africa; French, in Algeria, Tunisia, Egypt, and Senegambia.

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ROBERT J. KELLOGG.

African Methodist Episcopal Church: organized in 1816 by colored Methodists who down to that date had been under the care of the Methodist Episcopal Church. They elected Rev. Richard Allen their first bishop in 1816. Their doctrines are substantially the same as those of the parent church. They report (1900) 5,245 ministers and 663,906 members. They have four high academies, one university, and two weekly journals. Steps for the union of this body with the African Methodist Episcopal Zion Church have been taken. See METHODISM.

African Methodist Episcopal Zion Church: formed in 1820 by a secession of African Methodists from a congregation of the Methodist Episcopal Church in New York city. They held their first annual conference in 1821; it consisted of twenty-two preachers, and reported 1,426 church members. In 1838 the conference elected Rev. Christopher Rush its first bishop, with the title of superintendent. Its superintendents are elected quadrennially by the general conference. They report (1900) 2,908 ministers and 528,406 church members. Their doctrines and ecclesiastical system are mostly copied from those of the Methodist Episcopal Church. Measures have been taken for union with the African Methodist Episcopal Church. See METHODISM.

Africa'nus, SEXTUS JULIUS: a Christian writer eminent for his learning; d. about 232 A. D. He wrote a general chronology of the world from the creation to 221 A. D., in which he fixes the date of the creation at 5499 B. C. See H. Gelzer, *S. J. A. und die byzantische Chronographie* (Leipzig, 1880-85, 2 parts).

Afterglows: unusual and brilliant twilight colors after sunset; those before sunrise are called foreglows; the red colors are predominant, but others are seen. Afterglows usually occur after great volcanic eruptions, and spread from the volcano with great speed and to great distances. After the eruption in 1883 of Krakatoa in the Straits of Sunda (the greatest known to history), the remarkable fore and after glows spread around the earth within six months (from August to January), and recurred for several succeeding autumns with decreasing splendor. They are supposed to be due to an immense number of very minute solid particles remaining suspended in the air. See *Report of the Krakatoa Committee of the Royal Society* (1888). M. W. H.

Afton: a town of Union co., Ia. (for location of county, see map of Iowa, ref. 7-F); on railroad junction, 180 miles W. of Burlington and 50 miles S. W. of Des Moines. It has a fine normal and business college, splendid city schools, opera-house, and electric lights. Pop. (1880) 1,231; (1890) 1,045; (1900) 1,178. EDITOR OF "ENTERPRISE."

Afze'lius, ADAM: Swedish naturalist; b. at Larf, West Gothland, Oct. 7, 1750; became tutor in the University of Upsala, 1799; Professor Extraordinary of Materia Medica, 1812; d. in Upsala, Jan. 20, 1837. He edited the autobiography of Linnæus (Upsala, 1823). Several species of plants called Afzelia are named after him.

Afzelius, ARVID AUGUST: Swedish scholar and man of letters; b. at Fjellåker, May 6, 1785; pastor at Enköping, 1821; d. there Sept. 25, 1871. His translation of the Poetic Edda (1818), his collection of popular ballads, *Svenska Folkvisor från Forntiden*, edited by Geijer and Afzelius (4 vols., 1814-16; new ed. 1880), and his Swedish history, *Svenska Folkets Sago-Häfder* (1839), etc., did much to promote the romantic and national feeling in Swedish literature.

G. L. KITTREDGE.

Ag'ades, Ag'adez, or Ag'dez: a city of Central Africa; capital of the kingdom of Asben; in an oasis of the Sahara; lat. 16° 30' N., lon. 8° 12' E. (see map of Africa, ref. 3-D). It formerly had a population of about 50,000, which is now greatly reduced. It is visited by merchants from the Sudan, and others from Northern Africa. Pop. about 7,000.

Agamem'non (Gr. Ἀγαμέμνων): the son of Atreus, King of Mycenæ; a brother of Menelaus. He had the chief command of the Greeks at the siege of Troy, where he quarreled with Achilles. He, as well as his brother, was often called Atri'des (i. e. son or descendant of Atreus). After his return from Troy to his own kingdom he was murdered by his wife Clytemnestra and Ægisthus. He was the father of Iphigenia, Electra, and Orestes.

Ag'ami: a South American bird, the *Pso'phia crepitans*, called the trumpeter, from a peculiar sound which it utters. It is as large as a large pheasant, but has longer legs and neck. It can be perfectly domesticated.

Agamo'binum: the asexual generation of those animals or plants which exhibit alternation of generations. See ALTER-NATION OF GENERATIONS.

Agamogen'esis [from Gr. ἄγαμος, unmarried + γένεσις, birth]: any form of reproduction that occurs without conjugation of the opposite sexes, as by division or budding, the common method with the Protozoa and not rare with many higher forms. In many forms the ova even may thus develop asexually, or they may develop by being fertilized (sexually), and the form thus produced may reproduce itself

organically for a certain number of generations, when the last of the series will produce ova to be fertilized. See ALTERNATION OF GENERATIONS and PARTHENOGENESIS for examples.

DAVID S. JORDAN.

Ag'apæ [Gr. ἀγάπαι, love-feasts, from ἀγάπη, brotherly love]: love-feasts, or feasts of charity, in use among the early Christians. After the celebration of the communion, the oblations which had been made in the church, consisting of meat and bread, which the rich had brought from their houses, were consumed at a common feast. Abuses having crept in, the two services were separated, and the love-feasts disappeared in the eighth century. A modification of them exists among the Moravians and Methodists, but they are not meals, only religious services at which bread and water are distributed.

Revised by S. M. JACKSON.

Agapem'one [from Gr. ἀγάπη, brotherly love, and μονή, abode]: a community of fanatics and free-lovers formed in 1849 at Charlynch, in Somersetshire, England, by Henry James Prince, who was previously a clergyman of the Anglican Church. His disciples, known as "Lampeter Brethren," or "Family of Love," hold their property in common, live in splendid style, and pass their time in voluptuous ease. Mr. Prince makes extravagant pretensions as an apostle or reformer in religion, and it is said that he is styled "God incarnate" by his followers, who are sometimes called Princeites. See *The Newbery House Magazine* (Lond.), Nov., 1891.

Agape'tæ (Gr. ἀγαπηταί, beloved women): those virgins and widows among the primitive Christians who lived in a state of "spiritual love" with monks and other celibates. This practice was condemned by the Lateran Council in 1139.

Agapetus: name of two popes. I. Became pope in 535, when already an old man; was sent as legate to Constantinople by Theodahad, the Gothic king; there d. April 21, 536. II. Became pope 946; died Nov., 955.

A'gardh, KARL ADOLPH: Swedish botanist; b. in Scania, Jan. 23, 1785; ordained a priest in 1816. He wrote, besides other works, *Species of Seaweeds* (Species Algarum, 1820-28) and *Systematic Arrangement of Seaweeds* (Systema Algarum, 1824). D. Jan. 18, 1859, and was succeeded by his son, T. G. Agardh, an equally distinguished algologist.

Ag'aric [Lat. *Agaricum*, from Gr. ἀγαρικόν]: a fungus belonging to the genus *Agaricus*, the species of which are very numerous. True agarics have radiant gills, while *Boleti* have tubes beneath the cap or pileus. The *Agaricus campestris* or common mushroom and some others are delicate articles of food; the *Agaricus muscarius* and other species are dangerous poisons; many of the species are popularly called toad-stools; numerous small ephemeral species appear to be harmless. The *Agaricus olearius* is remarkable for being phosphorescent. The common mushroom is frequently cultivated, both in the open garden and in sheds. See FUNGI.

Aga'sias of Eph'esus: a Greek sculptor; supposed to have lived about 400 B. C. The fine statue called "The Gladiator" or "Borghese Fighter," or, by modern archaeologists, the "Runner in the Hoplitodromos," one of the finest pieces of ancient sculpture and one of the great ornaments of the Louvre Museum, is by him. See HOPLITODROMOS.

Revised by RUSSELL STURGIS.

Agassiz, aag'a-see, or aä-gaäs'ëe, ALEXANDER, LL. D.: scientist; son of Louis Agassiz; b. at Neuchâtel, Switzerland, Dec. 17, 1835; graduated at Harvard College, 1855; received the degree of Bachelor of Science from the Lawrence Scientific School, 1857; went to California, 1859, as an assistant on the Coast Survey; was an assistant in the Museum of Comparative Zoölogy, 1860-65. In 1865 he made a venture in coal-mining in Pennsylvania, and this led to the great venture of his life—the developing of the two richest copper mines in the world, the Calumet and the Hecla mines of native copper on the shores of Lake Superior. He spent the years of 1869-70 in Europe, visiting different museums, and upon his return resumed the duties of assistant curator of the Museum of Comparative Zoölogy. After the death of his father (1873) he was appointed curator, a position which he held until 1885, when he resigned on account of ill health, in the meantime doing much to develop the museum both by his wealth and by his experience. His winters have been spent in deep-sea dredging in connection with the Coast Survey. He has written many papers upon scientific subjects; among the more important are *Marine Animals of Massachusetts Bay*, by A. Agassiz and Elizabeth Agassiz

(1871); *North American Acalephæ* (1865); *Revision of the Echini* (1872); *North American Starfishes* (1877); *Report on the Echini of the Challenger Expedition*; and several extensive monographs on the deep-sea animals collected by the Coast Survey steamers.

Agassiz Association: a society first organized in 1879 by Harlan H. Ballard, principal of Lenox (Mass.) Academy, for the purpose of stimulating scientific interest among his own students, and named in honor of the great scientist, Louis Agassiz. In 1880 a general association was organized, which has spread over a large part of the world, and includes among its numbers not only young persons, but also many distinguished scientists who recognize the educational value of the movement. The local divisions are called chapters, and must consist of not less than four members. Persons not connected with a chapter may, on payment of a small fee, become corresponding members, and enjoy all the advantages of the association, which include free instruction by correspondence on scientific questions, exchange of specimens, etc. The badge worn by members is a Swiss cross, bearing the letters "A. A." and the number of the chapter. The association offers prizes for original researches. The number of chapters is about 1,000 and of members about 10,000.

C. H. THURBER.

Agassiz, LAKE: the name given by Upham to an extinct Pleistocene lake of the last glacial epoch, occupying the plain of the Red River of the North, in Minnesota and North Dakota, and thence N. into Canada, where its boundary has not been yet fully determined. Its area, as indicated by well-marked shore-lines and deltas, measured from 30 to 100 miles E. and W., and 400 or more miles N. and S. Its depth was from 200 to 400 feet. According to the studies of Upham and others, Lake Agassiz was held up on the N. by the retreating ice-sheet of the last glacial invasion. Its level was determined by the height of the lowest pass in the inclosing slopes of land to the S., where a channel 50 or more feet deep, 50 miles long, and a mile or more wide may be plainly seen, through which the overflow of the lake reached the Minnesota river, whose valley it enlarged on the way to the Mississippi. A number of shore-lines may be traced from 100 to 400 miles N. from the outlet, all rising at gentle but unequal slopes of half a foot to a foot or more in a mile; hence it is inferred that while the waters of the lake beat on the shore and received the deltas of inflowing rivers, the land was gradually rising from a depressed condition below its present altitude in the N. The deltas formed by the Buffalo, Pembina, Assiniboine, and other rivers now form sandy plains many square miles in extent, trenched by the rivers that built them. The plain of the lake bed is remarkably level, descending northward about a foot to a mile. The Red river and its branches have only cut narrow and shallow channels in the plain, few and far between. Other similar expanses of fresh water, marginal to the retreating ice-sheet, occurred in Michigan, Ohio, and Western New York. W. M. DAVIS.

Agassiz, LOUIS JOHN RUDOLPH, M. D., Ph. D., LL. D.: Swiss naturalist and geologist; b. in the parish of Motier, near Lake Neuchâtel, May 28, 1807; son of a Protestant minister. He studied the medical sciences at Zurich, Heidelberg, and Munich, where he graduated. His first work was a Latin description of the fishes which Martius and Spix brought from Brazil, published in 1829-31. He devoted much time to the study of fossil fishes, and was appointed Professor of Natural History at Neuchâtel in 1832. During a visit to Paris he formed friendships with Cuvier and Humboldt. His reputation was increased by a great work in French, entitled *Researches on Fossil Fishes* (5 vols., 1832-42, with more than 300 plates), in which he made important improvements in the classification of fishes. Having passed many summers among the Alps in researches on glaciers, he propounded some new and interesting ideas on geology and the agency of glaciers in his *Études sur les Glaciers* (1840) and his *Système Glaciaire* (1847), which are among his principal works.

In 1846 he crossed the Atlantic on a scientific excursion to the U. S., in which he took up his permanent residence. He accepted, about the beginning of 1848, a chair of zoölogy and geology at Harvard; he explored the natural history of the U. S. at different times, and gave a new impulse to the study of nature in the U. S. He rejected the Darwinian theory of organic development. In 1865 he conducted an expedition to Brazil, and explored the lower Amazon and its tributaries, in which it is stated that he discovered more than 1,800 new species of fishes. He became in 1868 a non-resident

Professor of Natural History at Cornell University, Ithaca, N. Y. Early in Dec., 1871, he accompanied the Hassler expedition, under Prof. Pierce, to the South Atlantic and Pacific oceans and the western coast of America. Among his important works are *Outlines of Comparative Physiology* (1848); a *Journey to Brazil* (chiefly written by his wife, 1868); and *Contributions to the Natural History of the United States*, an expensive work which was to extend to ten vols. 4to, of which the first four volumes appeared 1857-62. Probably no one except Hugh Miller did more to popularize science in our time than Agassiz, and no other teacher trained so many young and rising naturalists. Yet it may be observed that some of his favorite opinions (e. g. of the absolute immutability of species) are not now held by many living naturalists. More, however, than almost any other leader in modern science, Agassiz insisted upon a theistic view of creation, as opposed to the idea of the self-evolution of uncreated nature. "He is not merely a scientific thinker," says Whipple, "he is a scientific force; and no small portion of the immense influence he exerts is due to the energy, intensity, and geniality which distinguish the nature of the man. In personal intercourse he inspires as well as performs, communicates not only knowledge, but the love of knowledge." D. at Cambridge, Mass., Dec. 14, 1873.

Revised by G. K. GILBERT.

Ag'ate [Fr. *agate*, Ital. *agatha*, from Lat. *acha'tes* = Gr. *ἀχάτης*, the agate, whence directly Eng. *achate*]: a mineral much used for ornamental purposes; a variety of quartz marked with veins or layers, which are different in color and often concentric. This structure is due to the mode of formation, in successive layers on the walls of cavities, usually in volcanic rocks. Agates are found in all countries, and are much used for ornaments and utensils, such as seals, ring and pin stones, vases, cups, mortars, etc. Many of the polished agates are very beautiful, and their preparation has created an important industry at Oberstein, in Germany. Here great skill is displayed in cutting and polishing agates, and still more in coloring them. A large part of the Oberstein agates come originally from South America. See CHALCEDONY.

Ag'atha, SAINT: a Sicilian virgin and martyr, who was put to death at Catania, in Sicily, by torture administered by Quintianus, a Roman judge, in revenge for her resistance to his attacks upon her virtue, Feb. 5, 251 A. D. She is the patron saint of Malta, and her veil carried in procession, it is said, has frequently averted eruptions of Mt. Etna. See Butler's *Lives of the Saints*.

Aga'thias (surnamed ASIAXUS): Greek historian and poet; b. about 536 A. D. at Myrina, in Asia Minor; became an advocate in Constantinople, and d. there 582. A history of contemporary events is extant, and some 100 poems of his are preserved in the Greek anthology. See edition by L. Dindorf (vol. ii. *Hist. Græc. minor*), Leipzig, 1871.

Agath'ocles (Gr. Ἀγαθοκλῆς): tyrant of Syracuse; b. in Sicily, 361 B. C.; originally a potter, he raised himself by his talents to a high military rank, and also distinguished himself as an orator. Having massacred a large number of the prominent and respectable men of Syracuse, he obtained the supreme power in 317 B. C. He afterward waged war against the Carthaginians, over whom he gained several victories in Africa, but was subsequently defeated by them. In 306 B. C. a peace was made, which secured to both parties their former possessions. D. in 289 B. C. His death is ascribed to a poisoned toothpick given to him at the instigation of his grandson Archagathus. See his life by Rud. Schubert, Breslau, 1887.

Ag'athon, or A'gatho (Ἀγάθων): tragic poet; b. at Athens about 450 A. D.; a friend of Euripides and a butt of Aristophanes in the *Thesmophoriazusa*. He gained the prize in 416, and the banquet which he gave on that occasion furnished the setting for Plato's *Symposium*. Dainty and dandified in his art as in his person, he did not fall far short of genius, and the scant fragments of his tragedies still bear witness to his antithetic style and his epigrammatic wit. Ed. by Nauck, *Fragmenta Tragicorum Græcorum*, 2 ed. pp. 763-69. D. at Pella, about 400 A. D.

B. L. GILDERSLEEVE.

Agatized Wood: See CHALCEDONY.

Aga've [Lat. form of Gr. Ἀγавή, prop. name meaning noble]: a genus of 138 species of plants of the family *Amaryllidaceæ*; mostly natives of tropical America. The most remarkable species is the *Agave americana*, the maguey

of the Mexicans, etc., commonly called American aloe or century plant. The latter name originated in an incorrect opinion that it bears no flowers until it has attained the age of 100 years. This age, or near it, is sometimes attained in temperate climates, but in hotter regions it often blossoms when less than ten years old. When this takes place a bud rises from the crown of thick and fleshy spiny-toothed leaves, which lengthens at first at the rate of a foot or two a day into a scape from 20 to 30 feet high, bearing a panicle of greenish-yellow flowers, sometimes as many as 4,000 in number. After flowering and maturing seed, the plant dies. Just when the flower stalk is ready to appear, the Mexicans cut away the bud and scoop out the center; into this a sweet sap, which would have supported the rapid growth, is abundantly poured. This is evaporated into sirup or sugar, or fermented into a kind of beer or cider called *pulque*, the favorite beverage in Mexico. From the pulque a strong ardent spirit (mescal) is obtained by distillation. The leaves yield strong and useful fibers (pita thread, sisal hemp), the latter from *Agave rigida*. Other species are cultivated among tender succulent plants. A small one is a native of Virginia, Illinois, etc. Revised by CHARLES E. BESSEY.

Agde (anc. *Ag'atha*): town of France; department of Hérault; on the river Hérault and Canal du Midi, or Languedoc Canal; 2 miles from the Mediterranean, and 18 by rail E. of Béziers (see map of France, ref. 9-G). In the vicinity is an extinct volcano. The town is mostly built of black basalt, and is popularly called the Black Town. Here are a fine old Gothic cathedral and a college, and a school of navigation. Soap and verdigris are manufactured, and the town has an active trade in wine, oil, silk, grain, etc. Its harbor is in lat. 43° 17' N., lon. 3° 28' E., at the mouth of the Hérault river, is accessible to ships of 200 tons, and is defended by a fort. It is on the Canal du Midi. Pop. (1896) 8,478.

Age: (1) the whole duration of the life of a man or other creature; (2) a certain portion or period of human life, which, according to Shakspeare, is divided into seven ages; (3) the time when a person is authorized by law to act for himself, and is released from the control of his parents or guardians. According to the laws of Great Britain and the U. S., a person becomes of age when he or she is 21 years old. Before this age one can not vote or make a valid will. In the U. S., to be President a citizen must have reached the age of 35; Senator, 30; and Representative, 25. In Great Britain men are eligible to Parliament at 21. The natural divisions of human life are infancy, childhood, boyhood (or girlhood), adolescence, manhood (or womanhood), and old age. The age of puberty is 14 or 15. The 63d year is called the grand climacteric. Some trees are believed to live to an age of 4,000 years or more. The average life of a horse is from 25 to 30 years; of an elephant, probably about 200; of a dog, from 12 to 15. Fishes are remarkable for longevity, and a carp, it is said, has been known to live 200 years.

AGE, in chronology and history, is sometimes used as synonymous with century, and sometimes also with a generation. Writers differ in respect to the period included under what is called the *Middle Ages*, but they are commonly understood to begin about the time of Charlemagne, and to extend to the fifteenth century.

AGE, in literature, is a period usually bearing the name of some powerful person who flourished during that time. Among the most memorable of these are the age of Pericles, the Augustan age, the age of Leo X., and the age of Elizabeth (or Elizabethan age).

AGE is also used to designate one of the successive epochs or stages of civilization in universal history or mythology. The Greek and Roman poets imagined a series of four ages—the Golden, the Silver, the Brazen, and the Iron. An ancient and widespread tradition commemorates the pristine innocence, peace, and happiness of the primeval Golden Age under the reign of Saturn. The other three were regarded as successive degrees of declension from that primitive state. The *prehistoric* ages in modern anthropology are usually called the older and newer stone ages (Paleolithic and Neolithic ages) and the age of bronze.

Revised by R. LILLEY.

Agen, *ā-zhaan'* (anc. *Agin'num*): capital of the department of Lot-et-Garonne, France; on the right bank of the Garonne, 85 miles by rail S. E. of Bordeaux (see map of France, ref. 8-E). It is pleasantly situated in a fertile country, and has an active trade in brandy, prunes, leather, wine, madder, and other articles. Here are a college and a public

library; also manufactures of serge, cotton prints, and linen goods. It is the seat of a bishop and a high court of justice. Joseph Scaliger was born in the vicinity of Agen. Pop. (1896) 22,730.

Agen'da [neuter plural of *agendus*, gerundive of *a'gere*, do]: things to be done; applied by theologians to practical duties as distinguished from the *credenda* (things to be believed), or doctrines that must be accepted as articles of faith. In the ancient church it signified, first, divine service in general; and, second, the mass in particular. It is also applied to church books giving the order of church services. The service-books of the Lutheran Church are called *agenda*.

Agénois, *ā'zhā'nwāā'*: a former district of France, in GUIENNE (*q. v.*); area about 1,080 sq. miles. It is now comprised in the department of Lot-et-Garonne.

Age'nor (Gr. *'Αγήνωρ*): in classic mythology, a king of Phœnicia and a son of Neptune; was the father of Cadmus, Phœnix, and Europa.

A'gent [Lat. *agens*, *-tis*; pres. partic. of *a'gere*, act]: in law, one who acts for another. This is an extensive topic, and must be treated with a brevity scarcely admitting even a sketch of its rules. Many of its principles closely resemble the corresponding topic in the Roman law (*mandat*), so that they are of quite general application in the jurisprudence of civilized countries. Agency may be created by express words or by implication. There are cases in which an express authority in writing is necessary by statutory law. It is a general rule that when an act is to be done under seal the agent's authority must be of the same grade. Should a person act as agent without authority, the subsequent ratification of the act will make it valid and binding on the person for whom it was done, in the same manner as if he had originally directed it. An agency is often implied from the course of business. A wife who sells goods in her husband's shop, or receives payment of a debt due him with his knowledge and without objection, may be deemed to be his agent, and may bind him in subsequent transactions of a similar kind. An agency is in general revocable either by the principal's own act, executed with sufficient notoriety, or by some event which renders the performance of the act impracticable. Thus the death of the principal, in general, causes an instantaneous revocation. There is a class of powers, termed "powers coupled with an interest," which in their nature are irrevocable. There must be in this case an interest on the part of the agent in the property over which the power is to be exercised. An illustration is the pledge of goods for a debt, with a power to sell in default of payment. The leading points in agency are the relations of principals to third persons, those of the agent to third persons, and the mutual relations between the principal and agent.

I. The Relations of the Principal to Third Persons.—It is a rule that when an agent acts within the scope of his employment he may bind his principal. This is on the principle of identity. There is another class of cases where the agent is not acting within the scope of his employment, but the principal has given him the *appearance* of authority, and the third person with whom he deals has no adequate means of distinguishing between his apparent and actual authority. In this case the principal is liable under a rule that where one of two innocent persons must suffer, that one should sustain the loss who has put it in the power of the wrongdoer to commit the wrong. It is in substance the doctrine of **ESTOPPEL IN PAIS** (*q. v.*). Under this doctrine usage has great effect upon the power of agents to bind their principals. There is a large number of agents who have known and recognized functions, such as factors, brokers, and cashiers of banks. It is the well-settled rule that these persons, acting within the usage of their business, may bind their principals, notwithstanding instructions to the contrary, unless these restrictions are brought to the knowledge of the persons with whom they deal. It is a general rule that when a power is conferred upon an agent, he has by implication such incidental authority as is necessary to carry his power into effect. An authority created by writing must be followed, and an act in excess of it is unauthorized and not binding on the principal. The mode of execution deserves notice. The agent should purport to bind his principal. This rule is particularly applicable to sealed instruments. Should an agent have a so-called power of attorney to execute a conveyance of land, the deed should purport to be the act of the principal by the agent, and should be subscribed in that manner; otherwise it would be

at most the agent's deed, and not that of the principal. Where there is no technical rule in the way, a principal may be liable even though undiscovered, as he must be deemed to be identified with the agent. On the general principles of the law of contracts, the principal can take advantage of a contract made in his behalf with a third person, and enforce it by action in his own name, even though he were not at the time disclosed, subject to the qualification that the rights of the other party to the contract are not prejudiced. A principal is liable for the fraudulent or wrongful acts of his agent acting within his employment. He can not take the benefit of the agent's acts and avoid their burdens. So complete is the identification of these parties that notice to an agent on the subject of his employment is legally notice to the principal, although it be not in fact communicated. This rule often operates with great severity upon innocent principals, imputing legal fraud when none has been in fact committed.

II. *The Relations of the Agent to Third Persons.*—If the agent having power to bind his principal does so expressly, he is not liable. But if he exceeds his authority, or, acting within it, fails to disclose his principal, he becomes personally responsible. In the case first supposed he is deemed to have entered into an implied contract that he has the necessary authority, and is liable accordingly. In the other case, the third person, on discovering the principal, has an election either to charge the agent or the principal. This doctrine may perhaps be qualified if the agent contracts in writing, on account of the rule that parol evidence is inadmissible to alter a written instrument. The agent, in turn, may have a right of action upon a contract made in his own name with a third person, though in fact made for the benefit of his principal. It is a general rule that an action does not lie against an agent to test the right of the principal to a fund, but the action should be brought against the principal himself. But in the case of duress of goods (see *DURESS*), if payment is made to an agent under protest, an action may be brought against him to recover back the money. This doctrine assumes much importance in its application to duties collected upon imports; so that a law of Congress regulates the mode in which the protest should be made.

III. *The Relation of Principal and Agent as between Themselves.*—The rules governing this relation are quite different. The agent is bound to obey the instructions of the principal. If in violating them he binds the principal to third persons, he is personally liable to make compensation for his breach of duty. His relation is a fiduciary one. He is subject to the rule that he can not deal in his principal's affairs for his own benefit. When directed to sell, he can not become a purchaser; when ordered to buy, he can not become a seller. This rule springs from the relation, and is applied with as much rigor to agents who act gratuitously as to those who receive compensation. An agent having discretion to exercise can not delegate his authority; he can not substitute another in his place. Where the business requires it, he may employ subordinates in the execution of his duties. It is not uncommon to insert a clause in a written delegation of agency (power of attorney) allowing substitution; this is valid. An agent should keep separate accounts, and distinguish his principal's money from his own; otherwise he might become personally responsible for its loss. The measure of his liability ordinarily is reasonable care, which is determined by that diligence which prudent men usually exercise in the conduct of their own affairs. For his services he is in general entitled to a reasonable compensation. He is sometimes paid by commissions; this is usual in the case of a broker. He has earned his commissions when he has brought the purchaser and seller together. He can not be deprived of them by a failure on the part of his employer, through wantonness or caprice, to enter into the contract which he has succeeded in negotiating for him.

The law of agency underlies, to a considerable extent, the law of partnership. The rules whereby one partner can bind his associates by contracts within the scope of their business are but applications of the doctrines of agency to this special branch of the law. See *ATTORNEY, BROKER, FACTOR, PARTNERSHIP*, etc. T. W. DWIGHT.

Agésila'us II.: Spartan general and king; son of King Archidamus II. He began to reign at the death of his brother Agis in 398 B. C., two years after which war was renewed between the Spartans and the King of Persia. Agésilaus commanded the army which invaded Asia Minor,

and gained several victories, but in the meantime the Athenians, Thebans, and other Greek peoples had formed a coalition against Sparta, to defend which the king was recalled by the ephori in 394 or 395 B. C. He maintained his reputation in this war, which was ended by a treaty of peace in 378. Sparta was again involved in a war with the Thebans, who, under Epaminondas, gained a decisive victory at the great battle of Leuctra, 371 B. C., at which, however, Agésilaus was not present. He afterward defended the city of Sparta with success when it was besieged by Epaminondas. D. about 360 B. C., aged eighty-four years.

Agglu'tinate Languages [Lat. *agglutina're*, fasten with glue; *ad*, to + *glutina're*, glue]: in comparative philology, those languages which are in a certain state of development intermediate between those which are strictly monosyllabic, like the Chinese, and those which are inflectional, like the Greek or Latin. Examples of languages in the agglutinated state are found among the Indian languages of America and the Turanian languages of Asia. In the Aryan languages conjugation and declension are doubtless to a certain extent the result of *gluing on* pronouns to verbs and nouns; but in them these terminations have coalesced, so as to form practically a single word, and the primitive parts have therefore, in a greater or less degree, lost their original and independent force. In the Turanian languages, however, the declension and conjugation can still be taken to pieces, and the affixes are seen to be distinct from the roots to which they are appended, as in Turkish, etc. See Max Müller's *Lectures on the Science of Language* (first series, lect. viii.); Von der Gabelentz, *Die Sprachwissenschaft*, pp. 330 ff. (1891).

Agh'mat: a fortified town of Morocco, on the W. declivity of Mt. Atlas, 24 miles S. of Morocco. Pop. about 6,000.

Aghrim, or **Aughrim**, aw'grim, or aweh'rim: a parish of Galway, Ireland; 15 miles N. E. of Loughrea (see map of Ireland, ref. 9-E). Here the army of William III. gained a decisive victory over that of James II., July 12, 1691.

Agincourt, aǎ'zhǎn'koor', or **Azincourt**, aǎ'zhǎn'koor': a village of France; department of Pas de Calais; 18 miles E. of Montreuil, and 10 N. W. of St.-Pol (see map of France, ref. 2-F). Near this place the English king, Henry V., who had about 15,000 men, gained a complete victory over the French army of about 60,000 on Oct. 25, 1415.

A'gio [Ital. *agio*, *aggio*, case]: the difference between the real and nominal values of money, or the percentage difference between the values of the current and standard money of a place. The premium or discount on foreign bills of exchange is sometimes called *agio*.

Agis IV.: King of Sparta; b. about 264 B. C.; a wise and meritorious ruler. He began to reign conjointly with Leonidas in 244 B. C., when Sparta was in a degenerate condition. He attempted to restore the old Spartan institutions and to reform the corrupted morals of the people. He also proposed to improve the condition of the poorer citizens by an agrarian law. Condemned by the ephori on a charge of subverting the laws, he was strangled in 240 B. C.

Agnadello, aǎn-yaǎ-del'lo: a village of Northern Italy; 10 miles E. of Lodi (see map of Italy, ref. 3-C). Here the French Duke of Vendôme defeated Prince Eugène, Aug. 16, 1705, and Louis XII. of France the Venetians, May 14, 1509. Pop. about 1,600.

Agnano, aǎn-yaǎ'no: a lake of Italy, 3 miles W. of Naples; is about half a mile in diameter. It occupies the crater of an extinct volcano. It is a bathing resort. The Grotta del Cane is near by.

Ag'nate [Lat. *agna'tus*, relative by father's side; *ad*, to + *gna'sci*, be born]: In Roman law, *agnates* are those who descend through males from a common ancestor, in opposition to *cognates*—i. e. all the descendants of a common ancestor, whether through males or females.

Ag'nes, SAINT: a Roman virgin; said to have suffered martyrdom under Diocletian, Jan. 21, 303 A. D. See Butler's *Lives of the Saints*.

Agnes Sorel: mistress of King Charles VII. of France; b. 1409; became in 1431 lady of honor to the Duchess of Anjou, and so fascinated the king by her beauty that he appointed her lady of honor to the queen. She exercised in some respects a most beneficial influence over the king, whom she stimulated to action against the English, who then invaded France. She died Feb. 9, 1450—it is supposed by poison administered by the dauphin.

Ag'new, CORNELIUS REA, M. D.: eye and ear specialist; b. in New York city, Aug. 8, 1830; graduated at Columbia College, 1849; received his diploma in 1852 from the College of Physicians and Surgeons; became house surgeon to New York Hospital and its curator, and afterward surgeon to the Eye and Ear Infirmary; studied in Dublin, London, and Paris; member of many medical and scientific societies, and made valuable contributions to medical literature. He was noted for his public spirit, and was equally prominent in Christian work. D. in New York city, Apr. 18, 1888.

Agnew, DANIEL HAYES, M. D.: physician; b. in Lancaster co., Pa., Nov. 24, 1818; practiced medicine there for several years; filled the chair of surgery in the University of Pennsylvania; attained a great reputation by his surgical inventions and medical writings; author of *Principles and Practice of Surgery, Hydrocele, Handbook of Practical Anatomy*, etc. D. in Philadelphia, Mar. 22, 1892.

Ag'ni, or **Ag'nis** [Sanskrit. *agni*'-s, fire, god of fire; Lat. *ignis*; O. Bulg. *ogni*; Lith. *ugnis*]: in Hindu mythology, the god of fire. He was a deity of great importance among the early Aryans, but after the rise of the gods of the Hindu triad he sank into a very subordinate position. He is sometimes represented with two faces, three legs, and seven arms, with his head surrounded by flames, and is generally painted of a deep-red color. By some he has been made to correspond to the Vulcan of classic mythology, but he does not anywhere appear as an artificer, like that deity. His principal characters are those of a purifier and bearer of incense to heaven, thus being made a mediator between man and the gods. His two faces are supposed to be a type of fire in its two characters—beneficent (or creative) and destructive—and his seven arms to indicate the seven prismatic colors.

Revised by R. LILLEY.

Agnoë'tæ [Gr. *ἀγνοῦνταί*, from *ἀγνοεῖν*, to be ignorant]: in ecclesiastical history, a sect in the sixth century who maintained that Christ in his human nature was ignorant of many things, particularly of the day of judgment. An earlier sect of this name denied God's omniscience, maintaining that God knows the past only by memory, and the future only by inference from the present.

Revised by R. LILLEY.

Agno'men [from the Lat. *ad*, to + *no'men*, a name]: a fourth name, derived from some illustrious action or remarkable event, given by the Romans to a person in addition to his prænomen, nomen, and cognomen (*qq. v.*). Thus two Scipios had the name Africanus given them on account of their victories over the Carthaginians in Africa. The younger of these celebrated generals had a second agnomen—viz. Æmilianus—because he was the son of L. Paulus Æmilianus, and adopted into the family of the Scipios. Fabius *Cunctator* (i. e. Fabius the delayer) was so called because by his prudent delays he alone, of all the Roman generals, could oppose Hannibal successfully at the height of the latter's career.

Revised by R. LILLEY.

Agnos'ticism [inaccurately formed from Gr. *ἄγνωστος*, unknown, unknowing; *ἀ-*, not + *γνῶναι*, know]: the doctrine that human knowledge is limited to experience, and that therefore we can neither affirm nor deny the existence of God, or know anything of the ultimate nature of things. *Philosophically*, it is an exposition of the bounds of human thought and knowledge, and upholds the impossibility of knowledge of the Infinite, in opposition to the theory of restricted but true knowledge of the First Cause as infinite and absolute. *Theologically*, it is by inference an exposition of limits of the Infinite and restrictions on the Absolute, implying that God can not reveal himself to created intelligence. The term agnostic, taken from Paul's mention of the altar to the "Unknown God," was first suggested by Prof. Huxley in 1869. Agnosticism is of recent growth, and is traceable to Kant's theory of knowledge.

Ag'nus De'i: the fifth and last section of the Roman Catholic mass, beginning with the words "Agnus Dei, qui tollis peccata mundi" (i. e. Lamb of God, who takest away the sins of the world). The singing of the Agnus Dei at the communion was retained by Luther in his reformation of the Church service, and is extensively practiced in the Lutheran Church. The name *Agnus Dei* is also applied to the figure of a lamb bearing a cross, which is often worn by Roman Catholics.

Agobard': b. in 779, of Gallic parents settled in Spain; ordained a priest in 804 by Archbishop Leidrad of Lyons; became his coadjutor in 813, his successor in 816. D. at

Lyons, June 6, 840. He may be characterized as one of the men of Charlemagne, as representative of his ideas politically and theologically. His writings, which were collected and published in Paris by Masson, in 1605, and by Baluze in 1666, were directed against the idea of the verbal inspiration of the Bible, against the worship of images, against the belief that hail and thunder storms were raised by sorcerers, against ordeals, and against adoptianism, etc. A treatise by him against the Jews was translated into German, 1852. See Hundeshagen's monograph on the *Life and Writings of Agobard* (1831). The best edition of his works is that of Baluze (Paris, 2 vols., 1666).

Agon'ic Line [from Gr. *ἄγωνος*, without angle; *ἄ-*, not + *γωνία*, angle]: the line which joins all the places at which the magnetic needle points due N. and S. The plane of the *magnetic meridian* of a place, which is the vertical plane passing through the two poles of a magnetic needle freely suspended at that place, does not, generally speaking, coincide with that of the geographical meridian, a vertical plane passing through the place and the N. and S. terrestrial poles. The angle formed by these planes is termed the *magnetic declination*. At certain places these planes coincide, and such places are called places of *no declination*. The line which joins all these places is termed the *line of no declination*, or the *agonic line*. A line of this kind passes through the eastern part of South America to Hudson's Bay, thence toward the North Pole to the White Sea; passing southward, it cuts Arabia, and, after traversing the Indian Ocean and the eastern portion of Australia, goes through or near the South Pole to join itself again. It is not fixed in position, but is at present moving slowly westward on the American continent. There is a second agonic line which has been observed near China and Japan.

Agonis'tici: an ascetic sect of Christians who lived in Northern Africa in the fourth century. They renounced labor and matrimony. Their name, derived from the Greek *ἀγωνιστής* (*agonis'tes*), a "wrestler," appears to have been given in allusion to their wrestling with "the world, the flesh, and the devil."

Agos'ta, or **Angus'ta**: a seaport of Sicily; in the province of Siracusa; on the Mediterranean; 14 miles N. of Syracuse (see map of Italy, ref. 10-G). It is built on the peninsula of San Croce, and is connected with the mainland by a narrow causeway; is supposed to occupy the site of the ancient *Megara Hyblæa*. The harbor is difficult of access, but when entered is commodious, and is fortified. In 1693 the town and one-third of its people were destroyed by an earthquake. Pop. 13,867.

Agoult', aa-goo', MARIE CATHERINE SOPHIE, Countess d': b. Dec. 31, 1805, at Frankfort, whither her father, Count de Flavigny, had emigrated during the Revolution; was educated in Paris, and married in 1827 Count d'Agoult, who died in 1856. Under the pseudonym of "Daniel Stern" she wrote a number of novels and literary reviews, a volume of moral and political aphorisms, *Esquisses morales* (1849), and *Histoire de la Révolution de 1848* (2 vols., 1851). D. in Paris, Mar. 5, 1876.

Agouti, aa-goo'tee [Fr. form of native Indian name *aguti*]: a rodent mammal of the genus *Dasyprocta*, related to the porcupines. The common agouti (*Dasyprocta agouti*) is a native of Brazil and neighboring countries. Formerly in these districts it existed in great numbers, but from its frequent ravages on the sugar-cane, potatoes, and yams, it has in many parts been hunted out and almost exterminated. It is about the size of a rabbit, has long hind legs, round ears, bright black eyes, and a short, stumpy tail, which, as well as the rump and thighs, is covered with long, coarse, bristly hair, whence the name *Dasyprocta* (from the Gr. *δασύς*, rough, and *πρωκτός*, hinder parts). The agouti is an omnivorous animal, eating almost all kinds of vegetables, fruits, roots, meats, etc. Its habits are all quick and active, and even while eating it continually turns its head from side to side, in order to guard against danger. The animal is easily domesticated, but, as it is specially fond of using its teeth on all kinds of furniture, it is but little valued as a pet. It gnaws with great rapidity, taking but a few minutes to cut



Black agouti.

its way through an ordinary door. In some countries its flesh is eaten, but a prejudice generally prevails against it.

There are several other species, inhabiting Central and South America, one of which, the black agouti (*Dasyprocta cristata*), extends into the West Indies. This species is said to have been the largest mammal inhabiting the West India islands at the time of their discovery.

Revised by DAVID S. JORDAN.

A'gra, or Akbarâbâd': a city of the Northwest Provinces, British India, and capital of the division of the same name, is on the right bank of the river Jumna, 134 miles by rail S. S. E. of Delhi, and 754 miles by rail N. N. E. of Bombay; lat. 27° 11' N., lon. 78° E. (see map of N. India, ref. 6-E). It was the capital of the Mogul and Mohammedan Emperors of India from 1504 to 1647, and was once a large and splendid city, but a great part of it is now in a ruinous state. The houses are mostly built of red sandstone. Here are several magnificent edifices, the most celebrated of which is the Tâj Mahal, a mausoleum erected by the Emperor Shah Jehan (1627-66) in honor of his favorite queen. This edifice, the finest in India, and perhaps in the world, is built of white marble, surmounted with a dome 70 feet in diameter, and adorned internally with exquisite mosaics of cornelian, lapis lazuli, and jasper. It cost above \$15,000,000. Among the articles exported from Agra are cotton, sugar, salt, and indigo. Many houses in Agra were destroyed by the Sepoys during the mutiny of 1857. Pop. (1891) 168,710.

Ag'ram, or Zag'rab: a royal free city and the capital of Croatia, on the left bank of the Save, 172 miles S. of Vienna (see map of Austria-Hungary, ref. 8-E). It is the seat of a Roman Catholic archbishop, and has 2 gymnasia, 2 Real-schulen, 2 normal schools, and other institutions of learning. Six annual fairs are held here. Pop. (1890) 37,400.

Agrarianism: See the Appendix.

Agra'rian Law [Lat. *agrarius*, pertaining to the field (*ager*)]: in the ancient republic of Rome, a law enacted to distribute or regulate the public land, *ager publicus*. Such laws were opposed by the patricians, who had appropriated to their own use the lands acquired by conquest, and who had long enjoyed the privilege of occupying them as tenants, on the condition of paying to the state a tithe of the produce. The consul Spurius Cassius first proposed to divide a portion of public land among the poor citizens, but the measure was defeated by the aristocrats. In 367 B. C. an agrarian law was originated by Licinius Stolo, ordaining that no man should possess more than 500 *jugera* (330 acres) of the public domain, and that such public land as any man occupied in excess of 500 *jugera* should be distributed among the poor citizens. Tiberius Gracchus was the author of an important agrarian law. These and later agrarian laws were never executed. In Sparta the attempt of King Agis IV. to enforce an agrarian law led to his murder by the ephori (240 B. C.).

Agreement: See CONTRACT.

Agrie'ola, CNEIUS JULIUS: Roman general and statesman; b. at Forum Julii (Fréjus), in Gaul, June 13, 37 A. D. He was appointed Governor of Aquitania by Vespasian in 73, and became consul in 77. About a year later he was sent as governor to Britain, which he conquered, and governed with much ability and moderation. By a wise and humane policy he promoted the civilization and prosperity of the natives. He erected a chain of forts from the Clyde to the Frith of Forth. He was recalled about 85 A. D. by Domitian, who was jealous of him. D. in Rome, Aug. 23, 93 A. D. He was the father-in-law of the historian Tacitus, who wrote a *Life of Agricola*.

Agricola, JOHANN (originally *Schneider* or *Schnitter*): German theologian; b. at Eisleben, Apr. 10, 1492; studied at Wittenberg, and became a friend of Luther, with whom he was afterward involved in a doctrinal controversy. He became a lecturer at Wittenberg in 1536, and court preacher at Berlin, 1540. Agricola and his followers were called Antinomians. (See ANTINOMIANS.) He was one of the authors of the *Interim* (1548), wrote some practical works, and published a valuable collection of German proverbs. D. in Berlin, Sept. 22, 1566.

Revised by HENRY E. JACOBS.

Agricola, RUDOLPHUS: humanist; b. 1443, at Baflo, Friesland, his name properly being Rolof Huysmann; studied in the chief universities of Europe; was a teacher in Italy, but returned in 1483 to Heidelberg and Worms. D. at Heidelberg, Oct. 28, 1485. He was instrumental in introducing

into Germany the taste for literature, just reviving in Italy. His writings were published by Alard (2 vols., Cologne, 1539). He was a painter and musician.

C. H. T.

Agricultural Chemistry: the study of the chemical relations of those substances which compose the products of the farm. Since the chemistry of these substances is most intimately connected with their physical, geological, and physiological aspects, the term agricultural chemistry, as commonly understood, embraces a wide range of natural science in its applications to vegetable and animal production. The object of agriculture is to develop from seed and soil the largest possible value of useful plants and useful animals at the smallest cost. Nothing is plainer than that the farmer should accurately understand the nature of those materials and agencies which build up his crops and increase his herds. He should know whence the materials of his crops may be drawn, what ones are placed at his disposal naturally in surplus, and what must be provided by his own care. He should know how to control or work in harmony with the energies whose action is essential to his success. Agricultural chemistry inquires, first of all, what the plant and animal are made of. It finds that both, when living, consist largely of water, to the extent of 40 to 90 per cent., which is indispensable to their existence as a vehicle for the process of circulation or transfer of nutriment. The dry plant or animal may be divided into matter volatile by heat, 90 to 99 per cent., and 1 to 10 per cent. of ash. The volatile or combustible matter is either organized—i. e. possesses a structure, or is a tissue of organs, imitable by the art of man, through whose mechanism the principle of vitality operates—or else it consists of substances which are the direct results of chemical changes in the organized matter. Muscle-fiber and wood-fiber are of the former, sugar and urea are of the latter kind. The volatile matters are thence termed organic; they consist of carbon compounds, most of which are highly complex in their atomic constitution.

The most important organic matters of our staple field crops are few in number—being, 1. The amyloids, compounds of carbon with hydrogen and oxygen, the last two being in the proportions in which they exist in water—viz. cellulose or wood-fiber, starch, the sugars, and the gums; 2. The pectoids, also compounds of carbon, hydrogen, and oxygen, comprising pectose—the hard pulp of fruits and roots—and pectine, pectose, and pectic acids—the gummy or gelatinous matters of ripe and cooked fruits; 3. The fats and fixed oils; 4. The organic acids, oxalic, malic, citric, and tartaric; 5. The albuminoids, albumen, casein, fibrin, and their analogues, which, besides carbon, hydrogen, and oxygen, contain 15 to 18 per cent. of nitrogen, with $\frac{1}{2}$ to 1 per cent. of sulphur. The ash of the plant consists of phosphates, sulphates, chlorides, silicates, and carbonates of potassium, sodium, calcium, magnesium, and iron.

The growth of a plant is the development of a germ or seed when acted upon by the solar ray, with access of water, air, and soil. The organic matters above enumerated as constituents of crops are exclusively generated and organized by the plant. Carbonic acid gas supplies carbon, water furnishes hydrogen and oxygen, while nitrogen is derived partially from minute quantities of ammonia mingled with the air. Nitrogen is, however, chiefly obtained from the nitrates of the soil. All the ash elements come exclusively from the soil. The agriculturist can not aid the nourishment of his crops except through the soil, and there he can only influence the supplies of water, of nitrogen, and of ash elements. Carbon, the most abundant ingredient of all crops, making up 44 to 48 per cent. of the dry matter, is furnished so fully by the atmospheric carbonic acid that additional supplies from the soil are not directly advantageous. The atmosphere contains, it is true, but a very small proportion of this gas— $\frac{1}{25000}$ of its bulk—but this is considerably in excess of the wants of the most luxuriant growth.

The fertility of the soil depends, chemically—1. upon the presence in it of all the ash elements and of nitrates in proper quantity; and, 2. on their occurrence there in such states of combination as give a constant and regulated supply. Numerous experiments have demonstrated that a soil destitute of any one of the following substances—viz. phosphoric acid, sulphuric acid, potash, lime, magnesia, oxide of iron—is absolutely barren by virtue of such deficiency. It is also certain that a soil which contains the usual amount of potash, but only in the form of feldspar, or of phosphoric acid, but only as apatite, or of magnesia, but only as serpentine, is infertile, because these substances do not yield their elements

to the solvent agencies of the soil or plant rapidly enough to serve as plant-food. Alumina is an abundant element of soils, but it is mostly absent from agricultural plants; and recent investigations also appear to show that silica, which is present in many plants, is an accidental ingredient, and in no manner essential to their growth or perfection. Soda likewise appears to be unessential to most of the vegetative processes; for, although it is perhaps never entirely absent from cultivated plants, it often occurs in them in extremely minute quantity, so that the soda which is indispensable to the blood and milk of animals must be obtained, in part at least, directly from mineral sources.

Nitrates and ammonia salts—which are the natural supplies of nitrogen to crops—rarely are, and never need be, present in the soil in more than the minutest proportion. It is only requisite that they be generated or gathered there as rapidly as crops remove them. The process of nitrification, whereby inert or inassimilable nitrogen existing in the soil or in the air is converted into nitric acid, is one of the utmost agricultural importance, though still largely involved in mystery.

The great bulk of any soil is chemically indifferent in the nourishment of the present crop. The weight of an average loamy soil is about 4,000,000 lb. per acre for each foot of depth. A crop of grain of 33 bush. removes but 140 lb. of ash elements—viz. 40 lb. in the seed and 100 lb. in the straw. A hay crop of 2 tons carries off but 260 lb. of ash ingredients. These quantities, if assumed to come from 2 feet of depth, are respectively but $\frac{1}{30000}$ and $\frac{1}{87000}$ of the entire mass of soil. Hellriegel's experiments give results which warrant us in concluding that 55 lb. of potash, 17 of soda, 17 of magnesia, 23 of lime, 55 of phosphoric acid, 11 of sulphuric acid, 8 of chlorine, and 54 of nitrogen (in the form of nitrates), are all that need be present, in soluble condition, in 1,000,000 lb. of soil, in order to establish there a temporary fertility equal to the production of 33 bush. of barley grain and 2,000 lb. of straw per acre. In other words, the 140 lb. of ash elements may be taken from 1,000,000 lb. of a soil in which but 186 lb. exist in soluble condition, and in which, therefore, the proportion of real plant-food—nitrogen, but not water, included—is but $\frac{1}{4000}$. Good soil, in the practical sense, however, yields, and may contain, a larger proportion of immediately available plant food than one part in 4,000, but rarely more perhaps than ten times that amount.

As cropping removes these substances from the soil, they are replaced more or less rapidly and completely by weathering, whereby, under the influence of moisture, carbonic acid, and oxygen, aided by heat and by the alternations of heat and cold, the rock dust of the soil is gradually fluxed into soluble pabulum, and charged with nitrates.

The soil is endowed with absorptive qualities which enable it to retain in a state of comparative insolubility certain ash elements, especially those which are in general the least abundant—viz. phosphoric acid and potash—even when applied to it from external sources in the most soluble form and in large quantity. This absorption of plant-food by the soil is accompanied by a corresponding liberation of other substances, especially of lime and sulphuric acid. The impalpable matter of the soil, consisting largely of aluminous and ferruginous silicates, is mainly the seat of these absorptions; sand, silica, carbonate of lime, humus, and even pure clay (kaolinite), being destitute of the power in question.

Soils may be fully supplied with all the nutritive elements in proper quantity and form, and yet be infertile. This may happen on account of faults in physical condition, whereby they are rendered uncongenial to plants. A certain medium porosity, admitting of access and efflux of water, and a quality of being suitably warmed by the sun, and of carrying heat through the cool of the night, are no less indispensable to high productive power than an appropriate chemical condition.

Manures improve the soil by supplying one or several of those ingredients required by plants which are deficient either by reason of yearly removal of crops or from original poverty of composition. Practice has taught that phosphates and nitrogen in assimilable form are most commonly the substances which strikingly benefit land, and chemical analysis shows that of these the former is ordinarily the least abundant ingredient of soils, and the latter is one which is not only not abundant, but one which rapidly wastes by solution in rain-water, being daily carried off in immense quantities, through springs and rivers, into the sea.

The action of fertilizers is not, however, fully explained by their affording a direct supply of lacking nutritive ele-

ments; manures operate indirectly to feed crops, by their chemical effects upon the soil. It has been abundantly demonstrated that common salt, gypsum, and other saline matters may react on the soil to convert potash and magnesia, for instance, into soluble forms, and thus to give the same result as would follow an immediate application of the last-named substances.

Certain manures which are used in large doses, such as stable dung, peat, marl, and lime, also influence the fertility of the soil, by amending its texture or otherwise modifying its physical characters.

It is theoretically possible to produce a maximum crop of any given kind, continuously and perpetually, upon the same plat of land. In practice, however, it is far easier, and therefore far cheaper, to alternate or rotate crops. A hoed crop implies surface tillage, several times repeated during the growing season, thus effectually exposing the upper soil to the oxidizing influence of the air. A field put into grass or clover is to some extent under opposite conditions. In the one case, organic matters waste rapidly; in the other, they accumulate in the soil. In the first instance, the surface soil tends to lose that porosity and attractiveness for moisture due to the presence of humus, which is a quality of the utmost significance in climates subject to drouth. In the second instance, the soil gains in these respects. On the other hand, the lower soil, which under hoed crops is yearly broken up by repeated plowing, may settle down to injurious compactness in a pasture or meadow. Deep-rooted crops affect the soil very differently from those whose radication is confined to near the surface. The reasons for rotation thus become, to some extent, apparent. Agricultural chemistry is competent to show, further, that some plants while occupying the soil enrich it, and, though yielding the farmer a large and valuable harvest, yet actually manure the land for a subsequent crop. Clover has long been known as a plant of this kind. A good clover crop, when made into hay, removes from the soil twice or thrice the ash elements and nitrogen that are contained in a good wheat crop, and yet the good clover crop will develop in a soil where the good wheat crop can only be raised by help of manure. More than this, the good clover crop not only grows on the unaided soil, but likewise fertilizes that soil, so that it can subsequently make the good wheat crop. The enriching effects of clover are absolute in respect of nitrogen. The clover plant is able, in a given time and on a given surface, to assimilate nitrogen much more rapidly, or to a much greater amount, than the wheat plant can. It therefore flourishes better on a limited supply, or gives a full crop, where wheat would make perhaps but half a crop; and, besides, leaves in the soil where it has grown more nitrogen in its roots and stubble than an entire wheat crop contains. In respect of ash elements, the clover plant can add nothing to the soil in the way of quantity, but it strongly influences their quality. It transmutes the insoluble matters into soluble, and collects largely, by its deep-penetrating roots, from stores of food which the wheat plant can scarcely reach. When its roots decay, these substances remain where a succeeding wheat crop can at once utilize them. This enriching process has again its narrow limits. If we keep land in clover, it becomes "clover sick," probably from exhaustion of the deep-lying plant-food, and this disease is hard to cure, because of the inaccessibility of the subsoil to fertilizing applications.

By judicious rotation of crops a soil of moderate quality may be made to yield fair harvests without the loss of productive power. In order thus to economize in the fullest degree the resources of soil and crop, the farmer needs an accurate knowledge of their nature, such as can only be obtained by encouraging the study of agricultural chemistry.

In studying the utilization of vegetable products for obtaining the various animal matters which are employed as food, etc., agricultural chemistry enters into a higher and more difficult field. Here it has been obliged, by numerous experiments, to test much of the empirical knowledge which agricultural practice had too vaguely supplied, and also finds itself under the necessity of investigating the most purely scientific questions of physiology. Although many useful practical results have been obtained, this department of our knowledge is extremely incomplete, and, save in technical details, is too closely allied to the general subject of animal nutrition to require notice in these pages.

Of useful books on agricultural chemistry, those of Liebig and Boussingault take pre-eminence; the former by their

brilliant suggestiveness, the latter by their accurate experimental study of many points of the highest practical interest. See Liebig, *Agricultural Chemistry* (1841); *Modern Agriculture* (1859); *Natural Laws of Husbandry* (1863), etc.; Bonssingault, *Économie Rurale* (1851); *Mémoires de Chimie Agricole* (1854); *Agronomie, Chimie Agricole*, etc. (1860-68); Wolff, *Naturlgesetzliche Grundlagen des Ackerbaues* (1856); *Landwirthschaftliche Fütterungslehre* (1861); Heiden, *Düngerlehre* (1868); Knop, *Lehrbuch der Agricultur Chemie* (1868); Meyer, *Agricultur Chemie* (1886); Johnston, *Lectures on Agricultural Chemistry and Geology* (1847); Johnson, *How Crops Grow* (1890); *How Crops Feed* (1870); Armsby, *Manual of Cattle Feeding* (1880); Sachsse, *Lehrbuch der Agrikultur Chemie* (1888); F. H. Storer, *Agriculture in Some of its Relations to Chemistry* (2 vols., 1888); R. Warington, *Chemistry of the Farm* (1891). S. W. JOHNSON.

Agricultural Colleges: institutions of learning, established and carried on for the promotion and dissemination of knowledge in the various arts and sciences connected with agriculture. Agricultural colleges are a product of the nineteenth century. The first and still the most prominent institution of this kind established in England was the Royal Agricultural College, near Cirencester, where a company of noblemen headed by Prince Albert in 1845 erected a stately Gothic structure to be used as a college, and procured a charter authorizing them to give appropriate instruction. Provision was made for six resident professors besides the principal. In 1880 the institution received an additional impulse with the name The Royal Agricultural College of England. There is no endowment fund, the support of the institution depending wholly on the patronage of friends and the fees of students. The purpose of the school, as set forth in the charter, is to train scientific and practical agriculturists. It is adapted especially to meet the needs of three classes: future land-owners, future land-agents, surveyors and managers of estates, and future colonists and employes in Indian agriculture. Besides the technical and special opportunities afforded for these purposes, the college supplies the advantages of a liberal course of intellectual and moral training for the duties of a country gentleman. The entire government and control, both of faculty and students, is in the hands of the principal, who appoints and removes professors, determines the time and numbers of the lectures, and settles all questions respecting the work of the faculty. Students who live in the college building pay an annual fee of \$675. The fee for instruction alone is \$375. Instruction is by lecture and by personal assistance in the laboratory and the field. The subjects taught are chemistry, physics, bookkeeping, zoölogy, agricultural law, and all the phases of practical and theoretical agriculture, including animal industry and veterinary science. The laboratories and museums are admirably equipped. In 1880 the Agricultural College at Downton, near Salisbury, was established on a similar plan. It has five professors, occupying chairs of dairy farming, chemistry, natural history, estate management, and veterinary medicines. The principal has charge of the agricultural department. The fees are a trifle smaller than those at Cirencester, and the work is designed to be of a somewhat more practical nature. The aim of the school is to fit young men for being superintendents, surveyors, and farmers. Of similar character is the Aspatria Agricultural College, near Carlisle, which was established for the better accommodation of those living in Northern England. What is known as Minto House, at Edinburgh, has also a similar object. At Oxford and Cambridge no agricultural colleges have been founded, though lectures on agriculture are given at both of those seats of learning.

Agricultural schools were established on the continent of Europe early in the nineteenth century. But it was not until the chemist Liebig, in 1840, published his celebrated work, *Die Chemie in ihrer Anwendung auf Agricultur und Physiologie*, that any considerable impulse was given to agricultural schools. This eminent chemist showed that, however great the draft upon the soil, fertility may be fully maintained, and even increased, by restoring the mineral and organic matter taken from it by the harvest. He further demonstrated that the proportions and quantities of the ingredients taken up by the crop are so variable that nothing less than a careful and scientific study of soils will enable the farmer to restore those ingredients in the most efficient and economical proportions. These truths naturally made the deepest impression on the people of Germany. It was accordingly held by the governmental authorities that, for

the encouragement of such studies, schools of agriculture should be multiplied. Under the impulse thus begun, the number, as well as the efficiency, of the agricultural schools among the Germans has steadily increased down to the present day. In 1892 Prussia alone had 4 agricultural colleges of the first grade, with some 80 professorships, besides as many as 40 lesser schools, all having model farms. In the same kingdom there are also 5 special schools for the cultivation of meadows and the scientific study of methods of irrigation, 1 special school for the teaching of those who desire to reclaim swamp-lands, 2 special schools for teaching the growing of fruit-trees in industrial nurseries, a school for teaching horseshoeing, 1 for teaching silk raising, 1 for the raising of bees, and 1 for the cultivation of fish. There are also 20 schools for the education of gardeners, and 15 for the training of grape-growers. Agricultural schools have met with similar encouragement in the other German states. Bavaria has 26 agricultural colleges, besides more than two hundred agricultural associations. Würtemberg has 16 colleges of different grades, and 76 associations. Baden has 14 colleges and 4 schools for gardening and forestry. Saxony has 4 colleges of the highest grade, and 20 agricultural schools of secondary rank, besides a veterinary college, and a department of agriculture with 20 professors at the University of Leipzig. Saxe-Weimar has 3 agricultural colleges, and an agricultural department with 15 professorships at the University of Jena. Similar schools have also been established in large numbers in France and in most of the other countries of Europe. The benefits that have been derived from these schools and colleges are universally conceded to be very great. While in the U. S. the crops per acre under the American system of tillage are almost everywhere growing annually less, in those European countries where scientific agriculture has been most thoroughly taught the yield per acre has been steadily increasing. In many parts of England and Germany, Belgium and France, the yield per acre is fully twice what it was one hundred years ago.

The first agricultural colleges in the U. S. were founded before the middle of the nineteenth century. The development of these institutions was slow, however, until the passage of what is known as the Land Grant Act of 1862. By this act every State and Territory in the Union received a gift from Congress of land scrip representing 30,000 acres for each Senator and Representative. The purpose of the act was to provide for the establishment of one or more institutions in each State, "the leading object of which should be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life." In those States which no longer had any land subject to purchase under U. S. law, it was necessary to sell the scrip at the market price, and the fund received by such sale was devoted to the establishment and endowment of colleges of agriculture and the mechanic arts. In States still having lands subject to entry under U. S. law, purchases could be made with the scrip, and the increase in the value of lands so purchased could be applied to the educational purposes intended. The freedom granted to the several States in the management of these lands has led to a great variety of results. The following table, compiled in 1890 by S. D. Halliday, for the most part from official sources, and published in his *History of the Agricultural Land Grant of July 2, 1862*, shows the number of acres received by each State, the rate at which the land has been disposed of, and the amount of the endowment realized. From the States not represented, no response to inquiries could be procured:

STATE.	Number of acres.	Amount realized per acre.	Total amount realized.
Alabama.....	240,000	\$1 06 +	\$253,500 00
Arkansas.....	150,000	90	135,000 00
California.....	150,000	5 14 +	771,686 86
Colorado.....	90,000	1 25	112,500 00
Connecticut.....	180,000	75	135,000 00
Delaware.....	90,000	92 +	83,000 00
Florida.....	90,000	1 73 +	155,800 00
Georgia.....	270,000	90	243,000 00
Illinois.....	450,000	1 00	450,000 00
Indiana.....	390,000	87 +	340,000 00
Iowa.....	240,000	2 70 +	649,396 16
Kansas.....	90,000	5 57 +	501,426 33

STATE.	Number of acres.	Amount realized per acre.	Total amount realized.
Kentucky	330,000	\$0 60 +	\$200,000 00
Louisiana	210,000	1 00	210,000 00
Maine	210,000	56 +	118,300 00
Maryland	210,000	55 +	115,943 00
Massachusetts	390,000	56 +	219,000 00
Michigan	240,000	2 50	600,000 00
Minnesota	120,000	4 39	526,837 96
Mississippi	207,920	90 +	188,028 00
Missouri	330,000	52 -	170,000 00
Nebraska	90,000	7 00	39,504 52
Nevada	90,000	1 05½	95,000 00
New Hampshire	150,000	53 +	80,000 00
New Jersey	210,000	55	116,000 00
New York	989,920	6 73 -	6,661,473 88
North Carolina	270,000	46 +	125,000 00
Ohio	630,000	54 +	342,450 80
Oregon	90,000	1 04 +	93,985 00
Pennsylvania	780,000	52 +	406,000 00
Rhode Island	120,000	41 +	50,000 00
South Carolina	180,000	1 07 -	191,800 00
Tennessee	300,000	1 34½	403,500 00
Texas	180,000	1 16 +	209,000 00
Vermont	150,000	90 +	135,500 00
Virginia	300,000	95	285,000 00
West Virginia	150,000	60	90,000 00
Wisconsin	240,000	1 51 +	363,738 00
Totals	9,597,840	\$1 65 +	\$15,866,371 00

In 1890 the act of 1862 was supplemented by a Congressional law giving to each State for the further endowment of the colleges established under the act of 1862 the sum of \$15,000 for the first year, \$16,000 for the second, and thereafter an amount increasing by \$1,000 a year until at the end of nine years the sum shall annually amount to \$25,000. This sum is thereafter to be the annual appropriation. The liberal provisions thus made in the acts of 1862 and 1890 by the Federal Government for education in agriculture have been supplemented by numerous grants in several of the States. The number of agricultural colleges in the U. S. in 1892 was 48. According to the report of the Commissioner of Education for 1888-89, the income of the 32 colleges from which reports had been received was \$1,407,242, of which 37.04 per cent. was derived from State and municipal appropriations, 40.95 per cent. from productive funds, and 15.98 per cent. from tuition fees, leaving a small portion unaccounted for. In the 32 colleges reported, the number of professors and instructors was 670. The colleges of agriculture are generally, though not invariably, associated with similar institutions for giving instruction in the mechanic arts. In Massachusetts, for example, the Institute of Technology, at Boston, receives a part of the income from the land grant of 1862, while a part goes to the Agricultural College at Amherst. In the agricultural colleges tuition is usually free, while in the technological schools the charges for instruction vary, according to location, from \$50 to \$200 a year.

The instruction given in the agricultural colleges in the U. S. is both theoretical and practical. Embracing a period of four years, the curriculum aims to give a general as well as a technical education. In many of the States the training provided for seems to be intended for the sons of farmers, irrespective of the consideration whether the pupils intend to pursue agriculture or some other vocation. Hence studies in language and literature, as well as in history and in general science, make up no small part of the curriculum. In all of this class of schools, however, particular attention is paid to those studies which relate directly or indirectly to the interests of the farming community. Foremost among these branches may be mentioned chemistry, geology, botany, zoölogy, entomology, horticulture, veterinary science, and the various interests more directly associated with theoretical and applied agriculture. These colleges are all connected with experimental farms, on which students have the opportunity of observing carefully conducted experiments in the rotation of crops, the effect on different crops of the several kinds of fertilizers and manures, the breeding and care of domestic animals, the making of butter and cheese, and, indeed, in all the interests associated with the successful pursuit of agriculture. Each of the agricultural colleges issues an annual catalogue or register which contains carefully prepared information concerning the courses of study, and which will be sent gratuitously to any applicant.

C. K. ADAMS.

Agricultural Experiment Station: an establishment founded and carried on for the purpose of obtaining and disseminating information that will be useful to the farming

population. Farming must necessarily be an experimental science, because it is not ordinarily practicable to know either the exact constituents of the soils, or the way in which growing crops will be affected by climatic and other indeterminate peculiarities. The best farming therefore is a constant process of carrying on experiments, and observing carefully their results. The application of different fertilizers to different soils and for different crops; the determination of the most profitable rotation of crops; the uses to which different soils may most advantageously be put; the quantity and quality of the rations that under differing circumstances should be fed to animals; the conditions under which milk, butter, and cheese are most advantageously produced; the way in which different plants and fruits can best be protected from the ravages of pests—these are questions upon the answers to which depend the results of the farmer's efforts. It was for the purpose of assisting in reaching the proper conclusions on questions like these that agricultural experiment stations were established. The work of such stations is carried on in the laboratory, the field, the stable, the dairy, the garden, the orchard, the nursery, and the greenhouse. By systematic experiments, under advantageous circumstances, many questions too abstract and difficult for the practical agriculturist may be definitely settled in the experiment station. For example, what are the effects of the different kinds of fodder, as hay, bran, corn meal, and roots, on the quantity and quality of milk, butter, and cheese? What is the result of giving milch cows warm water instead of cold? What is the most economical food for fattening steers, for fattening hogs, and for working horses? How are the quantity and the quality of manure affected by the nature of the food? It is to obtain answers to such questions as these that experiments are carried on in the agricultural experiment stations.

The work of scientific experimentation may be said to have begun with the establishment in 1843 of the experiment station of Mr. John Lawes, known as Rothamsted, on his estate at Harpenden, England, about 40 miles N. of London. Mr. Lawes, afterward Sir John Lawes, associated with him a very eminent scholar, Prof. Joseph H. Gilbert; and the special object of Lawes and Gilbert was to carry on systematic experiments for the purpose of ascertaining the peculiarities and capabilities of the soils of Rothamsted, and the effect upon these soils of different manures and fertilizers. The most important of the experiments were devoted to testing the capacity of different soils for bearing the same crops year after year. From 1852 down to the present time the policy upon a considerable portion of the estate has been to raise the same crops without interruption, some without fertilizers of any kind, some treated systematically with the same kind of manure, and some treated with commercial fertilizers. An interesting peculiarity of this method of experimentation is the fact that each parcel of ground has been treated in precisely the same way year after year, and has borne precisely the same species of crops every year for nearly forty years. Very striking results have been secured. The plots of ground receiving no manure have uninterruptedly declined in fertility, until the average product of wheat is reported to be less than 10 bush. per acre; while the plots treated with artificial manures have come to yield during the past ten years about 35 bush. per acre; and the plots treated with farm-yard manure have come to yield about 40 bush. per acre. The comparative values of the different commercial fertilizers were also subjected to the same systematic tests. The results of these and kindred experiments, as published from year to year, have been received with great interest by all the more intelligent farmers of Great Britain. The influence of the station has been fruitful in securing most important results throughout the kingdom. While in 1840 the normal yield of wheat in England was not more than about 13 bush. per acre, the average yield between 1870 and 1880 was 29.3% bush. per acre. In 1885 it was 31.3% bush. per acre. In a similar way fields which, without systematic fertilizing, could be made to produce only about 2,300 lb. of hay per acre, were brought up to an average of 6,400 lb. per acre. These results were reached upon fields that have borne grass continuously since the days of Queen Elizabeth. By the experiments of Lawes and Gilbert it has been clearly demonstrated that lands under proper treatment may bear the same crops for at least forty years, and steadily increase in fertility.

But it is in Germany that the results of scientific experimentation have been most completely shown. The first agricultural experiment station proper was established at

Moeckern, a small village near the city of Leipzig, in 1851. A little later this humble beginning received governmental assistance, and became a permanent branch of agricultural instruction. The seed thus sown brought forth abundant fruit, and now there are in Europe more than 100 stations, in each of which from 2 to 15 investigators are at work.

The first agricultural experiment station in the U. S. was established at Middletown, Conn., in 1875. The success of Prof. W. O. Atwater in conducting this station soon led to the establishment of other stations in different parts of the country. In 1880 there were 4 in operation, and in 1887, 17. In that year the Congress of the U. S. made an appropriation of \$15,000 per annum to each of the States and Territories that had established agricultural colleges, for the purpose of founding new experiment stations or improving those already in existence. Under the encouraging influence of this law every State has at least one station, while several have more than one. In 1892 there were 53 fully equipped agricultural experiment stations, employing in all about 400 trained specialists for conducting scientific investigations. The appropriation for these stations by the General Government is about \$715,000 a year, and this is supplemented by about \$135,000 from the legislatures of the different States. In the U. S., as in Europe, the work of the different stations varies according to the special needs of the localities in which the stations are placed. In Germany, 27 stations exercise control over commercial fertilizers by analyzing and publishing the constituents of each, while 29 perform a similar service by the examination of feeding-stuffs. Fifteen are devoted mainly to investigations in vegetable physiology and 7 to animal physiology, including the most economical nutrition of plants and animals; 3 to dairy industry; 4 to sugar-beet culture; and 3 to the cultivation of fruits and vines. In the U. S. the division of work has been somewhat less symmetrically carried on; but the tendency is everywhere in the direction of specialization. Some stations are endeavoring to show how worn-out lands can best be restored; some are making a specialty of determining the value of the numerous commercial fertilizers; some are dealing with the vegetable and animal pests that afflict our fields and orchards; some are studying the influence of various foods on the fattening of cattle and on the production of milk, butter, and cheese; some are devoting themselves to the problem of sugar-making, and others to the problem of irrigation. All the stations in the U. S. are required by law to publish the results of their experiments; and, accordingly, bulletins are issued at least four times a year, and are distributed gratuitously to all such members of the farming community as may apply for them.

The following table gives the name, location, and certain other data of the several stations in the U. S.:

STATE.	Name and location of station.	Date of establishment.	Staff.	Income.
Alabama	Agricultural Experiment Station of the Agricultural and Mechanical College of Alabama, Auburn. Branch stations at Athens and Abbeville.	1883	10	\$23,000
Alabama	Canebrake Agricultural Experiment Station, Uniontown.	1885	2	4,500
Arizona (Ter.) ...	Arizona Agricultural Experiment Station, Tucson.	1890	..	15,000
Arkansas	Arkansas Agricultural Experiment Station, Fayetteville. Sub-stations at Pine Bluff, Newport, and Texarkana.	1888	10	15,000
California	Agricultural Experiment Station of University of California, Berkeley. Outlying stations at Paso Robles, Tulare, Jackson, Cupertino, Fresno, and Missiou San José.	1876	16	28,000
Colorado	Agricultural Experiment Station of Colorado, Fort Collins. Sub-stations at Del Norte and Rocky Ford.	1888	12	15,000
Connecticut	Connecticut Agricultural Experiment Station. First established in Middletown; reorganized in New Haven in 1877.	1875	9	18,600
Connecticut	Storrs School Agricultural Experiment Station, Storrs.	1888	5	7,500
Delaware	Delaware College Agricultural Experiment Station, Newark.	1888	5	15,000
Florida	Agricultural Experiment Station of Florida, Lake City.	1888	..	15,000
Georgia.....	Georgia Agricultural Experiment Station. Experiment near Griffin.	1888	7	\$15,000
Illinois.....	Agricultural Experiment Station of University of Illinois, Champaign.	1887	9	15,000
Indiana.....	Agricultural Experiment Station of Indiana, La Fayette.	1887	9	17,000
Iowa.....	Iowa Agricultural Experiment Station, Ames.	1888	11	15,000
Kansas	Kansas Agricultural Experiment Station, Manhattan.	1888	12	15,000
Kentucky.....	Kentucky Agricultural Experiment Station, Lexington.	1885	8	16,500
Louisiana.....	Sugar Experiment Station, Audubon Park, New Orleans.	1885	7	18,400
Louisiana.....	State Experiment Station, Baton Rouge.	1886	4	8,400
Louisiana.....	North Louisiana Experiment Station, Calhoun.	1888	2	12,000
Maine.....	Maine State College Agricultural Experiment Station, Orono.	1885	10	15,000
Maryland.....	Maryland Agricultural Experiment Station, College Park.	1888	6	15,000
Massachusetts...	Massachusetts State Agricultural Experiment Station, Amherst.	1882	7	10,000
Massachusetts...	Hatch Experiment Station of Massachusetts Agricultural College, Amherst.	1888	8	15,000
Michigan	Experiment Station of Michigan Agricultural College, Agricultural College P. O.	1888	18	15,000
Minnesota	Agricultural Experiment Station of University of Minnesota, St. Anthony Park.	1888	12	15,000
Mississippi.....	Mississippi Agricultural Experiment Station, Agricultural College P. O.	1888	10	15,000
Missouri	Missouri Agricultural College Experiment Station, Columbia.	1888	9	15,000
Nebraska.....	Agricultural Experiment Station of Nebraska, Lincoln.	1887	9	15,000
Nevada.....	Nevada State Agricultural Station, Reno.	1888	5	15,000
New Hampshire.	New Hampshire Agricultural Experiment Station, Hanover.	1888	9	15,000
New Jersey.....	New Jersey State Agricultural Experiment Station, New Brunswick.	1880	5	11,000
New Jersey.....	New Jersey State Agricultural College Experiment Station, New Brunswick.	1888	5	15,000
New Mexico(Ter.)	New Mexico Agricultural Experiment Station, Las Cruces.	1889	..	15,000
New York	New York Agricultural Experiment Station, Geneva.	1882	7	20,000
New York	Coruell University Agricultural Experiment Station, Ithaca.	1879	13	15,000
North Carolina..	North Carolina Agricultural Experiment Station, Raleigh.	1877	9	17,200
North Dakota ...	North Dakota Agricultural Experiment Station, Fargo.	1890	..	15,000
Ohio.....	Ohio Agricultural Experiment Station, Columbus.	1882	7	15,000
Oklahoma (Ter.)..	Oklahoma Agricultural Experiment Station, Stillwater.	1891	..	15,000
Oregou.....	Oregon Experiment Station, Corvallis.	1888	3	15,000
Pennsylvania....	Pennsylvania State College Agricultural Experiment Station, State College P. O.	1887	10	18,000
Rhode Island....	Rhode Island State Agricultural Experiment Station, Kingston.	1888	1	15,000
South Carolina ..	South Carolina Agricultural Experiment Station, Fort Hill.	1888	13	20,000
South Dakota....	South Dakota Agricultural Experiment Station, Brookings.	1887	..	15,000
Tennessee	Tennessee Agricultural Experiment Station, Knoxville.	1882	7	15,800
Texas.....	Texas Agricultural Experiment Station, College Station.	1888	11	15,000
Utah.....	Utah Agricultural Experiment Station, Logan.	1890	7	15,000
Vermont.....	Vermont State Agricultural Experiment Station, Burlington.	1886	8	19,500
Virginia	Virginia Agricultural Experiment Station, Blacksburg.	1888	5	15,000
Washington.....	Washington Agricultural Experiment Station, Pullman.	1891	..	15,000
West Virginia ...	West Virginia Experiment Station, Morgantown.	1888	5	15,000
Wisconsin.....	Agricultural Experiment Station of University of Wisconsin, Madison.	1883	8	20,000
Wyoming.....	Wyoming Agricultural Experiment Station, Laramie.	1891	..	15,000
Totals.....			369	\$800,400

Agricultural Geology: geology applied to agriculture embraces whatever can be learned in regard to the nature of the sub-structure of any district with reference to drainage and water-supply, the origin, physical structure, and mineral constituents of soils, the distribution and properties of mineral fertilizers, etc. With present imperfect knowledge of the essential properties of soils, geology is chiefly valuable in showing their distribution. The sub-soil is in general derived from the underlying rock, and the soil is derived from the sub-soil; so that for the most part the rock indicates the soil. The relations of the various type soils of a region to the geological formations of the region having been ascertained, their distribution is shown by a geological map; and the results of experimentation or other experience as to the soil of any locality are thus intelligently applied to the remainder of the tract underlain by the same formation.

Revised by G. K. GILBERT.

Agricultural System: a theory of political economy invented by F. Quesnay (physician to Louis XV.), who taught that those only increase the wealth of a country who develop the resources of the earth, such as the products of the vegetable and mineral kingdoms.

Agriculture [Lat. *agricultura*; from *ager*, *agri*, field + *colere*, *cultum*, till]: primarily the tillage of land; now understood to comprise all those special industries which are connected with the rearing of plants and animals for economic purposes. It deals, therefore, with all those branches of science which have to do with the improvement of soils, with the breeding and development of domesticated animals, and the amelioration of the vegetable kingdom, as well as with the various enemies and diseases of animals and plants; and it is also an art which rests upon the combined experience of all previous generations. The field in which agriculture operates is the farm, and farming in its broadest sense is therefore synonymous with agriculture. Because of the rapid development of special industries in recent years, however, there is now a tendency to restrict the term agriculture to those operations which are concerned with the raising of stock and grains, with the crops incident thereto; while all that portion which has to do with fruits, garden vegetables, and flowers is denominated horticulture. In this classification there are still some industries which fall outside either division, as apiculture, pisciculture or fish-breeding, and forestry. This classification is only one of convenience, however, for, speaking exactly, agriculture must be held to include all rural industries.

The energy expended in the operations of the farm to be at all effective must be carried on agreeably with the laws which govern tillage and the growth of plants and animals. Many of these laws are now known; some are concisely and systematically arranged, forming a true science; and some of them are capable of such definite application that they may be classed among the exact sciences. The production of butter from milk has been reduced to a science almost as exact as has the determination of the solids in milk by chemical analysis. Within the last quarter of a century the wall which divided science from practice has been broken down, though not entirely obliterated. So long as agriculture was considered and practiced as an art little permanent progress was made, but wherever or whenever it has been studied as both a science and an art advancement has been rapid and permanent. Nearly all of the improvements in agriculture which have been made in the last century have been due to the discovery and application of laws before unknown or unapplied, rather than to improvements in the mere art of farming. Bakewell in 1785 discovered and applied the primary laws which govern the art of improving domestic animals. Anciently the breeding of animals was practiced as an art alone; hence little improvement was made, and what advancement accrued was often lost in a single generation. For three-quarters of a century after Bakewell's time rural science suffered in reputation, because the scientists were ignorant of the art of agriculture, and those who knew the art would have none of the science. It is only within a score of years that science and art have consented to act together as a unit for the common good.

The primary or fundamental science and art of agriculture are those connected with maintaining or increasing the fertility of the soil. There has always existed much anxiety in the minds of the most thoughtful agriculturists lest cultivated soils should some day become depleted or exhausted, and profitable tillage of the land become im-

possible. But the experiences of the oldest civilized countries emphatically contradict this apprehension; and the researches of Sir Humphry Davy and Von Liebig, early in the nineteenth century, into the chemistry of the soil gave assurance that careful management of the land and the judicious application of manures can not only maintain but even augment the fertility of the soil. Thorough and frequent light tillage, when the land is neither very wet nor very dry, is of itself a conservator of fertility, from the fact that it aids in unlocking certain fertilizing elements which exist in an unavailable condition in all good soils. The application of concentrated fertilizers and farm manures is now governed by definite precepts, for which the reader is referred to the articles on FERTILIZERS and MANURES. Definite successions or rotations of crops were urged by Liebig and others for the purpose of conserving fertility, largely upon the supposition that plants excrete certain substances which are injurious to themselves, but which are innocuous or even beneficial to other species of plants. Although the original conceptions as to the reasons for maintaining rotations are largely given up, it nevertheless remains a fact that such rotations are exceedingly important in any well-considered scheme of farming.

Rotation of crops may be defined to be the arrangement of a certain regular succession of plants of different species with a view to economize the fertility of the land, prevent the growth of certain species of weeds, economize labor, and to distribute it, so far as possible, through the entire year. It is a well-known fact that some crops require that their food shall be abundant and readily soluble, while others are able to thrive well on nourishment drawn from less tractable substances. This is supposed to be due to the greater power of the roots in some species to excrete the solvents which assist in setting plant-food free. The difference in amounts of inorganic matter abstracted from the soil by different species of cultivated plants is so small that no account is taken of them in fixing a rotation. There are four conditions—climate, soil, local position, and economy of labor—which should be observed in fixing upon any given rotation. A common rotation is two years of grass or clover, one of corn, one of oats or barley, and one of wheat. Where wheat and potatoes both thrive, a three-years rotation—clover, potatoes, and wheat—is often adopted. The exudations of the roots of plants do not, as was formerly supposed, poison the soil; both wheat and corn have been raised continuously on the same land for more than twenty years without diminution of yield, though, from obvious reasons, continuous cropping with one species of plants does not give the best results. Save in exceptional cases, a rotation should be planned so as to secure the largest net returns, while maintaining, or even increasing, the productive power of the land.

The fears that soils necessarily become more or less exhausted after many years of cropping have been the exciting cause of much of the instability in agriculture in the U. S. The fertile and cheap lands of the interior country, offered by the Government and by railroads, have attracted much of the population from the older soils of New England, and have been the means of creating a most unwholesome feeling of unrest in the agriculture of all the Eastern States. The exodus from the East has been so great that many of the hill-farms of New England have been abandoned, and this circumstance is often cited as evidence that agriculture can not thrive in these States. But much or even most of the land which is thus abandoned is really unfit for farming purposes, and ought never to have been cleared. Its uses for forestry are greater than its value for tillage; and much of it is adapted to grazing, for which it is now largely employed. The remaining and really valuable lands in New England are now being devoted more and more to special styles of farming, and, being relieved from some of the neighboring competition, are perhaps as profitable as they ever were, while the best of them are very prosperous. As a rule, therefore, the so-called abandonment of Eastern farms does not call for apprehension; and the fact that the available Western lands are largely taken up is conducing to a more settled and hopeful feeling among our Eastern farmers.

LIVE-STOCK INTERESTS.—The fundamental problems regarding the fertility of the soil are now giving place in a measure to the scientific principles which underlie the improvement of animals and plants. This is well shown in the live-stock interests. While Spain was overrun with valuable sheep, and Great Britain had great numbers of improved horses and cattle, no advantage was taken of these facts

until about the beginning of the nineteenth century. A few English sheep had been imported into the U. S., but they were used only for the purpose of making a little homespun cloth, and it was not until 1809-11 that William Jarvis and others imported about 8,000 Spanish merinos. The commercial difficulties with Great Britain and France in 1807 caused unwashed wool to reach the fabulous price in 1810 of \$2 a pound, and during the war of 1812 it reached \$2.50. Many merino lambs sold for \$1,000 apiece, and from that day to the present the merinos have been bred in large numbers from the Atlantic to the Pacific.

Sheep.—These early prices exerted a powerful influence upon the sheep industry in improving the different breeds; for, while the former prices are now seldom obtained, the total value of the sheep products has wonderfully increased. The low price of wool within the decade 1880-90, and the high price of early lambs, has tended to bring about a change from sheep of intensely fine wool to those of mixed blood, or to the medium-wooled mutton sheep of the British islands. The total number of sheep of all kinds in the U. S. in 1892 was 44,938,365, valued at \$116,121,270, and the total product of wool for 1891 was 285,000,000 lb. The combined effect of all the influences which are now shaping the sheep industry is to make it more apparent that the ideal sheep for the farmer of the U. S. is one of medium size, compact build, quick growth, and rotund form.

Cattle.—It was not until 1830 to 1840 that serious attempts were made to improve the cattle of the U. S. These attempts were inspired by the remarkable success of Robert Bakewell, Charles Colling, Thomas Bates, Booth Brothers, and others in England in improving the shorthorns by careful selection and judicious crossing. Large importations were made from the Bates and Booth herds, and one family of shorthorns—known as the Duchess—early attracted unusual attention in this country. In 1867 J. O. Sheldon, of Geneva, N. Y., sold forty head of this family for \$42,300 to Wolcott and Campbell, of Utica, N. Y. In 1873 this herd was dispersed at public auction by Samuel Campbell. At the sale the eighth Duchess of Geneva was sold to R. Pavin Davies for \$40,600, the tenth Duchess of Geneva to Earl Bective for \$35,000, and the first Duchess of Oneida sold for \$30,600. The tenth Duchess of Oneida, an eight-months calf, sold for \$27,000. The effect of these almost fabulous prices was at once to draw the attention of farmers everywhere to the breeding and selection of cattle. So far as possible within his means nearly every herd-owner obtained the services of an improved bull. Grade shorthorn stock became common, and its effect upon the stock of the country was marked. It was but a step from this improved breeding to a careful study of every animal in the flock, with the result that the poor or unprofitable individuals were not allowed to breed, or are not now even allowed to remain in the herd. Attention was then attracted to the breeding of animals for particular purposes. The shorthorns are essentially a beef breed, and the result of American breeding was such that many judges contend that the herds in the U. S. exceed those of Great Britain in average value of individual animals. In 1850 John A. Taintor imported the Jersey, one of the best of the dairy breeds. Although this breed had been produced in a comparatively warm climate, and did not always adapt itself at first to the severities of the Northern States, it has been improved so much in hardness, quality, and size that it now stands second to no other breed of dairy cattle in the U. S. In 1857 W. W. Chenery, of Belmont, Mass., imported some cattle from North Holland. This importation was soon followed by others, and the animals became known as the Holstein-Friesian breed. This large breed has been handled with such skill in this country that its records for milk and butter astonish the world. Several cows have a record of 20,000 lb. and upward of milk per year, and one has a record of 31,000 lb.; while another has produced 1,153 lb. of butter in 365 days. From these small and recent beginnings, with comparatively little clover and almost no turnips, the stock interest of the U. S. has grown, until in 1891 there were 16,000,000 milk cows, valued at \$346,397,900. The total annual milk production is estimated at 20,000,000 tons, and the average annual production of milk per cow in the Eastern States is 3,000 lb. While, therefore, the prices for individual fancy animals have fallen off, the average value of the stock and dairy interest to the farmers of the country has greatly increased. See CATTLE, BUTTER, CHEESE, and MILK.

Horses.—Probably no animal has shown such quick re-

sponse to the ideals of the breeder as the horse, especially in the trotting horse. Horses from a very early period attracted wide attention, and the thoroughbred or running horse was imported into Great Britain and the U. S. at a very early date. As early as 1854 West Australia ran 2 miles and 4 furlongs in 4:27, or a mile in 1:47. Little progress has been made in the speed of this class of horses, as in 1890 the lowest running record was by Salvator, a mile in 1:35½. From the mixed blood horse of the country on one side and the hot-blooded Oriental, or thoroughbred, on the other, has been developed a distinct type of animal which for speed and endurance is unexcelled. The first trotting record below 2:30 was made less than fifty years ago by Lady Suffolk, in 2:26½, while at the present time there are in the U. S. several thousand horses which have trotted a mile in that time, or less. The first horse to make 2:10 was Jay Eye Sec, in 1884; now at least eight horses have equaled or lowered that time. The best stallion record is by Palo Alto, 2:08¾; the best team record by Belle Hamlin and Justina, 2:13; the best three abreast record by Belle Hamlin, Justina, and Globe, 2:14; the fastest pacing record is held by Direct, 2:06; while the queen of the trotters is Nancy Hanks, 2:04. The best records for different ages are: for yearlings, Frou-Frou, 2:25¼; for two-year-olds, Arion, 2:10¾; for three and four year olds, Sunol, 2:10½. It is no uncommon thing for some of the best bred trotting animals to bring from \$50,000 to \$120,000 each. The trotting horse is a remarkable development. The Puritans believed that a race-course was demoralizing and horse-racing wicked, and so the breeders of fast horses in New England, in deference to this idea, trained to secure trotters. The trotter, in turn, had a marked and positive influence on the character of all light wagons, and soon there appeared many styles of pleasure-carriages and road-wagons unrivaled for lightness and beauty; and they in turn produced lightness, durability, and lines of beauty in every class of farm implements and machinery, team wagons being lighter, and painted and decorated more elaborately than the carriages of the aristocracy of Europe. The South had no such scruples about horse-racing, and so, from the earliest history of the country, running horses have been fashionable there. See HORSE-RACING.

According to the census of 1890 there were in the U. S. on June 1, 1890, 14,976,017 horses and 2,246,936 mules, the average value of the horses being \$67 each, and of the mules \$77.88 each. See HORSE.

Swine.—Among swine there has also appeared a peculiar American breed, the Poland-China, produced in the corn-growing regions of Ohio from the crosses of several of the improved English breeds. Three-fourths of all the swine which arrive at the great pork-markets of the country are of this breed. The enormous corn crops of the country have stimulated the swine industry, until in 1891 there were in the U. S. 201,193,923 animals, at an average value of \$4.15 each, and there were slaughtered 8,200,000,000 lb., as against 8,800,000,000 lb. of beef and 1,000,000,000 lb. of mutton. See SWINE.

Poultry have also responded in a wonderful manner to good care and selection. In 1880 there were 102,000,000 fowls. In the middle of the nineteenth century there were not above half a dozen breeds; now there are over one hundred. Fine birds sell from \$25 to \$225 each. The annual egg product is worth upward of \$200,000,000, and the entire poultry product is estimated at \$700,000,000. Formerly 75 eggs per hen every year was considered a large yield; now many large flocks produce an average of 175 eggs per hen. This improvement, like many others of domestic animals, has been secured by original methods, discovered and put in practice in the U. S. See POULTRY.

Bees.—Marked progress has been made in the management of bees. Extractors, foundation comb, and adjustable hives have enormously increased the total product. The annual honey produced is estimated at 20,000,000 lb.; the number of colonies at 3,000,000. See APICULTURE and BEE.

CROPS.—In most of the older grain-growing sections of the U. S. the yield per acre has decreased since the first crops were taken from the land, and this circumstance has occasioned some alarm among farmers. But such a result is to be expected when we consider the careless methods pursued in pioneer farming. Crop after crop is taken from the virgin soil, rich in plant-foods accumulated during ages, and there is not only little or no attempt to supply the materials consumed, but the management of the land is hasty and often reckless. But it is an encouraging fact that the so-called depleted soils of some sections of the Eastern States are now

giving, under careful management, greater returns than they did in the early days. This is well shown in the wheat crop, of which the yield per acre averages, for the U. S., 15 bush., while many of the old farms in the Eastern States give an annual crop of 35 to 40 bush.; and it is significant that in England, where the land has been cultivated for centuries, the yield per acre is 32 bush. This productiveness of old lands is not due to excessive fertilizing, but to the moderate use of fertilizers in connection with thorough and careful tillage and underdraining. The fertility of virgin soil is really in a measure fictitious; that is, it is not an accurate measure of the intrinsic value of the land, but is rather an index of how much extraneous food material has been deposited upon it. The true science of agriculture finds its best and most permanent usefulness when it considers the management of old soils. A system of agriculture is successful only when it augments the productiveness of the land at the same time that it maintains or increases the product. The cereals now produced in the U. S. are enormous in quantity. In 1891 there were 78,000,000 acres of corn, which yielded 2,060,000,000 bush., worth \$836,439,228, with an additional valuation of stalks of \$156,000,000. Large areas were also grown for ensilage. See ENSILAGE. The wheat occupied 39,916,897 acres, giving 611,780,000 bush., worth \$513,472,711. There were consumed in this country 301,000,000 bush.; 206,000,000 were exported; 56,000,000 bush. were used for seed; the balance was in original hands and not accounted for. Oats covered 25,581,861 acres; produced 738,394,300 bush.; and had an estimated value of \$232,312,267, having increased in total amount over 50 per cent. during the decade. Hay production increased 240 per cent. from 1840 to 1880. At the present time more than 40,000,000 tons are cut annually. From 1791 to 1801 cotton production increased from 2,000,000 to 48,000,000 lb.; in 1891 it was 4,000,000,000 lb. If two pounds of seed are produced for every pound of clean lint, this would give 4,000,000 tons of seed. A ton of seed reginned produces 10 lb. of cotton, 35 gal. of oil, 750 lb. of meal, and 500 lb. of hulls. Less than one-third of the seed is manufactured; two-thirds is wasted or applied direct to the land as a fertilizer. See special articles on the various crops for more particular information. For fruit and kindred interests, see HORTICULTURE, FLORICULTURE, POMOLOGY, OLERICULTURE, and FORESTRY.

LANDS.—The extent of public lands in the U. S. and Territories in 1880 was 1,814,504,147 acres. Up to 1890 88,000,000 acres had been settled under the Timber and Homestead acts, 896,000,000 acres remained unoccupied, and the amount taken up by farms was 536,081,835 acres. During the decade from 1870 to 1880 the number of farms containing from 50 to 100 acres increased 37 per cent.; those from 100 to 500 acres trebled; those from 500 to 1,000 quintupled; while those containing 1,000 acres and above were eight times as many. In 1883 18,000,000 acres were owned by eight proprietors, and the railroad companies held 200,000,000 acres.

In 1892 1,000,000 sq. miles were unsettled, 80,000,000 acres were timber, 70,000,000 coal and other mineral lands, and 500,000,000 wild grazing and desert lands; not more than 25,000,000 acres of good arable lands, capable of profitable cultivation without irrigation or other artificial means, remained. The reckless devastation of forests during the pioneer days in the U. S. is without parallel in the history of nations. The axe and the firebrand preceded the march of population westward, stripping the rich valleys and the hill-sides of their natural covering, leaving vast areas to seorch in the burning sun and to quickly conduct away the melting snows, flooding valleys and inundating enormous tracts of country along the great rivers. Wise timber laws for the protection and extension of forest areas, such as are in existence in Germany and France, are not found in the U. S. Twenty-five billion cubic feet of wood are consumed annually in the U. S., which is equal to the annual wood-growth of 500,000,000 acres of forest, or more than the forests of the U. S. produce. See FORESTRY.

ROADS.—The wars of the U. S. have not made great military highways necessary, and the rapid settlement of new territory and the extension of railroads have tended to discourage a systematic knowledge and practice of road-construction. The number of miles of railroad in operation in the U. S. in 1891 was 170,601. The number of miles constructed during that year was 3,898. Early in railroad building in the U. S. a simple invention made it possible for trains to round short curves safely; this cheapened the cost of constructing them in the U. S. over that of the United Kingdom

by more than 20 per cent. Freight-cars carrying from 20 to 40 tons each have been substituted for the small 5-ton cars which were first used, and locomotives have doubled in size and weight. These are the three great factors which have made it possible to transport a bushel of wheat 2,000 miles by rail to the seaboard market for less than it can be transported 20 miles by wagon carriage. As the population of the country increases, however, there is an increased demand for wagon roads, and this subject is now undergoing great agitation, especially in the East. Undoubtedly the first requisite to a good road system is some sort of State control, by which competent engineers and superintendents can be employed; and it will then be found that proper engineering will make it possible to dispense with many or most of the expensive road-beds which are now advocated. See HIGHWAY, ROADS, and PAVEMENTS.

MACHINERY.—The rapid settlement of Government land brought into cultivation vast areas of productive virgin soil, and the rich rewards for agricultural products and the high price for human labor stimulated the invention of labor-saving machinery; while the universal use of steam-power, the general popularity of the printing-press, together with the discovery of the electric telegraph and telephone, added new impetus to manufacturing. Increased manufactures called for additional agricultural production to supply raw materials; this in turn stimulated invention of labor-saving devices, so that to-day the U. S. is remarkable for the value and number of its farm implements. Nearly every operation of the farm has been made less burdensome, and many methods of agriculture have been completely overturned. The Babcock tester for fat in milk and the milk-separator have revolutionized the dairy interests; seed-sowers and corn-harvesters, self-binders and steam-threshers, have made it possible for one man to accomplish the work which it would have required twenty men to perform a generation ago. In fact, it would be impossible to grow the annual agricultural product of the U. S. with our present population were it not for the farm machinery. There are sold annually about 125,000 self-binders in the U. S., valued at \$15,000,000, and 175,000 mowers, valued at \$8,000,000.

EDUCATION.—Agricultural education received its first great impulse when Congress passed the Morrill Land Grant Act in 1862, giving to every State public lands for the purpose of founding institutions where "such branches of learning as are related to agriculture and the mechanic arts" should be taught. In 1890 additional aid was given to the colleges established under the supplementary Morrill grant of \$15,000 per annum, to be increased each year by \$1,000 until the total annual appropriation shall have reached \$25,000. There were 46 agricultural colleges in operation in 1892, with an aggregate attendance of from 5,000 to 6,000 students. (See AGRICULTURAL COLLEGES.) The national Department of Agriculture at Washington is thoroughly and systematically organized, having for its head a Secretary of Agriculture, who is a member of the President's Cabinet. There are fifteen sub-departments, viz., the departments of statistics, botany, animal industry, plant pathology, gardens and grounds, records and editing, seeds, weather bureau, chemistry, forestry, entomology, mammalogy, microscopy, pomology, and experiment stations. Much valuable scientific work has been done, which is published in the form of bulletins and an annual report for free distribution. The department seeks to introduce new varieties of plants and animals, to foster new industries, to combat pests and diseases, to inspect agricultural exports and imports, to report upon the condition and prospect of crops in this and other countries, to preserve the forest areas, to prevent the adulteration of food products, to report upon the freight rates of transportation companies, and in general to look after the interests of the farmer, and to aid him in every way possible.

Previous to the year 1887 scientific agricultural research had been carried on in the U. S. to a limited extent by special State appropriations or by individual enterprise. At this time Congress passed the Hatch Act, giving to every State \$15,000 annually for the establishment of an agricultural experiment station. During 1891 the stations published 49 annual reports, 255 bulletins, with a total number of 40,000,000 distributed pages, and an aggregate mailing list of 350,000. The number of stations in operation in 1892 was 49 (see AGRICULTURAL EXPERIMENT STATION), employing 473 persons. Not a little of the progress in agriculture is due to the information placed before the farmer in the station bulletins. Great demand for agricultural knowledge has led not less than 30 States, including Canada, to make

an aggregate appropriation of \$85,000 for the holding of farmers' institutes. These institutes assumed definite shape nearly twenty years ago. In 1842 the New York State Agricultural Society provided by resolution for addresses at suitable times at the county agricultural societies. Massachusetts provided for holding farmers' institutes as early as 1859; Michigan in 1861; in 1869-70 farmers' institutes were held in Iowa. From this time on they increased in number and usefulness. (See FARMERS' INSTITUTES.) These farmers' meetings have marked a new era of agricultural education. Of various organizations, many of which receive State aid, there are between 3,000 and 4,000, such as agricultural societies, dairymen's associations, horticultural societies, poultry societies, and miscellaneous organizations. Sir John Lawes has provided by an ample endowment for an American biennial course of lectures on the agricultural investigations conducted at Rothamsted, to be delivered under the auspices of the Society of Agricultural Colleges and Experiment Stations. Upward of sixty villages in Kent, England, have courses of six lectures on botany, entomology, and other subjects relating to agriculture.

LITERATURE.—The literature of agriculture is very voluminous, though to a large extent out of date and unreliable, because of the constant discovery of new laws, methods, and principles. The best works which give us an idea of the agriculture of ancient times are those of Columella, who wrote *De Re Rustica*, and of Vergil, who wrote *The Georgics*. Cato, Varro, Pliny, and Palladius also contributed extensively to contemporaneous literature. The principal writer in Italy for the same period was Creseentius; in Spain, Herrera; in France, Oliver de Serres; in Germany, Hershbachius. Of later times, *The Booke of Husbandrie*, by Sir Anthony Fitzherbert; *Five Hundred Points of Good Husbandrie*, by Thomas Tusser; *The Whole Art of Husbandrie*, by Barnaby Googe; *The Jewel House of Art and Nature*, by Sir Hugh Platt; *The English Improver*, by Walter Blithe; *Husbandry of Brabant in Flanders*, by Richard Weston, are the best books of reference. The most reliable writers at the beginning of the nineteenth century were Fallipo Re, in Italy; Mayer, in Germany; and Marshall, in Great Britain. Still later works covering the general field of agriculture are Loudon's *Encyclopædia of Agriculture*; Stephens's *Book of the Farm*; Morton's *Cyclopædia of Agriculture*; and Wilson's *British Farming*. Later books are *Elements of Agriculture*, by Waring; *Talks on Manures*, by Harris; *Feeding Animals*, by Stewart; *Farm Drainage*, by French; *American Dairying*, by Arnold; *Practical Shepherd*, by Randall; *Swine Husbandry*, by Coburn; *Cattle Breeding*, by Warfield; *How Crops Grow and How Crops Feed*, by Johnson; *Horticulturist's Rule Book*, by Bailey; *Manual of the Apiary*, by Cook; *Animals and Plants under Domestication*, by Darwin; *Insects Injurious to Vegetation*, by Harris; *Farmer's Veterinary Adviser*, by Law; *Agriculture*, by Storer; *The Poultry Book*, by Wright; *Horses, Cattle, Sheep, and Swine*, by Curtis; *Horse Breeding*, by Sanders; *Gardening for Profit*, by Henderson; *Fruit Culture*, by Thomas; and *Fruits and Fruit-Trees of America*, by Downing. In 1884 there were 305 agricultural periodicals published in North America, as against 546 in all the rest of the world. Among the most valuable are the *Rural New Yorker*, *Country Gentleman*, *American Agriculturist*, *New England Homestead*, and *Pacific Rural Press*. Those covering special branches of agriculture are *The Breeder's Gazette*, *Hoard's Dairyman*, *The Dairy World*, *The Poultry Keeper*, *The Poultry World*, *American Gardening*, *Garden and Forest*, *Swine Breeder's Journal*, *American Horse Breeder*, *American Sheep Breeder*, and *Gleanings in Bee Culture*.

I. P. ROBERTS.

Agriculture, Department of: a commissionership of the U. S. Government established by Congress in 1862 in Washington, D. C., changed in 1889 to a department of the Government, with a cabinet officer or "secretary" at its head. By means of annual and monthly reports it diffuses information deemed advantageous to the agricultural interests of the country. It purchases and propagates seeds and plants, which are distributed to the people of the U. S. It has a fine building, which stands W. of the grounds of the Smithsonian Institution. Among its constituent parts are two bureaus (Animal Industry and Weather Bureau), many divisions, an office of experiment stations, a herbarium, a museum, chemical laboratory, propagating-gardens, and a library. Its monthly reports of the prospects of the staple crops are especially valuable. At the propagating-gardens

plants received by exchange from foreign governments and botanic gardens are tested, with a view to introducing new and useful plants in the U. S.

Agrirentum: an ancient city of Sicily, now called Girgenti (*q. v.*).

Ag'rimony: any herbaceous plant of the genus *Agrimonia* and family *Rosaceæ*. The *Agrimonia eupatoria*, a native of Europe and the U. S., has been used in medicine. Several species grow in the Southern U. S.

Agrip'pa, King: See HEROD AGRIPPA.

Agrippa, HENRY CORNELIUS, of Nettesheim: German physician, philosopher, and astrologer; b. at Cologne, Sept. 14, 1486. He cultivated many departments of knowledge, and engaged in various pursuits in many countries of Europe. He acquired fame by his talents and his supposed skill in occult science, but he was regarded as an impostor and heretic by some of his contemporaries. He lectured on theology at Cologne and other places, and practiced medicine in France. Among his works is a satire *On the Vanity of the Sciences* (in Latin, 1530). D. at Grenoble, France, Feb. 18, 1535. See his life by H. Morley (2 vols., Lond. 1856).

Agrippa, MARCUS VIPSANIUS: Roman statesman and general; b. in 63 B. C. He became in his youth a friend of Octavius (afterward the Emperor Augustus), to whom he rendered important military services, especially at the battle of Actium, where he commanded the fleet, in 31 B. C. Agrippa and Mæenas were the principal ministers and advisers of Augustus after he had obtained the supreme power. He married Julia, the daughter of Augustus, about 21 B. C., and had several sons, two of whom were adopted by the emperor. Agrippa wrote a memoir of his life, now lost, and projected a detailed map of the world, for which he had collected much material, which was deposited in the public archives and afterward used by Strabo, Pomponius Mela, and Pliny the Elder. After his death, Augustus executed the map, copies of which were sent to the provinces. D. in Mar., 12 B. C. Revised by M. WARREN.

Agrippi'na I.: a Roman lady; daughter of M. Vipsanius Agrippa and his wife Julia; married to the famous Germanicus. Her virtue is highly commended, and was the cause of her banishment in 29 A. D. to the island of Pandateria, near Naples, by the Emperor Tiberius, who hated her. There she died, Oct. 18, 33.

Agrippina II.: a daughter of the preceding; b. at Cologne, 16 A. D. She was the mother of the Emperor Nero, by Domitius Ahenobarbus, and was notorious for her profligacy and her crimes. Her second husband was Passienus Crispus; her third was the Emperor Claudius, whom she killed by poison. She was put to death by her son Nero in 60 A. D. See her life by A. Stahr (Berlin, 1867; 2d ed. 1880).

Agrostis: a genus of grasses containing about 100 species, which are widely distributed, especially in the north temperate zone. *A. vulgam* (redtop) and other species are valuable for pasture and hay. CHARLES E. BESSEY.

Ag'telek: a village near which is *Bar'adla*, one of the largest and most remarkable stalactitic caverns of Europe; is in the county of Gömör, in Hungary. Here is a labyrinth of caverns, one of which is 96 feet high, 90 feet wide, and extends about 900 feet in a direct line.

A'gna, VOLCAN DE (i. e. volcano of water): a mountain of Central America, in the state of Guatemala, situated about 25 miles S. W. of Guatemala; so called from the fact that it sometimes pours forth torrents of water. The old town of Guatemala has been twice destroyed by it. Its crater is 15,000 feet above the sea-level.

A'gnas Calien'tes (i. e. warm springs): a state of Mexico; bounded N. E. and W. by Zacatecas, and S. by Jalisco. Area, 2,950 sq. m. The soil is very fertile, but poor in minerals. Pop. (1890) 140,180. Capital, Aguas Calientes.

Agnas Calientes: a town of Mexico; the capital of state of same name; on a plain or table-land 6,000 feet above the sea, and 250 miles N. W. of the city of Mexico (see map of Mexico, ref. 6-F). It has numerous churches and three convents, and is surrounded by gardens and orchards of olives, pears, figs, etc. Hot springs occur in the vicinity. Pop. 35,000.

Agne [O. Fr. *ague*, sharp < Lat. *acutâ* (sc. *febris*, fever), fem. of adj. *acutus*, sharp]: the common name for the intermittent fever (*q. v.*). See also CHILL.

Aguilar, aã-gē-laar', GRACE: a Jewish authoress of Spanish extraction; b. at Hackney, near London, June 2, 1816. Among her numerous works are *Women of Israel*; *Home Scenes and Heart Studies*; and *Home Influence, a Tale*. D. at Frankfort, Sept. 16, 1847.

Aguilar' de la Fronte'ra: a town of Spain; on the Cabra, 22 m. S. S. E. of Cordova; noted for the whiteness of its houses and the cleanness of its streets (see map of Spain, ref. 19-E). It has several fine public squares, a town-hall, and a dismantled Moorish castle. Pop. 12,300.

Aguinaldo, EMILIO: Filipino leader; b. in Imus, province of Cavité, Luzon, in 1870. A Chinese mestizo (of Chinese and Tagalog parentage). Educated at the College of St. Jean de Lateran and the University of St. Tomas, in Manila. Afterward, as the protégé of a Jesuit priest, he was for a time a student in the medical department of the Pontifical University of Manila. In 1888 he went to Hongkong, and there studied the English, French, and Chinese languages, and became interested in military affairs, for which he showed a great aptitude. His education, shrewdness, and great personal magnetism made him a commanding figure in the outbreak against the Spanish authority in 1896. At the head of the diplomatic commission he made the terms with the Spanish Government, whereby they paid a large sum of money to the Filipino leaders to lay down their arms. In Hongkong, Aguinaldo quarrelled with his associates over the division of this money, and went to Singapore. At the beginning of the Spanish-American war, Admiral Dewey, on the representations of the American consul at Singapore, sent for Aguinaldo. Aguinaldo arrived at Cavité a few days after the battle of Manila Bay, and at once began the organization of Filipino troops. No promises were made to him, and the insurgents never were officially recognized by the Americans. June 12, 1898, he organized his so-called Filipino Republic, with himself as President, and a few days later proclaimed himself dictator. He protested against the treaty of peace ceding the Philippines to the U. S., and late in the year planned a gigantic massacre in Manila, which was discovered by the authorities and prevented. Feb. 4, 1899, his troops attacked the American lines in the suburbs of Manila. Aguinaldo made a determined resistance to American occupation, and it was not till early in 1900 that the organized insurrection was broken up, and its leader became a fugitive in the mountains. Fighting was continued under his nominal leadership by the dispersed fragments of his army till Mar. 23, 1901, when he was captured at Casiguiran, Isabella Province, Luzon, by a stratagem executed under the leadership of Gen. Frederick Funston. He was taken to Manila, and on Apr. 2 took the oath of allegiance to the U. S.

Aguirre, LOPE de: See LOPE DE AGUIRRE.

Agul'has, CAPE (the Needles): the most southern point of Africa; about 100 miles E. of the Cape of Good Hope. A lighthouse was erected on it in 1849; lat. of lighthouse, 34° 49' 46" S., lon. 20° 0' 37" E.

Agusti'na: the "Maid of Saragossa"; d. at Ceuta, Spain, in 1857. For her bravery during the siege of Saragossa by the French in 1809 she was made a lieutenant in the Spanish army and received numerous decorations. Byron extols her in *Childe Harold*, canto i., stanzas 54, 55, 56.

Agyu'ians [from Gr. à-, not + γυνή, woman]: a Gnostic sect of the seventh century who condemned marriage and the use of certain kinds of meat.

A'hab (Heb. *Ahab*): seventh King of Israel, B. C. 918-896 (Ussher). His wife was Jezebel, daughter of Ethbaal, the usurping King of Tyre. He dwelt at Jezreel, which he adorned with splendid buildings. The story of his weakness, his idolatry, and the stern opposition of the prophet Elijah is related in the first book of Kings. Ahab was killed in battle with Benhadad, King of Damascus.

Ahasuer'us: the name of one Median and of two Persian kings mentioned in the Old Testament. The Ahasuerus of Esther was probably Xerxes, the invader of Greece, who reigned from 486 to 465 B. C. He invaded Greece in 480, and is supposed to have married Esther the year after.

A'haz (Heb. *Ahaz*, possessor): eleventh King of Judah after its secession from Israel; reigned B. C. 741-725. His reign was greatly disturbed by the attacks of Rezin, King of Damascus, and Pekah, King of Israel, as well as those of the Edomites and Philistines. Ahaz called to his aid the powerful Tiglath-Pileser, King of Assyria, who overthrew

the enemies of Judah, but made Ahaz his vassal, and carried off rich treasures from the temple and palaces of Jerusalem. Ahaz was an idolater. His history is given in 2 Kings xvi.; 2 Chron. xxviii. A statement in 2 Kings xvi. 2 as to his accession would make his son and successor, Hezekiah, to have been born when he was eleven years old, but this must be a transcriber's error or the date of a viceroyship.

Ahazi'ah: eighth King of Israel; succeeded his father Ahab, and ruled under the direction of Jezebel, his mother, B. C. 897-896.—Also the name of the fifth King of Judah, B. C. 885-884. A famous error of some transcriber (2 Chron. xxii. 2; xxi. 5, 20) makes him older than his father.

Ahith'ophel (Heb. *Ahithophel*, foolish): a Hebrew politician and counselor of David. He took the side of Absalom in his rebellion, but, foreseeing the failure of the enterprise, went home and hanged himself. See 2 Sam. xvi., xvii.

Ah'quist, AUGUST ENGELBERT: Finnish philologist: b. at Kuopio, Finland, Aug. 7, 1826; made the Finnish language his especial study, and endeavored to raise it to the rank of a written language, and to create a national Finnish literature. For this purpose he traveled with great hardship through Northern Russia and Siberia. He was elected Professor of Finnish Language and Literature in the University of Helsingfors (1862). His chief works are *An Attempt at a Moksha-Mordwinian Grammar* (1862); a *Grammar of the Wotish Language*, and a description of his travels in Siberia (1853-58); *The Structure of the Finnish Language* (in Finnish), 1877. He has also written many poems in the Finnish language, and made several translations from the German of Schiller. D. at Helsingfors, Nov. 20, 1889.

Ah'madabad' (i. e. the abode of Ahmed): a city of British India; in the presidency of Bombay; on the river Sabarmati; 160 miles by rail N. N. W. of Surat; lat. 23° 1' N., lon. 72° 48' E. (see map of S. India, ref. 1-C). It was formerly a large and magnificent capital, but is now much decayed. Here are several beautiful mosques and other remains of its ancient splendor. It was founded by Ahmed Shah in 1412. Pop. (1891) 145,990.

Ahmadna'gar (i. e. the fort of Ahmed): a city and fortress of British India; in the presidency of Bombay; on the Seena; 162 miles by rail E. of Bombay (see map of S. India, ref. 3-C). It was founded by Ahmed Nizam Shah in 1493, and became a capital of the kingdom of the same name. It was taken by Gen. Wellesley in Aug., 1803, and the fortress is now held by a British garrison. Pop. 37,500.

Ah'med IV., sometimes called **Abd'ul-Hamid**: a Turkish sultan; b. in 1725; succeeded to the throne in 1773. His reign is chiefly notable on account of the two disastrous wars with Russia, in which Turkey lost the Crimea, a portion of Circassia, with some other territories, and a number of important fortresses. D. in 1789.

Ahn, JOHANN FRANZ: German writer; author of a new method of learning foreign languages; b. at Aix-la-Chapelle, Dec. 15, 1796; published a *Practical Course for the Quick and Easy Acquisition of the French Language* (Cologne, 1834; 167th ed. 1870), and other similar works, which have found an immense circulation. His method has been imitated by many other writers in the different civilized lands. From 1843 to 1863 he taught at Neuss, retired in the latter year, and died there, Aug. 21, 1865.

Ahnapee: city, Kewaunee co., Wis.; on Lake Michigan; 32 miles E. of Green Bay (see map of Wisconsin, ref. 4-F); has saw and grist mills, and trade in grain, bark, and ties. Pop. (1880) 948; (1890) 1,384; (1900) 1,196.

Ah'rens, HEINRICH: German jurist; b. at Kniestedt, Hanover, July 14, 1808; educated at Göttingen. On account of his participation in the political upheavals in 1830 he fled to Paris, where he lectured in 1833 on the history of German philosophy; became in 1834 Professor of Philosophy in Brussels; in 1850, Professor of Law and Political Economy at Graz; in 1859, of Practical Philosophy and Political Science at Leipzig. His principal works are *Cours de droit naturel* (Paris, 1838; 7th ed. 1875), in German under the title *Philosophie des Rechts* (2 vols., 6th ed. 1870); *Juristische Encycl.* (1855-57). D. at Salzgitter, Aug. 4, 1874.

Ah'riman: Among the ancient Persians the principle of evil. See ORMAZD.

Ah'tena: See ATHAPASCAN INDIANS.

Ah'waz: a small town of Persia; 100 miles N. E. of Basorah; was once an important city. The ruins of the ancient city extend 12 miles on the bank of the Karun.

Ai, aa'i: common name given to the three-toed sloths, edentate mammals of South America, several species of which have been confounded under the Linnæan name of *Bradypus tridactylus*. It takes its name from the loud cry which it makes while moving in the forests.

Revised by D. S. JORDAN.

A'i (i. e. a ruin): a city of Palestine (Gen. xii. 8; xiii. 3), which was destroyed by Joshua (Josh. vii. 2-5; viii. 1-29). Its site is not positively known; also a city of Ammon, destroyed by the Babylonians.

Aid'an, SAINT: first Bishop of Lindisfarne; b. in Ireland, and sent as a missionary bishop to Northumbria by the Bishop of Iona about 635 A. D. He was successful in establishing Christianity, being aided by the king and nobles. His life was adorned by charity, humility, and all the Christian virtues. The Venerable Bede (*Eccles. History* iii. c. c. 5, 17) gives an interesting account of his excellent characteristics and his apostolic labors. D. at Bamborough, opposite Lindisfarne, Aug. 31, 651. See his life by A. C. Fryer (Lond. 1884).

Aidé, HAMILTON: English poet, novelist, and army officer; b. at Paris in 1830 of Armenian parentage, and educated at Bonn. He has published some dozen of novels, including *Carr of Carlyon* (1862); *Poet and Peer* (1880); and *Passages in the Life of a Lady* (1887). Also several volumes of poems: *Eleanore* (1856); *The Romance of the Scarlet Leaf* (1865); *Songs Without Music* (1882), etc. Some of his songs have been set to music.

HENRY A. BEERS.

Aides-de-Camp: confidential officers selected by general officers to assist them in their military duties, are *ex-officio* assistant adjutants-general (act Mar. 2, 1821). They are in the U. S. service attached to the person of the general, and receive orders only from him. Their functions are difficult and delicate. Often enjoying the full confidence of the general, they are employed in representing him, in writing orders, in carrying them in person if necessary, in communicating them verbally upon battle fields and other fields of maneuver. It is important that aides-de-camp should know well the position of troops, routes, posts, quarters of generals, composition of columns, and orders of corps. It is necessary that their knowledge should be sufficiently comprehensive to understand the object and purpose of all orders, and also to judge in the varying circumstances of a battle-field whether it is not necessary to modify an order when carried in person, or if there be time to return for new instructions. (*Scott's Military Dictionary*.) The existing law of the U. S. allows 6 aides-de-camp (colonels) to the general; 2 and a military secretary (lieutenant-colonels) to the lieutenant-generals; 3 (captains or lieutenants) to a major-general; and 2 (lieutenants) to a brigadier-general. The singular is *aide-de-camp*.

Aidin', or **Guzel-Hissar** (anc. *Tral'les*): a town of Asiatic Turkey, in Anatolia, on the river Mender (Meander); about 68 m. S. E. of Smyrna, with which it is connected by railroad (see map of Turkey, ref. 6-D). It has a large trade, being next to Smyrna in commercial importance, and is the residence of a pasha. Here are several fine mosques and synagogues, and a flourishing Protestant mission. The ruins of the ancient *Tralles* are in the vicinity. Aidin is noted for its figs, great quantities of which are produced in the neighborhood, and many are exported. Pop. 30,000.

Aigne Belle, äg'bel': a small town of France in Savoy; on the left bank of the Arc and on the Mont Cenis R. R.; 15 miles E. of Chambéry (see map of France, ref. 6-I). Pop. about 1,100. Here the combined French and Spanish armies defeated Duke Charles Emmanuel III. of Savoy, in 1742. The road built by Napoleon over Mont Cenis commences near Aigne Belle.

Aigne Belle, PAUL ALEXANDRE NEVEUE, d': a French naval officer in the service of China; b. Jan. 7, 1831. He took part with the Franco-Chinese corps against the Tai-Pings, and took in 1864 the important city of Hang-Chow-Foo. He entered the Chinese service, was created a mandarin of the first rank, organized an important military arsenal at Fuh-Chow-Foo, and in June, 1869, he launched the first man-of-war of the new navy built on the European plan. He was then made grand admiral of the Chinese fleets, which title was expressly created for him.

Aignes-Mortes: a town of France; department of Gard; 19 miles from Nîmes (see map of France, ref. 8-G). Pop. about 4,000. The large saline works of Peccais are in the neighborhood. An interview between Francis I. of France

and the Emperor Charles V. took place here in 1538. Louis IX. embarked from this place on the seventh crusade, Aug. 25, 1248, and on July 4, 1270, on the eighth and last crusade.

Aiguillon, ARMAND VIGNEROT DUPLESSIS RICHELIEU, Duke of: French statesman; b. in 1720; was Governor of Alsace, and afterward of Brittany. He gained the favor of the king's mistress, Madame du Barry, and through her influence was made prime minister. Upon the accession of Louis XVI. he was removed from office and banished from court, and d. in 1782.

Aiguillon, ARMAND DE VIGNEROT DUPLESSIS RICHELIEU, Duc: son of the preceding; earnestly supported the popular cause in the States-General of 1789. He commanded one of the armies in 1792, but was proscribed by the ruling party the same year, and escaped by flight. D. in 1800.

Aijalon: See AJALON.

Aiken, ä'ken: capital of Aiken co., S. C. (for location of county, see map of South Carolina, ref. 6-D); on the South Carolina R. R., 120 miles W. by N. of Charleston; noted as a resort for invalids, especially those suffering from pulmonary complaints. Being situated on a plateau 600 feet above the level of the sea and 400 feet higher than the city of Augusta, which is 17 miles distant, and the soil being sandy and porous, the system of natural drainage is almost perfect, rendering the atmosphere peculiarly dry and elastic. The dew-point is invariably low. The climate is a mean between the dry, cold region of Minnesota and the moist, temperate section of Florida, and has proved efficacious in restoring health to thousands of invalids. Here are Aiken Institute, a classical school for white students, and the Schofield Normal School and the Immanuel Training and High School for the colored race. Pop. (1880) 1,817; (1890) 2,362; (1900) 3,414.

EDITORS OF "JOURNAL AND REVIEW."

Aiken, CHARLES AUGUSTUS, D. D., LL. D.: b. at Manchester, Vt., Oct. 30, 1827; graduated at Dartmouth College in 1846, and at Andover Theological Seminary in 1853; was pastor of a Congregational church in Yarmouth, Me., from 1854 to 1859; Professor of the Latin Language and Literature at Dartmouth from 1859 to 1866; Professor of Latin in the College of New Jersey from 1866 to 1869; president of Union College from 1869 to 1871; and became Professor of Christian Ethics and Apologetics in the Princeton Theological Seminary. He was one of the O. T. Company of Revisers of the A. V. of the Bible. He translated and edited the book of Proverbs in the American edition of Lange's *Commentary*, and published several articles in the *Bibliotheca Sacra* and *Princeton Review*, besides numerous critical notices of books. D. Jan. 14, 1892. Revised by GEORGE P. FISHER.

Aiken, WILLIAM: b. in Charleston, S. C., in 1806, graduated at South Carolina College in 1825. He was prominent in public affairs, was Governor of South Carolina (1844-46), and a Democratic member of Congress (1851-57). He was a man of great wealth, and owned Jehossee island, where he formerly employed 1,000 slaves in rice culture. He was noted while in public life for his wisdom and moderate views, and contributed largely to the cause of education and to benevolent objects. While in Congress (Feb., 1856) he lacked but three votes of becoming Speaker of the House of Representatives. D. Sept. 7, 1887.

Aikin, JOHN, M. D.: an English writer; b. in Leicestershire, Jan. 15, 1747. He produced, conjointly with his sister, Mrs. Barbauld, an instructive juvenile book called *Evenings at Home* (1792-95), which had great popularity. He practiced medicine in London and other places. Among his numerous works is a biographical dictionary, entitled *General Biography* (10 vols. 4to, 1815). He edited the *Monthly Magazine* (1796-1806). D. Dec. 7, 1822.

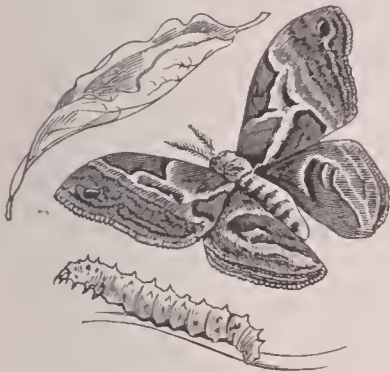
Aikin, LUCY: a daughter of John Aikin; b. Nov. 6, 1781; wrote, besides other works, a memoir of her father (1823), and *Life of Joseph Addison* (1843). D. Jan. 29, 1864.

Aikins, JAMES COX: Canadian statesman; b. in township of Toronto, Ont., Mar. 30, 1823; educated at Victoria College, Cobourg. Entering public life, he represented the county of Peel in the Canadian Assembly, 1854-61; was a member of the Legislative Council of Canada, 1862-67; became a member of the Privy Council in 1869; and was Secretary of State from that date till the resignation of the Macdonald Ministry, Nov. 5, 1873. He was reappointed to the same office, Oct. 19, 1878; became Minister of Inland Revenue, Nov. 8, 1880, which portfolio he resigned May 23, 1882. He was proclaimed a member of the Dominion Sen-

ate, May, 1867, and appointed Lieutenant-Governor of Manitoba and Keewatin, Dec. 22, 1882, an office he held until July 1, 1888.
NEIL MACDONALD.

Ailan'tus [Malay name said to mean tree of heaven]: a tree of the genus *Ailantus*, a native of China, having remarkably large pinnate leaves. It grows rapidly, and is often planted as an ornamental or shade tree in the cities of Europe and the U. S. The foliage is handsome, but it causes much annoyance by the rapid spread of suckers from the parent tree. The staminate flowers, which are borne on distinct trees, have an offensive odor that often produces headache and nausea. The female plants are free from this objection, and the clusters of winged fruit which they bear are quite ornamental, so that they should always be chosen for shade trees. Besides the above (*Ailantus glandulosus*), there are several other species, chiefly tropical. They belong to the family *Simarubaceæ*.

Ailantus Silkworm: the *Attacus cyn'phia*; so named from its feeding on the leaves of the ailantus tree. The silk obtained from this worm is extensively used in China. The eggs are hatched in a manner similar to that in which the eggs of the common silkworm are hatched, and the larvæ, after being fed through their first moult with picked leaves, are transferred to the trees and there left.



Ailantus silkworm.

vaulx, Yorkshire; b. at Hexham, in England, in 1109; educated in Scotland. He wrote numerous sermons, histories, and other works, part of which were edited by Twisden (1652), by Camerarius (1631), and by one Gibbon (Douai, 1631). D. Jan. 12, 1166.

Ail'sa Craig: an islet in the estuary of the Clyde, 10 miles from the coast of Ayrshire, Scotland (see map of Scotland, ref. 14-E). It is a crag of trap-rock of a somewhat columnar character. It is 1,139 feet high, and is not inhabited except by a rabbit catcher and the lighthouse keeper. It gives title to the Marquis of Ailsa, its proprietor.

Ailu'rus ["having a waving tail," like that of a cat; from Gr. *αἶλος*, quickly moving or waving, and *οὐρά*, a tail]: a genus of carnivorous animals of the family *Procyonidæ*. The *Ailurus fulgens*, allied to the raccoon, is found in the mountains of Nepal. By the inhabitants of that country it



Ailurus fulgens.

is termed *panda*, *chitwa*, and *wah*, the last name having been given it on account of its peculiar cry. It is about the size of a large cat, and is remarkable for its singularly rich and beautiful fur, which is mostly of a bright chestnut brown, but deepens into a fine rich black on the chest and outside of the legs. It has a short head and a thick muzzle. The head is of a whitish fawn color, with a ruddy chestnut spot under each eye. The tail is of the same color as the body, being marked with a series of dark rings. "The coat of the panda is not only handsome in appearance, but is very thick, fine, and warm in texture, being composed of a double set of hairs—the one forming a thick, woolly covering to the skin, and the other composed of long, glistening hairs that pierce

through the wool and give the exquisitely rich coloring to the surface of the fur." Cuvier regarded the panda as the most beautiful of known quadrupeds. These animals live among rocks and trees at a considerable elevation in the Himalaya mountains. Their food is chiefly fruit and other vegetable substances.
Revised by D. S. JORDAN.

Aimard, ay-maar', GUSTAVE: French novelist; b. Sept. 13, 1818; came to the U. S. at an early age, and after a stay of ten years went through Southern Europe and Eastern Asia. Among his works are *Les Trappeurs de l'Arkansas*; *Les Aventuriers*; *L'Araucan*, etc. D. Apr. 30, 1883.

Aimorés, or **Aymorés**: See BOTOCUDOS.

Ain, añ: a department of Eastern France; bounded N. by the departments of Saône-et-Loire and Jura, E. by Haute Savoie, on the S. by Isère, and W. by Rhône and Saône-et-Loire. Area, 2,239 sq. miles. The department is watered by the Rhône and the Saône, which flow along its boundaries, and by the Ain. The western part consists of a large plateau, which is very fertile. In the E. large mountain ranges prevail, which contain iron, asphaltum, and the best lithographic stones in France. Pop. (1896) 351,569. Chief town, Bourg-in-Bresse.

Ain-müller, MAXIMILIAN EMANUEL: German painter; b. at Munich, Feb. 14, 1807; noted as the restorer of the art of painting on glass. Among his works are the windows of the cathedrals of Ratisbon and Cologne. D. Dec. 8, 1870.

Ainos, ī'nōz: the aboriginal inhabitants of Japan, now found only in Yezo, Saghalin, and the Kurile islands, whither they have been driven by the advance of the Japanese, who seem to have entered the country from the S. W. Though mentioned in Japanese history as "barbarians," they are of a mild and amiable disposition. Their chief occupations are hunting and fishing. They have Caucasian features, are low of stature but strongly built, and are in general very hairy. They are fetishists, and are in a low state of civilization. In Yezo, however, they are being gradually civilized by Japanese schools and arts; their number is less than 15,000. Very complete vocabularies of their language (which is quite distinct from Japanese) have been compiled, but the affinities of the language have not been determined. See Miss Bird's *Unbeaten Tracks in Japan* (1880); Chamberlain's *Aino Studies*; Batchelor, *The Ainu of Japan; Religion, Superstitions, and General History of the Hairy Aborigines of Japan* (1892).
R. LILLEY.

Ainsworth, ROBERT: an English classical scholar; b. near Manchester in 1660; taught school in London. He published a well-known Latin dictionary (1736). D. April 4, 1743.

Ainsworth, WILLIAM HARRISON: English novelist; b. in Manchester, Feb. 4, 1805. He published *Rookwood* (1834) and *Jack Sheppard* (1839), the latter of which had an extraordinary success; *The Tower of London* (1840), etc. In 1845 he became the proprietor of the *New Monthly Magazine*. His numerous stories, largely historical in subject, have had great popularity. D. Jan. 3, 1882.

Aintab, in-taab': a town of Asiatic Turkey; on the south slope of Mt. Taurus or Alma-Dagh; about 60 miles N. of Aleppo and 92 miles N. E. of Antioch (see map of Turkey, ref. 6-H). It is well built, and has manufactures of leather, woolen cloths, etc. A flourishing mission among the Armenians of this town has been maintained for years by Protestant missionaries from the U. S. Pop. estimated at 20,000.

Air [O. Fr. *air* < Lat. *aer*, -is, from Gr. *ἀήρ*]: considered an element by the ancient philosophers, but now known to be a mixture of oxygen and nitrogen with some other gases. See ACOUSTICS, ATMOSPHERE, BAROMETER, PNEUMATICS, METEOROLOGY, NITROGEN, etc.

Air (in painting): See AËRIAL PERSPECTIVE.

Air: an oasis in the Sahara. See ASBEN.

Air-Bladder, or **Swim-Bladder**: an organ in fishes consisting of a large sac filled with air, which enables them to modify their specific gravity by increasing or diminishing the volume of air in the bladder. This air is largely composed of nitrogen, and is obtained by secretion from the walls of the bladder. It is the homologue of the lungs of air-breathing animals. Both air-bladder and lungs are supposed to be derived from the cellular air-bladder found in the more generalized ganoid fishes. Many fishes are destitute of air-bladders. In others the organ has a highly complex structure.
Revised by D. S. JORDAN.

Air-Cells: in birds, are closed sacs connected with the lungs and distributed over the inside of the chest and abdomen. The bones also contain air-spaces communicating with the air-sacs, the arrangement serving to lessen the weight of the body and adapt the bird for flight. Air-cells in plants are spaces in the cellular tissue, containing air. They occur chiefly in aquatic plants. Revised by D. S. JORDAN.

Airdrie, ā'r'dri: a market-town and parliamentary borough of Lanarkshire, Scotland, 11 miles E. by N. of Glasgow, with which it is connected by railway (see map of Scotland, ref. 12-G). It is well built and lighted with gas. Mines of iron and coal are worked in the vicinity. Pop. 16,335.

Air-Engine: See HOT-AIR ENGINE.

Aire-sur-l'Adour, ā'r'-sūr-la-door': an old French town in Landes, on the river Adour; 20 miles S. E. of Mont de Marsan (see map of France, ref. 8-D); the seat of a bishop, has a cathedral and a college. It was once the capital of the Visigoth kings. Pop. about 5,000.

Air-Gun: an instrument for projecting bullets or other missiles by means of the elastic force of condensed air. A strong reservoir of metal is constructed into which air is forced by a condensing-syringe. The reservoir may be of any form, but it is most conveniently disposed of by placing it within the stock. The bullet should fit the barrel very exactly, so as to leave no windage. On pulling the trigger, the condensed air escapes through the valve and rushes with violence into the barrel, propelling the bullet before it; and the instant the finger is withdrawn from the trigger the valve is closed by the pressure of the air in the magazine, which remains in a somewhat less condensed state for the next discharge. Thus the same supply of air in the magazine will serve for several successive discharges, but the force becomes weaker and weaker after each. The force with which a projectile is propelled from an air-gun is commonly much less than that produced by an ordinary discharge of gunpowder, but they may be so made as to be very formidable weapons.

Airlie, ā'r'li, EARLS OF: Barons Ogilvy of Airlie (1491), Barons Ogilvy of Alyth and Lintrathen (1639, in the Scotch peerage), a prominent family of Great Britain. The first Earl of Airlie was created in 1639.—DAVID GRAHAM DRUMMOND OGILVY, the tenth earl, was born May 4, 1826, and succeeded his father in 1849.

Air-Plants: certain epiphytic tropical plants, which hang in festoons from forest trees, and are able to live suspended in the air. The family of *Orchidaceæ* furnishes many beautiful specimens of air-plants. Air-plants must be distinguished from parasites, like the mistletoe, which feed on and not merely grow on trees, etc. Revised by C. E. BESSEY.

Air-Pump: a machine for the production of a vacuum, or sometimes for the compression of a gas. The vacuum-pump was invented by Otto von Guericke, about 1650. The essential parts of the ordinary air-pump are similar to those of suction-pumps for water (see PUMP), but the capacity of the cylinder is relatively larger, and the valves are constructed with special reference to delicacy of action. All air-pumps with valves cease working before the vacuum is complete. Even where leakage is successfully eliminated, a point is reached at which the valves become inactive. The vacuum attained by means of mechanical pumps is probably rarely as good as $\frac{1}{1000}$ of an atmosphere. By means of various forms of the mercurial air-pump, however (see VACUUM), it has been found possible to reduce the pressure to less than $\frac{1}{100000}$, and, by means of extraordinary precautions, to about $\frac{1}{20000000}$ of an atmosphere. (See PNEUMATICS.) For detailed descriptions of various types of the mechanical air-pump, see Deschanel's *Natural Philosophy*, Part I., pp. 179-203. E. L. NICHOLS.

Air'y, Sir GEORGE BIDDELL, K. C. B., LL. D., D. C. L., F. R. S.: astronomer and physicist; b. at Alnwick, Northumberland, June 27, 1801; educated privately, and at the Colchester Grammar School; entered Trinity College, 1819; elected a fellow, 1822; and graduated B. A. in 1824, being senior wrangler. In 1826 he became Lucasian Professor of Philosophy, and in 1828 Plumian Professor of Astronomy. In 1835 he was appointed astronomer-royal, and was in charge of the Greenwich Observatory until Sept., 1881, when he retired with a pension of £1,100 per annum. Dr. Airy attained a very high rank as an astronomer and physicist, and wrote much upon weights, measures, coinage, railways, and other kindred subjects. He made important improvements in astronomical and philosophical instruments.

He devised the system now in common use for the correction, by means of magnets, of the disturbances of the compass in iron-built ships. He wrote the article *Gravitation* in the *Penny Cyclopædia*, and *Trigonometry, Figure of the Earth*, and *Tides and Waves* in the *Encyclopædia Metropolitana*; also *Mathematical Tracts*; *Ipswich Lectures on Astronomy*; *Errors of Observation*; treatises on *Sound, Magnetism*, etc.; besides very numerous and important monographs and papers for periodicals. He conducted the astronomical operation connected with the definition of the boundary between the U. S. and Canada, and was employed in tracing the Oregon boundary. From the universities of Edinburgh, Cambridge, and Oxford he received the honorary degrees of D. C. L. and LL. D.; was a Fellow of the Royal Society, and its president for two years; and was made a Knight Commander of the Bath, July 30, 1872. D. in London Jan. 4, 1892. R. LILLEY.

Aisne, ān: a river of the N. part of France; rises in the department of Meuse; flows nearly westward, passes by Soissons, and enters the Oise near Compiègne. Length about 85 miles; navigable 44 miles. The canal of Ardennes connects it with the Meuse.

Aisne: a department in the north of France; bounded N. by the Nord department, E. by Ardennes and Marne, S. by Seine-et-Marne, and W. by Oise and Somme. Area, 2,839 sq. miles. It is traversed by the Oise, the Aisne, and the Marne rivers. The soil is fertile, and the manufacturing industry in this department is very large. Wheat and hay are among the staple productions. It is subdivided into 5 arrondissements, 37 cantons, and 841 communes. Chief town, Laon. Pop. (1881) 556,891; (1891) 545,493; (1896) 541,613.

Aist, DIETMAR, von: one of the earliest German minnesingers. An Austrian by birth, whose name is mentioned during the years 1143-70. Few of his beautiful songs were preserved. See *Des Minnesangs Frühling*, Lachmann u. Haupt. JULIUS GOEBEL.

Aitken, Sir WILLIAM, M. D., LL. D., F. R. S.: physician; b. Apr. 23, 1825, in Dundee, Scotland; M. D., University of Edinburgh, 1848; Demonstrator of Anatomy, University of Glasgow, 1848-55; volunteered for hospital service in Turkey during the Crimean war; appointed Professor of Pathology in the Army Medical School, 1860; knighted at the Queen's Jubilee, 1887. Author of numerous published papers on pathology and the science of medicine. C. H. THURBER.

Aitken, Rev. WILLIAM HAY MACDOWALL HUNTER: Church of England "missioner"; b. in Liverpool, Sept. 21, 1841; educated at Oxford; ordained in 1867. After a brief incumbency in Liverpool, Mr. Aitken has devoted himself to the superintendency of the Church of England Parochial Mission Society, which he founded in 1877 to supply trained mission preachers for evangelistic work. He conducted a successful "mission" in New York city in the winter of 1885. He has published *Mission Sermons* (3 vols., 1875-76); *Newness of Life* (1877); *What is your Life?* (1878); *The School of Grace* (1879); *The Highway of Holiness* (1883); also, *Difficulties of the Soul* (1879); *God's Everlasting "Yea"* (1881); *The Glory of the Gospel* (1884); *Around the Cross* (1884); *The Revealer Revealed* (1885); *The Love of the Father* (1887); *Eastertide* (1889). W. S. P.

Aiton, WILLIAM: botanist; b. in Scotland in 1731; director of botanical garden at Kew, England, 1759-93; published *Hortus Kewensis*, a catalogue of plants in the Royal Botanical Garden at Kew. D. in 1793.

Aitze'ma, LIEUWE, van: Dutch historian; b. at Docum in 1600; served for many years in the Dutch diplomatic service; wrote a *History of the Netherlands from 1621 to 1668*. D. in 1669.

Aix, āks (anc. *A'quæ Sextiæ*): a city in the S. E. part of France; department of Bouches-du-Rhône; 33 miles by rail N. of Marseilles (see map of France, ref. 8-H). It was formerly the capital of Provence, and was a celebrated seat of learning in the Middle Ages. It is the seat of an archbishop, has a fine cathedral, a city hall (hôtel de ville), a museum, a royal college, and a public library containing about 100,000 volumes. Here are manufactures of silk and cotton, and warm mineral springs, from which it derived its ancient name. Pop. (1881) 29,257; (1896) 28,913.

Aix-la-Chapelle, āks-la-sha-pel' (in Lat. *A'quis Granum*; Ger. *A'chen*): a city of Rhenish Prussia; on the frontier of Belgium; and on the railway which connects Liège and Cologne, 44 miles by rail W. S. W. of the latter

(see map of German Empire, ref. 5-C). It was once famous, and the capital of the empire of Charlemagne, who made it his favorite residence. It is a well-built, handsome city, with a cathedral founded in 796 A. D., a large town-hall, an elegant theater, a public library, and several hospitals. Here are celebrated mineral springs, the temperature of which is about 112° F. They are considered efficacious for the cure of the gout, rheumatism, and cutaneous diseases. This city has important manufactures of fine broadcloths, needles, and pins. The cathedral contains the tomb of Charlemagne and a collection of relics, which attract a multitude of visitors. The successors of Charlemagne and the Emperors of Germany were crowned here from the ninth century until 1531. Pop. (1895) 110,551.

Aix-la-Chapelle, CONGRESS OF: a congress held in 1818 for settling the affairs of Europe after the war of 1815. The King of Prussia and the Emperors of Russia and Austria were present in person. The different representatives were Metternich, Wellington, Castlereagh, Hardenberg, Bernstorff, Nesselrode, and Capo d'Istrias, with Richelieu on behalf of France. Their deliberations resulted in the withdrawal from French territory of the army of occupation, and prepared the way for what was afterward known as the "HOLY ALLIANCE" (q. v.).

Aix-la-Chapelle, TREATIES OF: I. *Treaty of 1668*. This treaty was concluded May 2, 1668, between Louis XIV. of France on the one side and the "Triple Alliance," including England, Sweden, and Holland, on the other. At the death of Philip IV., Louis laid claim, in the name of his wife and under the laws of succession of Brabant and Namur, to a large portion of the Spanish Netherlands. He had already seized several strongholds and fortresses, when Holland, becoming alarmed at his rapid progress, concluded the triple alliance with England and Sweden. Louis, rather than resort to a war against so powerful a league, determined to accept mediation; and a treaty of peace was concluded at Aix-la-Chapelle, by which France retained possession of Charleroi, Valenciennes, and other strong towns, which she had already seized.

II. *Treaty of 1748*. This treaty ended, in 1748, the Austrian war of succession, in which all the great powers of Europe were, either on one side or the other, engaged. Several German princes had disputed the claim of Maria Theresa to the throne of Austria, and from this cause the war arose. It lasted with various success for eight years (from 1740 to 1748), at the end of which time a peace was concluded which left the different states with nearly the same possessions as before.

Aix-les-Bains, āks'lā-bān': an attractive and fashionable bathing-resort in Savoy, France. It is in the mountains, about a mile from the picturesque Lake Bourget, 90 feet above the lake and 823 above the sea (see map of France, ref. 6-H). It is easy of access, and the accommodations are good. The season is from May to September. The climate is usually mild, but it is sometimes very hot in summer. About 25,000 people underwent treatment here in 1883. The springs are sulphurous; their temperatures range from 113° to 115° F.; and they yield 1,320,000 or more gallons daily. The diseases treated are rheumatism, gout, eczema, neuralgia, catarrh, throat diseases, constitutional syphilis, and scrofula. The waters are administered internally and externally. Pop. (1896) 8,328.

Aizani, ī-zaa'nee: an ancient town of Asia Minor, now in ruins. Among its ruins, the theater, with accommodations for over 12,000 spectators, is in a fine state of preservation.

Ajaccio, a-yaat'chō, or **Ajazzo**, a-yaāt'sō: a seaport; capital of Corsica; on the west coast; lat. 41° 54' N., lon. 8° 44' E. (see map of France, ref. 2-J). It has a good port defended by a citadel. It has also a cathedral and a library of 18,000 volumes. Wine and olive oil are exported from this town. Napoleon Bonaparte was born here on Aug. 15, 1769. A magnificent monument, representing the Emperor Napoleon I., surrounded by his four brothers, was finished in 1865. Pop. (1886) 17,576; (1896) 20,561.

Ajalon: a town of Palestine belonging to the Levites, in the land of Dan. It was probably on the spot now occupied by the village of Yālo. Over the valley in which this town was situated the moon stood still while Joshua pursued the five kings.

A'jax (Gr. *Aias*): surnamed THE GREATER; the son of Telamon, a Grecian hero; was King of Salamis. He acted a

prominent part at the siege of Troy, and exceeded the other Greek warriors in strength and stature. Having been defeated by Ulysses in a competition for the armor of Achilles, he became insane and killed himself.

Ajax: the son of Oileus; surnamed THE LESSER, to distinguish him from Ajax the son of Telamon; was King of Locris. He was one of the Greek heroes that fought at the siege of Troy, and excelled all the Greeks in swiftness, except Achilles. For offending Minerva by his impiety, he was drowned on his homeward voyage from Troy.

Ajmir, or **Ajmere**, aj'neer', or **Rajputana**: a city of British India; capital of a division and a district of the same name; 220 miles S. W. of Delhi, and situated in a picturesque valley (see map of N. India, ref. 6-C). It contains several massive temples and mosques; also an English and Oriental school. Pop. (1891) 67,880.

Ak'abah: a fortified village of Arabia, near the north extremity of the Gulf of Akabah. See ELATH.

Akabah, GULF OF (anc. *Sinus Elanites*): portion of the Red Sea, lying in the northwest part of Arabia; bounded W. by the peninsula of Sinai. It is about 100 miles long, from 12 to 17 miles wide, has high and steep shores and numerous coral reefs.

Ak'bar, or **Ak'ber** (written also ACBAR and ACKBAR), **Mohammed**, surnamed JALĀL-ED-DEEN: a famous and excellent Mogul emperor; b. at Amerkote, in the valley of the Indus, in 1542. He was a son of Humāyun, whom he succeeded in 1556. He displayed great military talents and political wisdom, and extended his dominions by the conquest of Bengal and part of the Deccan. Under his reign the Christians and Jews were tolerated and protected. He encouraged literature and promoted commerce. He ordered a complete survey and census of his empire, the result of which, with minutely detailed statistics, was recorded in a book called *Ayin Akbery* (institutes of Akbar), which is very celebrated. Akbar was greatly distinguished for his justice, humanity, and magnanimity. He died in 1605, and was succeeded by his son Selim, surnamed Jehāngir.

Aken, aa'ken: a town of Prussia; province of Saxony, on the left bank of the Elbe; 24 miles S. E. of Magdeburg; has factories of beet-sugar and chemicals (see map of German Empire, ref. 4-F). Pop. 5,571.

A'kenside, MARK, M. D.: English didactic poet; b. at Newcastle-on-Tyne, Nov. 9, 1721; studied medical sciences at Edinburgh, graduated as M. D. at Leyden in 1744, and practiced in London, where he settled in 1748. His reputation is founded chiefly on *The Pleasures of the Imagination*, in blank verse (1744), which was received with great favor. He wrote several shorter poems and medical treatises. His *Treatise on Dysentery* (in Latin, 1764) proved him to be an excellent classical scholar. He was appointed a physician to the queen in 1760. D. June 23, 1770.

Akerblad, JOHAN, DAVID: Swedish antiquary and Orientalist; b. in 1760. He visited Jerusalem in 1792, and the Troad in 1797; gained distinction by deciphering the demotic writing of ancient Egypt; and wrote a *Letter on the Egyptian Inscription of Rosetta* (1802). D. Feb. 8, 1819.

Ak'erman, AMOS TAPPAN: attorney-general of the U. S. (1870-72) under Gen. Grant; b. in New Hampshire, Feb. 23, 1821, but for fourteen or fifteen years previous to his appointment had been a citizen and practicing lawyer of Georgia. He sided with the Confederates in the civil war, but after the surrender of the Southern arms he advocated the sanction of the reconstruction measures of Congress; was a member of the State convention of 1867-68, and acted a prominent part in shaping the new Constitution formed by that body. D. Dec. 22, 1880.

Akers, BENJAMIN PAUL, commonly known as *Paul Akers*: sculptor; b. at Saearappa, Me., July 10, 1825; studied in Boston and at Florence (1852), and spent some years in Italy, where some of his works were executed, but generally lived and practiced his art in the U. S., most of his work being portrait busts and medallions. D. May 21, 1861.

Akhaltikh, Akalzik, āā-kaāl-tseek', or **Akis'ka**: city of Asiatic Russia; in Georgia; on an affluent of the Koor, about 92 miles W. of Tiflis (see map of Russia, ref. 12-F). It contains a mosque and several churches, and has some trade in silk and honey. Many of the inhabitants are Armenians. The Russians defeated the Turks near this place in 1828, and it was ceded to Russia in 1829. Pop. 18,270.

Ak-Hissar, *āk'his-saar'* (i. e. white castle), written also **Ek-Hissar** (the ancient *Thyat'ira*): a town of Asia Minor; in Anatolia, 53 miles N. E. of Smyrna (see map of Turkey, ref. 5-D). It contains no ancient buildings, the houses being mostly of mud. Pop. about 10,000, two-thirds of whom are Turks.

Akhlāt': a town of Armenia, in Asiatic Turkey; on the N. W. shore of Lake Van; 203 miles S. E. of Trebizond. It was formerly the seat of the Armenian kings, and is at present the seat of an Armenian bishop (see map of Turkey, ref. 5-I). Pop. about 4,000.

Ak'iba, BEN JOSEPH: Jewish rabbi, of great learning and influence; president of the school of Bene Barak in the second century A. D. Having joined the rebellion of Barchochebas, he was flayed and burned by the Romans in the year 135 A. D.

Ak'ka: a dwarf race of Central Africa. See PYGMY.

Akkadians: See SUMERIANS.

Ak'kerman: fortified town of Bessarabia; on the right bank of the Dniester; about 4 miles from the Black Sea, and 28 miles S. W. of Odessa. Lat. $46^{\circ} 12' N.$, lon. $30^{\circ} 22' E.$ (see map of Russia, ref. 10-C). It has a port, several mosques and Greek and Armenian churches, numerous factories, and an extensive trade in salt, etc. A treaty concluded at Akkerman on Sept. 4, 1826, exempted the Danubian provinces from all but a nominal dependence on Turkey. Pop. (1887) 41,178.

Ak'kra, or **Ae'era**: town of Africa; capital of the British Gold Coast colony; situated in about lat. $5^{\circ} 30' N.$ and lon. $0^{\circ} 12' W.$ (for location, see map of Africa, ref. 5-C). It has a population of 16,276, and is one of the most healthful points on the coast.

Akmol'insk: a province of Russia; in Central Asia; S. of the government of Tobolsk. Area, 229,609 sq. miles. It consists of a plateau, in the N. level, and in the S. mountainous, having very little rain. It is frequently visited by heavy snow-storms. Pop. (1897) 683,721. Chief town, Ak-molinsk.

Akragas: the Greek name of the city called by the Romans Agrigentum. See GIRGENTI.

Akron: village (incorporated in 1850) in Erie co., N. Y. (for location of county, see map of New York, ref. 4-C); situated on the West Shore R. R., and on B. and T. branch of N. Y. C. and H. R. R. R.; 25 miles from Buffalo. It has 6 churches, a public school with an academic department, 2 hydraulic cement works, a flouring-mill, a stave and heading mill, and a saw and planing mill. Pop. (1880) 1,036; (1890) 1,492; (1900) 1,585.

EDITOR OF "BREEZE."

Akron: city; railroad center, and capital of Summit co., O. (for location of county, see map of Ohio, ref. 3-H); on the Ohio Canal, 36 miles S. of Cleveland, on the highest point of land between Lake Erie and the Ohio river. It has a variety of manufactures, employing 6,500 hands; annual value of products, \$15,000,000; a beautiful cemetery, a public library, a high school, water-works, electric light, street-cars, etc., and is the seat of Buchtel College. Pop. (1870) 10,006; (1880) 16,512; (1890) 27,601; (1900) 42,728.

EDITOR OF "DAILY BEACON."

Akshehr' (i. e. white city): a city of Asiatic Turkey; in the vilayet of Konia. It is on the route from Constantinople to Syria, and has an important trade. Pop. 15,000. It is the ancient *Philomelion* of Strabo.

Ak'su: a town of East Turkestan, on a river and in a province of its own name; 250 miles N. E. of Yarkand (see map of Asia, ref. 5-E). It has manufactures of woolen stuffs and jasper, and is visited by many caravans from all parts of Central Asia. Pop. 60,000 or more.

Akyab': a town of Burma, at the mouth of the Aracan river; 550 miles S. E. of Calcutta. Its situation is healthful and very advantageous for commerce, with a commodious and safe harbor. It has a large trade, especially in rice, large quantities of which are exported hence (see map of S. India, ref. 2-K). Pop. 34,000, mostly Bengalese and Chinese. Here is a Protestant missionary station.

Al: the Arabic definite article, forms a prefix to many Oriental names, as Al-Mansur, the victorious; Al-Amin, the faithful, etc., and found in English in many words of Arabic origin: e. g. *algebra*, *alcohol*, *almanac*, etc.

A'la, wing: a Roman military term, denoting the wing of an army. At first, when the whole legion consisted of Roman citizens, it was applied to the body of horsemen who served with the foot-soldiers, but after the admission of *socii*, whether Latini or Itali, it was applied to the troops of the allies, both horse and foot, which were stationed on the wings. At a still later time the *alæ* were composed of foreign troops serving with the Roman armies; while under the empire the term was given to bodies of horsemen raised generally in the provinces, and serving apart from the legion. See WING.

Alaba'ma: a river of the U. S.; formed by the Coosa and the Tallapoosa, which unite about 10 miles above Montgomery, in Alabama. It flows nearly westward to Selma, and afterward in a general S. W. direction, and unites with the Tombigbee to form the Mobile river. It is navigable for large steamboats through its whole extent, which is about 300 miles. It traverses a fertile region, of which cotton and maize are the staple products.

Alabama (signifying, in the Creek language, Here we rest): one of the S. or Gulf States of the U. S., lying between the parallels of $30^{\circ} 15'$ and $35^{\circ} N.$ lat., and the meridians of $84^{\circ} 56'$ and $88^{\circ} 48' W.$ lon. from Greenwich. Length from N. to S., 336 miles; breadth, from 148 to 200 miles. Bounded on the N. by Tennessee, E. by Georgia and Florida, S. by Florida and the Gulf of Mexico, W. by Mississippi. Area, 52,250 sq. miles, or 33,440,000 acres.

Alabama, by census of 1900, ranked seventeenth among the States in population, sixteenth in value of agricultural products, and the value of manufactures was greatly increased.

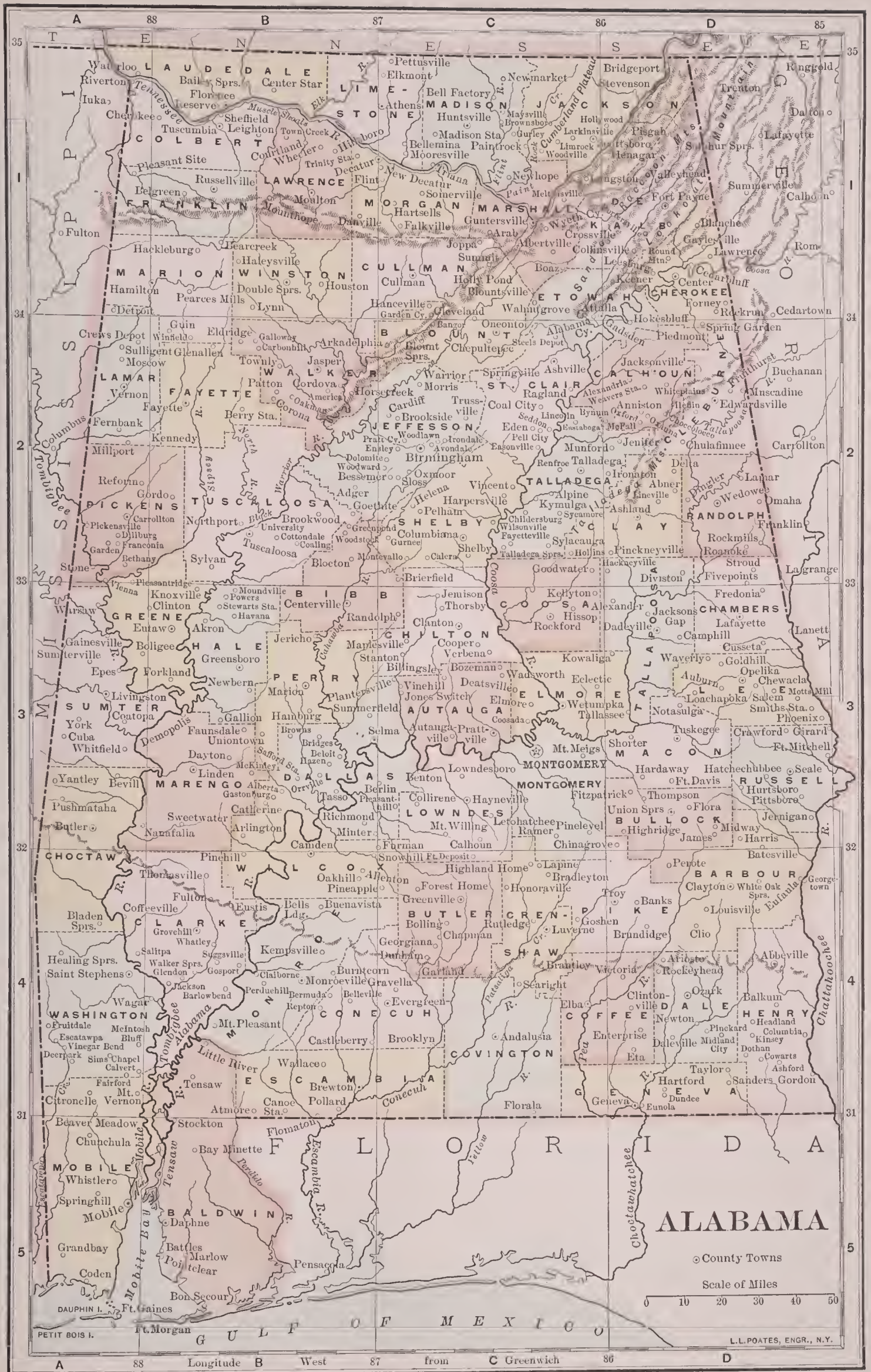
Surface, Rivers, etc.—In the N. broken and hilly, from outlying hills of the Blue Ridge; S. of this almost level, but gently declining to the Gulf. Principal rivers are Tennessee, near N. line of the State, Mobile, Tombigbee, Alabama, Coosa, Black Warrior, Tensaw, Perdido, and Chattahoochee, and their affluents. Of these, the Tennessee, Tombigbee, Black Warrior, Alabama, Tensaw, Chattahoochee, and Perdido are navigable. Mobile bay is the principal bay of the State, Grand, Bonsecours, and Perdido bays being shallow.

Soil.—The soil is divisible into three belts or sections—viz. 1. The S. section, one-fifth of the State, a light but productive alluvial and diluvial soil, yielding moderate crops of corn, cotton, and fruits, with considerable forests of yellow pine. 2. The cotton belt, limestone and chalk lands, mostly prairie, producing good cotton and corn. 3. The N. section, a mineral region, yielding gold, coal, iron, etc., some of it poor and hilly land, but healthy and with good water-power. In this region also is the great Tennessee valley, with fine fertile side valleys yielding cotton, corn, cereals, and fruits, while the hillsides are well adapted to grazing.

Minerals.—Of gold discovered in Randolph County, 1836, there had been deposited in the Mint to June, 1891, \$235,335. There are also mined in the State silver, copper, lead, iron ores of various kinds, and excellent bituminous coal; 7,593,416 tons of coal were mined in 1899; 2,662,943 tons of iron ore were mined in 1899, Alabama ranking as third in amount of production in the U. S. There are many rarer minerals, mineral earths, building-stones, and also mineral springs.

Vegetation.—The forests in the N. belong to the temperate, in the S. to the semi-tropical, zone. Five species of oak, hickory, chestnut, poplar, cedar, elm, mulberry, and white pine in the N. are replaced in the S. by cypress, live-oak, yellow pine, magnolia, and loblolly, with brake or American bamboo, saw-palmetto, etc. The apple, pear, plum, and hardy peach give place to the fig, pomegranate, olive, apricot, scuppernong grape, and orange.

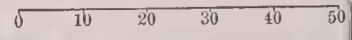




ALABAMA

County Towns

Scale of Miles



L.L. POTATES, ENGR., N.Y.

A 88 Longitude B West 87 from C Greenwich 86 D

Zoölogy.—The wild animals common to the W. and S. W. are found here. The alligator inhabits the rivers and bayous, and there are lizards, some venomous snakes, terrapin, turtles, and excellent fish, and most game-birds, also birds of prey, songsters, and birds of exquisite plumage.

Climate.—Temperature in Northern Alabama delightful, frosts rare, and no intense heat. In Central Alabama, greater heat, but cool nights; occasional frosts. In the S., protracted heat, but good breezes, cool nights, and heavy dew. Rain-fall from 48 to 54 inches. Water in the N. excellent; in the S. poor.

Agricultural Productions.—Cotton is the largest crop, the State ranking, in 1899, fourth in cotton production, and fourth in number of acres cultivated. Alabama was eighth among Southern States in production of corn, but other cereal crops were small. Some cane-sugar and molasses, and more sorghum sirup, are made. Ramie is grown in the S. counties. Average wages of farm labor, 1890, \$14, or with board, \$9.85 per month. The number of farms has doubled in the last decade, but nearly half are rented. Of the farms, eight-tenths are under 100 acres. The crop returns of 1899 exhibit a product of 1,176,042 bales of cotton; corn 33,015,120 bush.; wheat, 431,186 bush.; oats, 3,012,070 bush.; hay, 82,746 tons; other agricultural products were of minor importance.

*Farm Animals.**—In 1899 there were reported 133,546 horses, 132,321 mules, 279,278 cattle, 171,799 sheep, and 231,802 milch cows.

Manufactures are now large, and increasing; lumber, iron, steel, machinery, and cotton goods are the principal articles produced. The production of pig-iron in 1899 was 1,083,905 tons. The census of 1880 reported 2,070 manufacturing establishments, employing 10,019 persons, and that of 1890 reported 2,977 establishments, with \$46,122,571 capital.

Railroads.—In 1886 there were 2,105 miles of railroad in the State, and in 1899 4,023.82 miles. The recent growth of the railway system has been rapid and important.

Finances.—State debt, \$9,249,900, at 4 and 5 per cent. Taxable property assessed for the year 1900, \$266,243,170. Amount raised by taxation for State purposes, \$1,469,676.29. The receipts for the seven months ending Apr. 30, 1900, were \$2,243,191.53, and the disbursements \$1,428,179.28.

Commerce.—Mobile is the only port of entry. Imports for the seven months ending Jan., 1901, \$1,584,164; exports, mostly cotton, \$7,187,165. The number of vessels entering the port was 182; tonnage, 47,376 tons. The number which cleared was 209; tonnage, 36,445.

Banks and Insurance.—There were, Sept. 5, 1900, 28 national banks in operation; capital, \$3,480,000; surplus and undivided profits, \$1,393,640.52; deposits, \$10,938,390.23; outstanding circulation, \$1,717,210. June 30, 1900, there were 20 State banks; capital, \$1,546,500; surplus and profits, \$393,384; deposits, \$4,588,607. Total banking capital, \$5,026,500; total deposits, \$15,526,997.23. The insurance, both life and fire, is mostly in the hands of foreign companies.

Education.—The total expenditure for school purposes in 1898-99 was \$800,273; revenue, \$916,450; value of school property, \$1,500,000. There were 7,058 schools; 7,303 teachers—2,262 male, 5,041 female; average monthly salaries: male, \$32.04; female, \$25.35. There were 634,061 children of school age; enrolled in public schools, 433,733; average daily attendance, 341,138; enrolled in private schools, 26,722. Average number of days school was held, 100; average expenditure per pupil, based on daily attendance, \$3.59. There were 6 universities and colleges with 1,441 students; 41 seminaries, academies, and schools of secondary instruction, with 5,336 students. There were 7 public normal schools, with 77 instructors and 975 students. There were 3 schools of theology, 1 of law, and 1 of medicine, and a State agricultural and mechanical college.

Libraries and Newspapers.—There are 41 public libraries of over 300 volumes, aggregating 95,303 volumes in all, numerous college and school libraries, and many private libraries, having in all nearly 600,000 volumes. In 1900 there were in Alabama 238 newspapers and periodicals, including 19 dailies.

Churches.—The Baptists are the leading denomination, but are followed by the others in the following order: Methodists, Presbyterians, Episcopalians, Disciples or Christians, Roman Catholics, Congregationalists, and minor denominations.

Population of Alabama in 1820 was 127,901; (1830) 309,527; (1840) 590,756; (1850) 771,623; (1860) 964,201; (1870) 996,992; (1880) 1,262,505; (1890) 1,513,017; and (1900) 1,828,697.

* On farms only.

POPULATION IN 1900.

COUNTIES.	* Ref.	Pop. 1890.	Pop. 1900.	COUNTY TOWNS.	Pop. 1900.
Autauga.....	5-D	13,330	17,915	Prattville.....	1,929
Baldwiu.....	8-B	8,941	13,194	Daphne.....	.....
Barbour.....	6-E	34,898	35,152	Clayton.....	998
Bibb.....	4-C	13,824	18,498	Centreville.....	422
Blount.....	3-D	21,927	23,119	Oneonto.....	583
Bullock.....	5-E	27,063	31,944	Union Springs..	2,634
Butler.....	6-D	21,641	25,761	Greenville.....	3,162
Calhoun.....	3-E	33,895	34,874	Jacksonville....	1,176
Chambers.....	4-E	26,319	32,554	La Fayette.....	1,629
Cherokee.....	2-E	20,459	21,096	Centre.....	282
Chilton.....	4-D	14,549	16,522	Clantou.....	611
Choctaw.....	6-A	17,526	18,136	Butler.....	.....
Clarke.....	6-B	22,624	27,790	Grove Hill.....	.....
Clay.....	4-E	15,765	17,099	Ashland.....	422
Cleburne.....	3-E	13,218	13,206	Edwardsville...	398
Coffee.....	7-E	12,170	20,972	Elba.....	635
Colbert.....	1-B	20,189	22,341	Tuscumbia.....	2,348
Conecuh.....	6-C	14,594	17,514	Evergreen.....	1,277
Coosa.....	4-D	15,906	16,144	Rockford.....	.....
Covington.....	7-D	7,536	15,346	Andalusia.....	551
Crenshaw.....	6-D	15,425	19,668	Luverne.....	731
Cullman.....	2-C	13,439	17,849	Cullman.....	1,255
Dale.....	7-E	17,225	21,189	Ozark.....	1,570
Dallas.....	5-C	49,350	54,657	Selma.....	8,713
De Kalb.....	2-E	21,106	23,558	Fort Payne.....	1,037
Elmore.....	5-D	21,732	26,099	Wetumpka.....	562
Escambia.....	7-C	8,666	11,320	Brewton.....	1,382
Etowah.....	2-D	21,926	27,361	Gadsden.....	4,282
Fayette.....	3-B	12,823	14,132	Fayette.....	452
Franklin.....	2-B	10,681	16,511	Russellville.....	1,602
Geneva.....	7-E	10,690	19,096	Rockford.....	1,032
Greene.....	4-B	22,007	24,182	Eutaw.....	884
Hale.....	4-B	27,501	31,011	Greensboro.....	2,416
Henry.....	7-F	24,847	36,147	Abbeville.....	889
Jackson.....	1-E	28,026	30,508	Scottsboro.....	1,014
Jefferson.....	3-C	88,501	140,420	Birmingham....	38,415
Lamar.....	3-B	14,187	16,084	Vernon.....	291
Lauderdale.....	1-B	23,739	26,559	Florence.....	6,478
Lawrence.....	2-C	20,725	20,124	Moulton.....	290
Lee.....	5-E	28,694	31,826	Opelika.....	4,245
Limestone.....	1-C	21,201	22,387	Athens.....	1,010
Lowndes.....	5-D	31,550	35,651	Haynesville.....	.....
Macon.....	5-E	18,439	23,126	Tuskegee.....	2,170
Madison.....	1-D	38,119	43,702	Huntsville.....	8,068
Marengo.....	5-B	33,095	38,315	Linden.....	.....
Marion.....	2-B	11,347	14,494	Hamilton.....	235
Marshall.....	2-D	18,935	23,289	Guntersville.....	.....
Mobile.....	8-A	51,587	62,740	Mobile.....	38,469
Monroe.....	6-C	18,990	23,666	Monroeville.....	422
Montgomery.....	5-D	56,172	72,047	Montgomery....	30,346
Morgan.....	2-C	24,089	28,820	Decatur.....	3,114
Perry.....	5-C	29,332	31,783	Marion.....	1,698
Pickens.....	4-B	22,470	24,402	Carrollton.....	278
Pike.....	6-E	24,423	29,172	Troy.....	4,097
Randolph.....	4-E	17,219	21,647	Wedowee.....	.....
Russell.....	5-F	24,093	27,083	Seale.....	386
St. Clair.....	3-D	17,353	19,425	Ashville.....	362
Shelby.....	4-D	20,886	23,684	Columbiana.....	1,075
Sumter.....	5-B	29,574	32,710	Livingston.....	851
Talladega.....	4-D	29,346	35,773	Talladega.....	2,661
Tallapoosa.....	4-E	25,460	29,675	Dadeville.....	1,136
Tuscaloosa.....	4-B	30,352	36,147	Tuscaloosa.....	5,094
Walker.....	3-C	16,078	25,162	Jasper.....	1,661
Washington.....	7-A	7,935	11,134	St. Stephens....	.....
Wilcox.....	5-C	30,816	35,631	Camden.....	478
Winston.....	2-C	6,552	9,554	Double Springs..	.....
Total.....	.....	1,513,017	1,828,697	.....	.....

* Reference for location of counties, see map of Alabama.

Principal Towns and Population, 1900.—Montgomery, the capital, 30,346; Mobile, 38,469; Birmingham, 38,415; Anniston, 9,695; Selma, 8,713; Huntsville, 8,068; Florence, 6,478; Bessemer, 6,358; Tuscaloosa, 5,094; Eufaula, 4,532; New Decatur, 4,437; Gadsden, 4,282; Opelika, 4,245; Phoenix, 4,163; Troy, 4,097; Pratt City, 3,485; and Sheffield, 3,333.

History.—First settlement in 1702, by Bienville; Mobile planted in 1711-13; territory N. of 31° ceded by France to Great Britain in 1763, and in 1783 transferred to U. S.; first attached to Georgia and South Carolina, but in 1802 organized as Mississippi Territory; region S. of 31° belonged to Spain, but in the war of 1812 seized and annexed to Mississippi Territory; this region and Florida purchased from Spain in 1819; Creek war in 1813-14—480 whites killed, 400 wounded, and 1,617 Indians killed; Gen. Jackson defeats the Creeks, who make peace and give up three-quarters of their territory; immigration increases; Mississippi set off as a State in 1817, and Alabama admitted to the Union in 1819. Alabama took an active part in removal of Indians to Indian Territory; as one of the largest slave-holding States in the Union uniformly acted up to what were considered the interests of its section, taking strong ground in favor of the annexation of Texas, resisting all measures for the restriction of slave territory, and opposing with great vehemence what its political leaders

characterized as Northern aggressions; in 1860-61 one of the first of the Southern States to declare for secession and a Southern confederacy; convention of all the Southern States held at Montgomery, Feb. 4, 1861, to organize a Southern confederacy; provisional government organized; Jefferson Davis elected President, and Montgomery made capital of Confederacy; Gov. Moore seized in Jan., 1861, U. S. arsenal, arms, forts, and revenue cutter; July, 1861, capital removed to Richmond, Va. In the progress of the war Alabama took an active part, though the northern portion of the State contained a strong Union party. Several severe battles were fought within the limits of the State—notably the naval actions and the capture of the forts in Mobile bay in Aug., 1864, the siege and capture of Mobile in Mar. and April, 1865, and the capture of Selma and other towns by Gen. Wilson in April, 1865. There were also minor conflicts at Athens, Montevallo, Scottsboro, Talladega, and Tusculumbia. *Reconstruction Measures*: Provisional government appointed June 21, 1865, and State temporarily under military control; State convention met Sept. 25, 1865, and annulled ordinance of secession; military government very lenient; State convention called by Gen. Pope to meet Nov. 5, 1867, to form a new constitution and State government; constitution submitted to people Feb. 4, 1868. There was much opposition to it, and many of those opposed stayed away from the polls; the result was that, though the constitution received a majority of the votes cast, it did not receive a majority of those registered, and hence was deemed to have been rejected. Most of its provisions have, however, been engrafted on the present Constitution of 1875. The State was admitted to a representation in Congress by an act passed over the President's veto June 25, 1868. With the return of financial prosperity, and the development of the mineral, agricultural, manufacturing, and commercial resources of the State by the aid of the great railroad lines now traversing it, Alabama entered on a new era of rapid advancement. The material wealth of the State has been prodigiously increased, and capital has developed the iron and coal industries, which are among the richest in the Union.

GOVERNORS OF THE STATE.

William W. Bibb.....	1819-20	John Gill Shorter.....	1861-63
Thomas Bibb.....	1820-21	Thomas H. Watts.....	1863-65
Israel Pickens.....	1821-25	Lewis E. Parsons, <i>Prov.</i>	1865-65
John Murphy.....	1825-29	Robert M. Patton.....	1865-68
Gabriel Moore.....	1829-31	William H. Smith.....	1868-70
John Gayle.....	1831-35	Robert B. Lindsay.....	1870-72
Clement C. Clay.....	1835-37	David P. Lewis.....	1872-74
Arthur P. Bagby.....	1837-41	George S. Houston.....	1874-78
Benjamin Fitzpatrick....	1841-45	Rufus W. Cobb.....	1878-82
Joshua L. Martin.....	1845-47	Edward A. O'Neal.....	1882-86
Reuben Chapman.....	1847-49	Thomas Seay.....	1886-90
Henry W. Collier.....	1849-53	Thomas G. Jones.....	1890-94
John A. Winston.....	1853-57	William C. Oates.....	1894-96
Andrew B. Moore.....	1857-61	Joseph F. Johnston.....	1896-

Revised by A. R. SPOFFORD.

Alabama Claims: The claims made by the Government of the U. S. in favor of certain of its citizens and on its own behalf upon the Government of Great Britain, on account of the acts of certain warlike vessels, thirteen in number with their tenders, which sailed from British ports in the interest or employ of the Confederate States during the war of the rebellion in the U. S. The treaty of Washington describes them as "differences [which] have arisen between" [the two governments], "and still exist, growing out of the acts committed by the several vessels which have given rise to the claims generically known as the Alabama claims." The Confederate cruisers in respect of which the U. S. made any reclamations before the tribunal of arbitration at Geneva should be separated into two classes; first, those which were substantially fitted out and adapted to warlike use in Great Britain, so that they actually commenced their hostile careers by sailing from a British port; and, secondly, those which commenced their hostile careers in the Confederate service within other territorial jurisdictions.

First Class.—The Florida was an iron srew gunboat. The contract for her was made in 1861 by Bullock, the Confederate agent in England, with Laird & Son, of Birkenhead. Her object and destination were well known at that place, but the formal pretense was kept up that she was designed for the Italian navy. She cleared for the Mediterranean on Mar. 22, 1862, with a crew of fifty-two men, all British except three or four, of whom only one was a citizen of the U. S. Her actual destination proved to be Nassau. She was in every respect a man-of-war, except that no guns were on board. While she was preparing to sail, shot, shells, etc., were sent by river from Liverpool to Hartlepool, and there

shipped on board the steamer Bahama, which left for Nassau, and there joined the Florida. All these facts were from time to time diligently brought to the attention of the British authorities by Mr. Adams, the U. S. minister, and by Mr. Dudley, the U. S. consul at Liverpool. At Nassau certain abortive proceedings against the Florida were undertaken by the colonial government. She sailed from Nassau on the 8th of August, having cleared for St. John, New Brunswick. At the same time a schooner laden with shot, shell, and other munitions of war sailed from Nassau, and met her at a neighboring island, where the transfer was made. But her British crew had refused to serve longer, alleging deviation of voyage, and the Florida after shipping her armament found herself too short handed to cruise. Failing to enlist a crew in Cuba, she accordingly ran the blockade into Mobile and there lay some months. Escaping early in 1863, she cruised for twenty months. Her career ended at Bahia, where she was cut out by the U. S. steamer Wachusett in glaring defiance of Brazilian sovereignty. Three of her captures, the Clarence, the Tacony, and the Archer, were fitted out and armed as tenders, and aided in the work of destruction. During her cruises she was repeatedly received into British ports, and permitted to repair and to take in full supplies of provisions and coals. She and her tenders captured and destroyed U. S. merchant vessels and cargoes amounting in value to many millions of dollars.

The Alabama was a companion ship to the Florida, and was manned by British subjects. She was a wooden steam sloop of about 1,040 tons register, built for the Confederate States by Laird & Son at Birkenhead, in England, and was called "No. 290," from her number in the list of steamers constructed by that firm. She was barque rigged, was furnished with two engines of 350 horse-power each, and was pierced for twelve guns. Strict precautions were taken to keep her destination a secret, but the suspicions of the agents of the U. S. having been excited before she was quite finished, the minister of the U. S. requested the British Government to detain her. The British ministers consulted the Crown lawyers, and after some delay, caused by the illness of the queen's advocate, an opinion was given in favor of detaining her. In the meantime the "No. 290" had escaped under a pretext of a trial trip, near the end of July, 1862. She was not equipped with guns and warlike stores when she left the Mersey, but received them at Terceira, whither they were conveyed by two other vessels. In August, 1862, Capt. Semmes took command of the steamer, which he named the Alabama, and began his cruise with a crew of eighty. He burned most of the merchant vessels which he captured, being unable to take them into any port of the Confederate States in consequence of the blockade. The Alabama never entered any port that was possessed by the Confederate States.

It is stated that she captured sixty-five vessels, and destroyed property valued at \$6,000,000. Much greater than this amount was the damage inflicted on ship-owners of the U. S. by the heavy insurance for war risks to which they were subjected, and by the difficulty in obtaining freight for their vessels.

After a long cruise in the Pacific Ocean, she returned to Europe, and entered the port of Cherbourg to refit and obtain a supply of stores, June 11, 1864. There the Kearsarge, Capt. Winslow, found her and offered battle. Though hardly in fighting trim, the Alabama came boldly out and was speedily sent to the bottom by her antagonist.

The Georgia was built for the Confederates on the Clyde. She sailed early in 1863, and proceeded to a point off the French coast, where she met the steamer Alar, which had been sent from Liverpool with her arms, ammunition, etc. Some steps were taken by the British Government to prevent her escape, but they were too late. After a warlike career of about a year she returned to Liverpool, and was there sold by the Confederate agents, Mr. Adams remonstrating in vain against this proceeding. Shortly after the sale she left the port, and was captured by the U. S. cruiser Niagara.

The Second Class.—The Sumpter, the Nashville, the Retribution, the Tallahassee, the Chickamauga. These were all armed and equipped in and sailed from Confederate ports. The claims made in respect of them were based upon allegations that they were received into British ports, and permitted to ship coal and supplies, in excess of the maximum amount permitted by the queen's proclamation of neutrality; and also in respect of the Retribution, that she was permitted to take captured cargo into one of the Bahamas, and there sell or dispose of it without any judicial

process. The case of the Shenandoah was quite different. She was originally a British steamer, called the Sea King, and had been engaged in the East India trade. She sailed Oct. 8, 1864, for Bombay in ballast, with a crew of forty-seven. She was not then armed and equipped or fitted out as a man-of-war. On the same day another steamer, the Laurel, sailed from Liverpool, ostensibly for Nassau, having on board a number of Confederates and a quantity of guns, gun-carriages, and other munitions of war. These steamers met at Funchal, in the island of Madeira, where the transfer was made. Here she was taken command of by Capt. Waddell, of the Confederate service, and manned. A small part only of the original crew consented to remain with her, and she sailed with less than one-half of her regular force of men. On the 25th of Jan., 1865, she arrived at Melbourne, where she was permitted to repair and to coal. She also at the same place enlisted a large number of men, augmenting her crew by forty-five new enlistments. This was done so openly that it was the common talk of the town, and was freely commented upon by the local papers. The U. S. consul at Melbourne appealed to no fewer than five different officials to stop the enlistment and detain the ship, but without avail. The tribunal of arbitration decided that the colonial authorities did not exercise due diligence in preventing these enlistments. Leaving Melbourne, she proceeded to the Arctic regions, and there, beyond the reach of any U. S. cruisers, she made great havoc among the U. S. whaling ships. This was continued for several months after the complete overthrow of the Confederacy. She finally arrived at Liverpool on the 6th of Nov., 1865, and was surrendered to the British Government, and by it delivered over to the U. S.

A diplomatic correspondence arose at once from the foregoing events. We can only state in the briefest manner the points which were urged by either side. It should be carefully borne in mind that the protracted negotiations growing out of the recognition of the Southern States as belligerents by the queen's proclamation of neutrality on the 13th of May, 1861, had no necessary connection with the Alabama claims. Although the two alleged causes of complaint were often mingled, and perhaps deemed inseparable, in popular opinion in the U. S., yet they were entirely distinct, and were finally and definitively held to be so by the treaty of Washington. During the war the immediate object of all communications made on the part of the U. S. was to induce the British Government to interfere and prevent the escape of the Confederate cruisers; the remote object of the same communications, and the sole purpose of those made after the war, was to present and urge a demand for compensation.

Mr. Secretary Seward and Mr. Adams placed themselves upon the fundamental position that a neutral nation is bound by the principles and doctrines of the international law, independent of any mere municipal regulations, to use all the means in its power to prevent its territory from being made the base of military operations by one belligerent against the other. "If your neutrality laws are sufficient," they said, "enforce them; if insufficient, amend them." The British Government took issue with this position; they denied all international duty antecedent to or beyond the existing statute; this statute, they claimed, was the limit of their power and responsibility. The statute referred to, known as the Foreign Enlistment Act, was passed in 1819. In substance it provides "that if any person within any part of the United Kingdom shall . . . equip, furnish, fit out, or arm" any vessel, or attempt to equip, etc., any vessel, or procure any vessel to be equipped, etc., or knowingly aid in equipping, etc., any vessel, with intent that it may be employed in the service of one belligerent, he shall be guilty of a misdemeanor, and shall be fined and imprisoned, and the vessel, with its arms, etc., shall be forfeited. Lord Russell refused to go beyond this statute, and declared that the executive as such could not act, and that all proceedings under it must be judicial. To this end he demanded from Mr. Adams such preliminary technical proofs as would warrant a conviction by the courts. There was thus thrown upon Mr. Adams and Mr. Dudley the duty of acting as police agents and detectives for the British Government in obtaining the evidence which the local officials did not busy themselves with discovering. At last a construction was given to this statute by the English courts in the case of the Alexandra which made the Foreign Enlistment Act a dead letter. Like the Florida and the Alabama, she was constructed for the Confederates, in every respect a man-of-war ready for action, except that her guns and ammunition were not on

board. She was proceeded against under the statute, which makes it an offense "to equip, furnish, fit out, or arm any vessel." The judge at the trial held that these acts must all be proved coincidentally, and, as the Alexandra was not actually armed in a British port, the law was not violated. This ruling was sustained on appeal by the higher court. As the Government had denied all international obligation, so this decision removed all municipal duty to interfere with the operations of the Confederate agents. Such was the course of the negotiations during the war.

In the year 1868 a change in the sentiments of British statesmen was apparent. They saw what a dangerous precedent they were laying down. Accordingly, a convention was signed on the 14th of Jan., 1869. It provided for a settlement through commissioners or by arbitration of all claims of citizens of either country against the other. The national claims of this country were not taken up. This convention the Senate rejected.

Then negotiations were resumed by Mr. Secretary Fish which ended in the treaty of Washington of 1871. This treaty referred the fishery dispute to arbitration as well as the Alabama claims. See FISHERY RELATIONS. It was the work of a joint high commission, consisting of five men from each country. In the deliberations leading up to it the U. S. commissioners claimed compensation for *direct losses* in the destruction of vessels and cargoes, and in national expenditure in the pursuit of the Confederate cruisers, and for *indirect injury* in the transfer of U. S. shipping to the British flag, in the enhanced rates of insurance, in the prolongation of the war, and in the addition to the cost of the war; they proposed that Great Britain should pay a lump sum, to be agreed upon, for all these claims. The British commissioners in answer proposed arbitration. The U. S. commissioners would not agree to arbitration "unless the principles which should govern the arbitrators were first agreed upon." Finally the latter suggestion was accepted; arbitration was adopted, and the rules which should govern the arbitrators were agreed upon. Articles I. to XI. of the treaty relate to the Alabama claims. The first describes, as has been shown, the matters submitted for decision; the others describe the constitution of the tribunal, its procedure, and the form of its decision. The seventh contains the important three rules, as follows:

First. That a neutral government is bound, first, to use due diligence to prevent the fitting out, arming, or equipping, within its jurisdiction, of any vessel which it has reason to believe is intended to cruise or carry on war against a power with which it is at peace; and also to use like diligence to prevent the departure from its jurisdiction of any vessel intended to cruise or carry on war as above, such vessel having been specially adapted in whole or in part within such jurisdiction to warlike use. *Secondly.* Not to permit or suffer either belligerent to make use of its ports or waters as the base of naval operations against the other, or for the purpose of the renewal or augmentation of military supplies or arms, or the recruitment of men. *Thirdly.* To exercise due diligence in its own ports or waters, and, as to all persons within its jurisdiction, to prevent any violation of the foregoing obligations and duties; it being a condition of this undertaking that these obligations should in future be held to be binding internationally between the two countries.

These rules Great Britain denies to have been parts of the international law when the acts complained of were done, but for reasons of comity only consents that they retroact and apply to those acts, and be made the basis of decision. The article concludes as follows: "The high contracting parties agree to observe these rules as between themselves in future, and to bring them to the knowledge of other maritime powers, and to invite them to accede to them." It may be here remarked that an acceptance of these rules by other powers has never been secured, nor is there any general agreement as to their interpretation. In pursuance of the treaty the following persons constituted the tribunal of arbitration: Count Edward Sclopis, named by the King of Italy; Mr. Jacob Staempfli, named by the President of the Swiss Confederation; Viscount d'Itajuba, named by the Emperor of Brazil; Mr. Charles Francis Adams, named by the President of the U. S.; and Sir Alexander E. Cockburn, named by the Queen of Great Britain. The case for the U. S. was separated into six parts; it gave a minute history of the acts of the British Government toward the U. S. during the rebellion, and of the fitting out and subsequent operations of each Confederate cruiser; and discussed the

questions of international law involved in the controversy, and concluded with a demand of the compensation to be awarded. The British case was separated into ten parts, and covers a similar ground to that of the U. S., though from a different point of view. Both were supplemented by many volumes of evidence. Two very distinct questions arose upon these papers: (1) What matters were submitted by the treaty to the arbitrators? and (2) By what rules and principles of law were the arbitrators to be guided in deciding the matters submitted to them? The consideration of the first and preliminary one of these questions gave rise to a controversy which for a while threatened to interrupt the whole scheme of arbitration. In Part VI. of the U. S. case the U. S. presented the items of damage to which it claimed to be entitled. Quoting the language used by the U. S. high commissioners, the case described claims for "direct" losses or damages, and other claims for "indirect" losses. The "direct" were said to include "losses growing out of the destruction of vessels and their cargoes by the insurgent cruisers, and the national expenditures in pursuit of those cruisers." The "indirect" were said to embrace "the loss in the transfer of the U. S. commercial marine to the British flag," "the enhanced payments of insurance," "the prolongation of the war," and the "addition to the cost of the war." The presentation of these so-called indirect claims caused a great opposition in Great Britain. The Government denied that they were included, or intended to be included, in the terms of the treaty. Fresh negotiations were opened; a supplemental treaty was proposed; the controversy was continued after the meeting of the tribunal; and for a while it seemed possible that the whole proceeding would be a failure. The British agent asked for an adjournment of the tribunal for eight months, to allow formal negotiations. Finally, June 19, Count Sclopis, president of the tribunal, announced that the arbitrators, without deciding the question whether these claims were included in the treaty, "had arrived, collectively and individually, at the conclusion that these claims do not constitute, upon the principles of international law applicable to such cases, good foundation for an award of compensation or computation of damages between nations." The difficulty was then ended, and the arbitration went on.

The argument upon the merits which was presented by the litigant nations to this high tribunal was most able and exhaustive. There is not space to present it even in the briefest outline. It turned mainly upon the true meaning of the phrase "due diligence" used in the three rules. The counsel on the part of Great Britain was Sir Roundell Palmer, then the acknowledged leader of the English bar, and afterward made Lord High Chancellor, with the title of Lord Selborne. The counsel on the part of the U. S. were William M. Evarts, Caleb Cushing, and Morrison R. Waite. The final decision of the tribunal was announced Sept. 14. The arbitrators decided unanimously in favor of Great Britain in respect of the Georgia, Sumpter, Nashville, Tallahassee, and Chickamauga, and similarly in respect of the Retribution, by a vote of three to two. They all decided (Sir Alexander Cockburn for reasons peculiar to himself) that Great Britain was liable for the original fitting out and escape of the Alabama, and for her subsequent free admission into British ports. The same conclusion was reached in respect to the Florida, Sir Alexander Cockburn alone dissenting. The ruling as to these vessels applied also to their tenders. The tribunal was unanimous that no liability arose in respect of the Shenandoah prior to her arrival at Melbourne; but three of the arbitrators, Count Sclopis, Mr. Staempfli, and Mr. Adams, held that the colonial authorities failed to exercise due diligence to prevent the enlistment of men at that port, and that Great Britain was liable for captures made after her departure thence. The tribunal, in making their award, formulated and announced the following general principles, a portion of which lie at the basis of the whole decision, while a portion apply only to the estimate of the quantum of damages: "Due diligence should be exercised by neutral governments in exact proportion to the risks to which either one of the belligerents may be exposed by failure to fulfill the obligations of neutrality on their part." The effects of a violation of neutrality, as committed by the Alabama and other such cruisers, were not done away with by a commission subsequently issued by the Confederate Government. "The Government of Great Britain can not justify itself for its failure in due diligence on the plea of the insufficiency of the legal means of action which it possessed." The claim of the U. S. for the national cost of

pursuing the Confederate cruisers can not be distinguished from the general expenses of the war, and is therefore an indirect loss which can not be allowed. Prospective injuries to shippers and ship-owners, such as loss of future profits, are equally uncertain and indirect. All double claims for the same losses are rejected, but interest is allowed. Upon these principles the tribunal awarded, for actual losses of ships and cargoes and interest, the sum of \$15,500,000. It is thus seen that the tribunal wholly overruled the position maintained by Great Britain from the beginning, that its statute was the sole criterion of its power and duty. In like manner the tribunal brushed away all claims by the U. S. for indirect and national losses, and strictly confined its judgment to the compensation of private citizens of the U. S. for losses of ships, cargoes, freight, and wages.

Revised by T. S. WOOLSEY.

Alabama Indians: See MUSKHOGEAN INDIANS.

Alabaster [Lat. *alaba'ster*, from Gr. *ἀλάβαστρος*]: one of two kinds of white mineral substances, similar in appearance, but different in composition. Alabaster proper is a fine-grained variety of gypsum or sulphate of lime; the finest quality of this is found near Volterra, in Tuscany. It is manufactured into various ornamental forms in Florence, Italy, which is the center of the alabaster trade. The other is a translucent carbonate of lime, and is harder than the first. Both are manufactured into ornaments.

Considerable deposits of alabaster of the gypsum variety are found in England, chiefly in Derbyshire and Staffordshire. It is used there to form the plaster molds of the potters, and is hence called "potter's stone." The fine blocks are used by the turners. A yellow variety found at Sienna is called *alabastra agatato*.

Alabaster, WILLIAM, D. D.: b. at Hadleigh, Suffolk, England, about 1567; educated at Westminster School and at Trinity College, Cambridge; was incorporated at Oxford in 1592; became fellow of Trinity; was chaplain to Robert, Earl of Essex; was converted to Roman Catholicism in France in his twenty-fourth year, but did not long remain a Roman Catholic. He was enticed to Rome and imprisoned, but escaped at the peril of his life. On his return to England he became prebendary of St. Paul's and rector of Hatfield, and was a famous Hebraist. D. about 1640.

Alabaster Cave: a remarkable cavern in Placer co., California; 8 miles S. E. of Auburn, and a mile from the North Fork of the American River. This cave contains beautiful chambers incrustated with alabaster of various tints. It also contains a lake of undetermined extent.

Alabas'trum (in Gr. *ἀλάβαστρον*): a small jar, vase, or bottle, used for holding unguents and liquids. The vessel mentioned in Matt. xxvi. 7, called "alabaster box" in the Authorized Version, and "alabaster cruse" in the Revised Version, is an *alabastrum*.

Alacran'es (i. e. the scorpions): a group of small islands and coral reefs (cays); 80 miles N. of the coast of Yucatan in the Gulf of Mexico. Cay Perez is in lat. 22° 24' N., lon. 89° 42' W. (see map of Mexico, ref. 6-K). They are dangerous to navigation, but have a secure harbor on the south side.

Alago'as: a maritime state of Brazil; between 9° and 10° S. lat.; bounded N. and W. by Pernambuco, E. by the Atlantic, and S. by Sergipe and the river San Francisco. Area, 22,583 sq. miles. The surface is partly mountainous; and the soil of the valleys and lowlands is fertile, and produces cotton, sugar, maize, etc. Capital, Maceio. Pop. (1890) 511,440.

Alagoas (Port., the lakes): a town of Brazil; state of the same name; on the Lake Maysuaba; until 1839 the capital of the province. It was formerly a large and important city, but since the change of the seat of government it has declined very much (see map of South America, ref. 5-H). It has a considerable trade in tobacco. Pop. 15,000.

Alagon': a river of Spain; enters the Tagus about 2 miles N. E. of Alcántara. Length, about 120 miles. It is noted for its fine trout and other fish.

Alain de Lille (Lat. *Ala'nus ab In'sulis*): the *Doctor Universalis*; flourished in the twelfth century; was a Cistercian monk, and wrote a great number of books, theological, philosophical, and poetical. See Dupuy's *Alain de Lille* (1859).

Alais, aã'lay' (anc. *Al'esia*): a town of Southern France; in Gard, on the Gardon, and at the foot of the Cevennes; 31 miles by rail N. W. of Nîmes, with which it is connected by

a railway (see map of France, ref. 8-G). It is in a productive coal-field, and has several manufactories, a college, and a school of mines. Alais was a stronghold of the French Protestants in the seventeenth century, and was captured in 1629 by Louis XIII. It has a citadel built by Louis XIV., and a fine Gothic church. The cold mineral springs in its vicinity are visited by great numbers in the summer season. Pop. (1886) 22,514; (1896) 24,382.

Alajuela, ã-la-hwã'la: a city of Costa Rica, Central America, capital of a province of same name; 23 miles W. N. W. of Cartago (see map of Central America, ref. 8-J), has considerable trade through the port of Puntas Arenas on the Pacific Ocean. Pop. of city, 9,000; of province, 53,087.

Alakul, ã-la-kool': a lake in Northeast Turkestan, Russian Asia; lat. 46° N., lon. 81° 30' E.; 50 miles long, 20 broad; area, 790 sq. miles; 2,559 feet above sea-level. It receives the drainage of a large basin, and is connected by a chain of small lakes with the smaller Sissikul lying a short distance N. W.

Alameda: city, Alameda co., Cal. (for location of county, see map of California, ref. 7-C); on the Southern and Central Pacific R. R. Pop. of township (1870) 1,557; (1880) 5,708; (1890) 11,165; (1900) 16,464.

Alamgir: See AURUNGZEBE.

Alamo, The [*Alamo* is the Sp. for poplar-tree]: a celebrated fort at San Antonio, Tex. A band of 140 Texans here bravely resisted a Mexican force of ten times their number from Feb. 23 to March 6, 1836, and nearly all perished rather than surrender. The six who finally surrendered were murdered by the Mexicans. In consequence of this heroic defense, Alamo is styled the "Thermopylæ of America." "Remember the Alamo!" became the war-cry of the Texans in their struggle for independence.

Alamos, Los: a city of Sonora, Mexico, 110 miles N. W. of Sinaloa; has rich silver mines in the vicinity (see map of Mexico, ref. 3-D). Pop. fluctuating, about 10,000.

Åland Islands, or **Aaland**: a numerous group of small islands in the S. part of the Gulf of Bothnia, near the Baltic, belong to the Grand Duchy of Finland, government of Åbo (see map of Russia, ref. 5-B). About eighty are inhabited. Pop. 18,500; total area, 550 sq. miles. They were ceded to Russia by Sweden in 1809. The Russian fortifications here were destroyed by the British and French troops in 1854; and by a separate convention annexed to the treaty of Paris (April, 1856), the Emperor of Russia agreed "that the Åland Isles should not be fortified," etc.

Ala'ni: an ancient warlike tribe of unknown origin, who made incursions into the Roman empire as allies of the Goths and Vandals. They invaded Asia Minor in the reign of Aurelian, and co-operated with the Vandals in the invasion of Gaul in 406 A. D.

Alarcón, PEDRO ANTONIO, de: Spanish novelist and poet; b. in 1833; began his literary career as a journalist and satiric writer. He took part in the war of 1859 against Morocco, in the capacity of historiographer, and wrote his *Diario de un testigo de la guerra de África* (1860). In subsequent years he wrote, first, a number of successful short sketches, then novels of a more serious character, among them *El sombrero de tres picos* (1868); *La Alpujarra* (1870); *El Escándalo* (1875). The last of these, strongly Catholic in tone, and sharply opposed to the scientific and realistic tendencies in contemporary Spanish literature, was especially successful. D. July 20, 1891. A. R. MARSH.

Alarcón y Mendo'za, DON JUAN RUIZ, de: Spanish poet and dramatist; b. in Mexico about 1590. He became a resident of Spain in 1622, after which he obtained the office of reporter of the royal council of the Indies. A volume of his dramas was published in 1628. Among his works, which present a faithful delineation of Spanish manners, and are commended for elevation of sentiment, are *Las Paredes Oyen* (Walls have Ears), and *La Verdad Sospechosa* (Suspicious Truth), which Corneille imitated in his *Menteur*. D. Aug. 4, 1639. The best edition of his works is by Hartzenbusch (Madrid, 1857). A. R. MARSH.

Alarie: a celebrated conqueror; a Visigoth; b. about 350 A. D. Soon after the accession of Arcadius as Emperor of the East, Alarie invaded Thrace, Macedonia, and other provinces, in 395 A. D. He took Athens and entered the Peloponnesus, from which he was driven out by Stilicho. Hostilities were then suspended by a treaty, and Arcadius appointed Alarie governor of Illyria in 396. He invaded

Northern Italy in 402, but was defeated by Stilicho at Polentia and Verona. Stilicho having been killed in 408, Alarie renewed the invasion of Italy, which the Emperor Honorius was unable to defend. The army of the Visigoths invested Rome, but they were induced to retire by the payment of 5,000 lb. of gold and 30,000 lb. of silver. After unsuccessful efforts to negotiate, Honorius rejected the terms of Alarie, who in 410 took Rome, and permitted his soldiers to pillage it for six days. He was marching to Sicily when he died at Cosenza, in 410 A. D. See Simonis, *Kritische Untersuchungen über die Geschichte Alarich's* (1858).

Alarie II.: King of the Visigoths; began to reign in 484 A. D., on the death of his father, Euric. His dominions included parts of Spain and of Gaul. He was killed in battle by the hand of Clovis, King of the Franks, in 507.

A Las'co, **Alas'co**, or **Alas'ko**, JOHN (in Polish, Lascki): a Polish nobleman; b. in 1499; a great traveler in his early life, who, while at Zurich, imbibed the doctrines of Zwingli. At Basel, in 1525, he became the friend of Erasmus, who bequeathed to him his library. On the invitation of Cranmer he removed from Embden, in East Friesland, to London in 1551, where he became superintendent of the congregations of foreign exiles who had embraced the reformed faith. The Church of the Austin Friars, in Broad Street, was assigned to him, and here he established a Presbyterian form of church government with a service-book from which all the sacerdotal and sacramental principles of the English Prayer-Book of 1549 were carefully eliminated, and sitting at the communion and the disuse of ecclesiastical vestments were enjoined. On the accession of Queen Mary, in 1553, A Lasco and his congregation were banished. In 1556 he returned to Poland, where he died Jan. 13, 1560. A Lasco wrote a number of theological treatises, chiefly in defense of the sacramental views of the Swiss Reformers, and was one of the eighteen divines who prepared the Polish version of the Bible which was published in 1563. W. S. PERRY.

Ala Shehr (the ancient *Philadelphia*, founded about 200 B. C. by Attalus Philadelphia): a walled city of Asia Minor, at the N. E. base of Mt. Tmolus, 93 miles E. of Smyrna (see map of Turkey, ref. 5-E). Here are five Christian churches and numerous ancient ruins. Pop. about 15,000.

Alas'ka: formerly Russian America; a Territory of the U. S., comprising the northwestern part of America, purchased from Russia in 1867 for \$7,200,000. Its eastern boundary starts at lat. 54° 40' N., in the Portland channel, and ascends this channel to where the fifty-sixth meridian crosses the coast of the mainland. From here it passes inland to the summits of the mountains parallel to the coast, or lacking mountains to ten marine leagues from the coast, northward to the meridian of 141° W. From this point, which proves to be very near the apex of Mt. St. Elias, it passes northward to the "Frozen Ocean." The western limit comes southward from the "Frozen Ocean" to the middle of Bering Straits, thence southwesterly in such a way as to pass between Attu (the most westerly of the Aleutian islands) and the Commander islands off Kamchatka. It thus includes not only an enormous tract of mainland, but Prince of Wales island, the King George or Alexander archipelago to the northward, the Kadiak islands, the Aleutians, Pribyloff, and St. Lawrence island in Bering Straits.

Topography.—The coast-line of Alaska is greater than that of the Atlantic seaboard of the U. S. The chief inlets are Prince William Sound and Cook Inlet, on the northern extension of the Pacific called the Bay of Alaska; Bristol bay and Norton Sound on Bering Sea; and Kotzebue Sound on the Arctic Ocean. Point Barrow (lat. 71° 23' N.) is the northernmost point of Alaska. The principal river is the Yukon, which rises in British Columbia less than 200 miles N. N. E. of Sitka, strikes a broad arc of a circle more than 2,000 miles long, and enters Bering Sea on the S. side of Norton Sound through an extensive delta. At 600 miles from the coast it is over a mile wide, and the volume of its water is so great as to freshen the water 10 miles off shore from its principal mouth. The next largest river is the Kuskokwim, which rises on the northern slopes of the Alaskan range of mountains to the eastward of the meridian of 150° W., and empties into Kuskokwim Bay, Bering Sea, in about lat. 60° N. Like the following, it is but little known. Next in order of size are the Colville, flowing into the Arctic Ocean E. of Point Barrow; the Copper, flowing southward from the Alaska Mountains, and emptying into the Bay of Alaska in about long. 145° W.; the Suschitno, and several Arctic

streams. The Rocky Mountains turn westward in about lat. 63° N. and pass into the Alaska Mountains, a range which runs first W., then S. W., and is finally prolonged into the peninsula of Alaska and the Aleutian islands, the peaks in the two latter being often volcanic. This range apparently culminates in Mt. Wrangel, in about lon. 145° W., lat. 62° 30' N.; height, 17,500 feet. Near the coast is a less continuous range, which culminates in Mt. Logan (lat. 60° 30' N.), altitude 19,500 feet, thus overtopping Mt. Elias (18,100 feet), which is situated at the point where the U. S. boundary makes a turn from westward to northward, and which was long regarded as the highest peak N. of Mexico. Among these coast mountains is Mt. Cook (in British territory), 15,750 feet, and Mt. Fairweather (U. S.), 15,500 feet. Glaciers are frequent among these mountains, and one from Mt. Elias dips its nose into salt water at Icy Bay.

Natural Divisions.—The Territory falls naturally into six divisions: (1) The Arctic division, including the entire area that drains into the Arctic Ocean. It is a treeless district, diversified by ranges of hills, almost entirely within the Arctic circle, with no population except the Esquimaux along the coast. The area is 125,245 sq. miles, and the population barely surpasses 3,000. (2) The Yukon basin. This district has an area of 176,715 sq. miles. It has extensive forests, except near the coast. The population is Esquimaux on the coast (numbering about 4,500) and Indians in the interior (about 2,500). Fishing is the chief means of subsistence. (3) The Kuskokwim district. This includes the Kuskokwim basin and the remainder of the area between the Alaska range and the Yukon basin. Its character is much like that of the Yukon district, but it is more mountainous. Area, 114,975 sq. miles. Pop. 8,000 Esquimaux, less than 1,000 Indians, and a few whites. (4) The Aleutian district, comprising the Aleutian islands from the peninsula of Alaska westward. The islands are without trees, but the climate is relatively mild, the rainfall considerable, and the herbaceous growths are luxuriant. Fishing and sealing are the chief means of support. Area, 14,610 sq. miles. Pop. about 2,500; mostly Aleuts, but now much mixed with Russian blood. (5) The Kadiak district, including the mainland and islands S. of the Alaskan range, W. of meridian 141° W., and E. of the central ridge of the peninsula of Alaska. This region is but little known, except near the coast. It is believed to have considerable mineral wealth. Area, 70,884 sq. miles. Pop. about 2,000 Esquimaux, 1,200 Indians, and 1,000 whites and half-breeds. (6) The Sitka district, which includes the archipelago and strip of coast extending southward, W. of British Columbia. It has abundant forests containing magnificent tree trunks for masts and spars. The climate is relatively mild and the rainfall heavy. There is considerable mineral wealth, especially to the N. Area, 28,980 sq. miles. Pop. (1880) 523 whites and half-breeds, 7,225 Indians; (1890) 1,880 whites, 5,432 Indians, 324 Chinese. Total area, 531,409 sq. miles. The most valuable of the export products of the industries of Alaska consists of the furs of seals, bears, foxes, otters, martens, beavers, minks, and some other animals. Next in importance is that of the fishing industry. The center of the salmon-canning industry is at the islands of the Kadiak district, the output for 1890 (over 200,000 cases) being almost two-thirds of the total output of Alaska. Gold is mined in several places, bullion to the value of about \$5,459,500 being shipped in 1899. There are unworked deposits of lignite and copper.

Population.—The population for the whole Territory in 1880 was 33,426, of whom 17,617 were Esquimaux, 11,478 Indians, 2,145 Aleuts, 1,756 half-breeds, and 430 whites. In 1890 the census enumeration (necessarily largely an estimate), gave 4,416 whites, 82 blacks, 1,568 half-breeds, 13,735 natives not Esquimaux, 2,125 Chinese, 8,400 Esquimaux; total, 30,326. The recent census (1900) gives a total population of 63,592. The Esquimaux, or Inuit, are confined to the coast and are found along almost the entire coast of the mainland. They are less gentle than those of the Atlantic side. The Aleuts are a gentle, genial, and fairly industrious people, formerly celebrated as whale-hunters, now contented to live without such dangerous pursuits. They are now gradually dying out. They appear to be more nearly related to the Esquimaux than to the Indians. Among the Indians the Thlinkets are the most numerous (about half).

History.—The coast of this part of America was discovered by a Russian expedition under Bering, in 1741. Settlements were gradually made, and the coast was at one time claimed as far S. as San Francisco. In 1799 the Territory was granted to a Russo-American fur company by the

Emperor Paul VIII., and the charter was renewed in 1839. New Archangel, now Sitka, was the principal settlement. The privileges of the company expired in 1863, and the Territory was purchased by the U. S. in 1867. Portions of the Territory were soon after explored by employees of the Russo-American Telegraph Company in surveying a route for an overland telegraph line to Europe. Explorations of the coast have since been continued by the Coast and Geodetic Survey. The Yukon has been explored by Dall and Schwatka, and Mt. Elias by several parties, the most successful of which was that of Russell in 1891. From Sept. 8, 1881, to Aug. 29, 1883, a well-equipped meteorological station of the U. S. Signal Service was kept at Point Barrow. In 1884 a district government was created by Congress, with a governor and a district court. The latter sits alternately at Sitka and Wrangel. The laws are those of Oregon. Sitka is the capital and has a land-office. The farming of the Pribylof or Fur Seal islands in Bering Sea was at first granted to the Alaska Commercial Company at a rental amounting to about \$300,000 annually. On the expiration of their lease in 1890, the right was acquired by the North American Commercial Company. In 1886 three Canadian sealers were seized by a U. S. revenue cutter while sealing in Bering Sea, their captains and crews tried for illegal sealing, fined, and imprisoned. In 1887 five were similarly seized and tried. In 1888 a Russian steamer seized a Canadian schooner sealing in Russian waters. In 1889 four schooners were seized by the U. S. revenue cutter and a fifth warned to leave. In 1890 and 1891 there were no seizures, but negotiations in the latter year were going on to settle the status of the question of foreign sealing. See *BERING SEA CONTROVERSY*.

Boundary Dispute.—A treaty was signed by the Secretary of State and the British Ambassador in Washington on Jan. 30, 1897, providing for the demarcation of so much of the boundary between Alaska and Canada as lies along the 141st meridian. The remainder of the question was left to the joint high commission appointed to attempt the settlement of all questions at issue between the U. S. and Canada, which first met in Quebec, Aug. 28, 1898, with the following delegates: Great Britain—Lord Herschell, chairman of the conference; Canada—Sir Wilfrid Laurier, Sir R. Cartwright, Sir Louis Davies, Hon. John Charlton; Newfoundland—Sir James Winter, Hon. A. B. Morine; U. S.—Gen. John W. Foster, Hon. George Gray, Hon. C. W. Fairbanks, Hon. John A. Kasson, Hon. Nelson Dingley, T. Jefferson Coolidge. No agreement having been reached, on Oct. 20, 1899, a *modus vivendi* was agreed to by Great Britain and the U. S., fixing a provisional boundary "such as should be without prejudice to the claims of either party in the permanent adjustment of the international boundary"; and officers were appointed by both governments to mark this temporary line.

REFERENCES.—Dall's *Alaska and its Resources* (1870); Whymper's *Travels in Alaska and on the Yukon* (1868); Elliott's *Our Arctic Province* (1886); Schwatka's books, and many U. S. Government publications.

MARK W. HARRINGTON.

Alas'sio: a charming health resort in the Riviera, Liguria, Italy; 56 miles W. of Genoa. It is on the Mediterranean, and is protected toward the N. by picturesque and wooded mountains (see map of Italy, ref. 4-B). It has been frequently visited by the Italian royal family and by Garibaldi, and is becoming a favorite English resort in winter. Pop. 6,000.

Ala'tri: a town of Italy; province of Rome; 45 miles E. S. E. of Rome (see map of Italy, ref. 6-E). The ancient city which occupied the site of Alatri was called *Alatrium*, or *Aletrium*, and was one of the principal cities of the Hernician League. Here are some of the finest and best-preserved cyclopean or polygonal walls in Italy. They were part of the defenses of the ancient city, and were built of immense polygonal blocks of stone, without cement. Pop. 13,596.

Alatyr': a town of Simbirsk, Russia; at junction of Alatyr and Sura rivers (see map of Russia, ref. 7-G). The principal industries are glass-making and dyeing. Pop. 15,000.

Alau'didæ: the larks; a family of passerine birds, the best known of which is the skylark (*Alau'da arven'sis*), after the nightingale the most celebrated song-bird of Europe. It mounts to a great height in the air, singing vigorously as it rises, and at the end of its song it drops suddenly to the ground, where it skulks among grass and weeds. The beau-

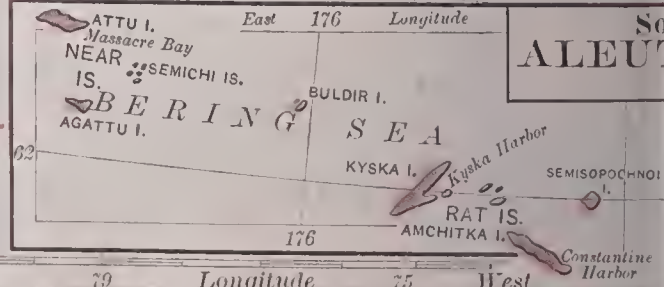
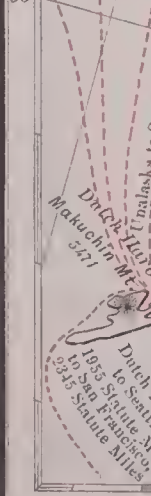
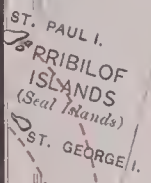
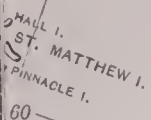
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ALASKA

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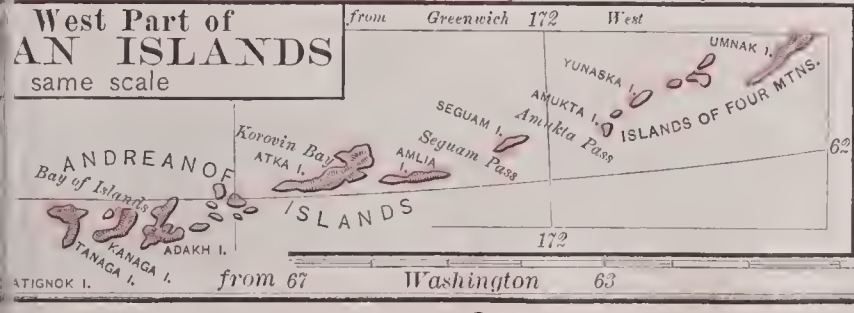
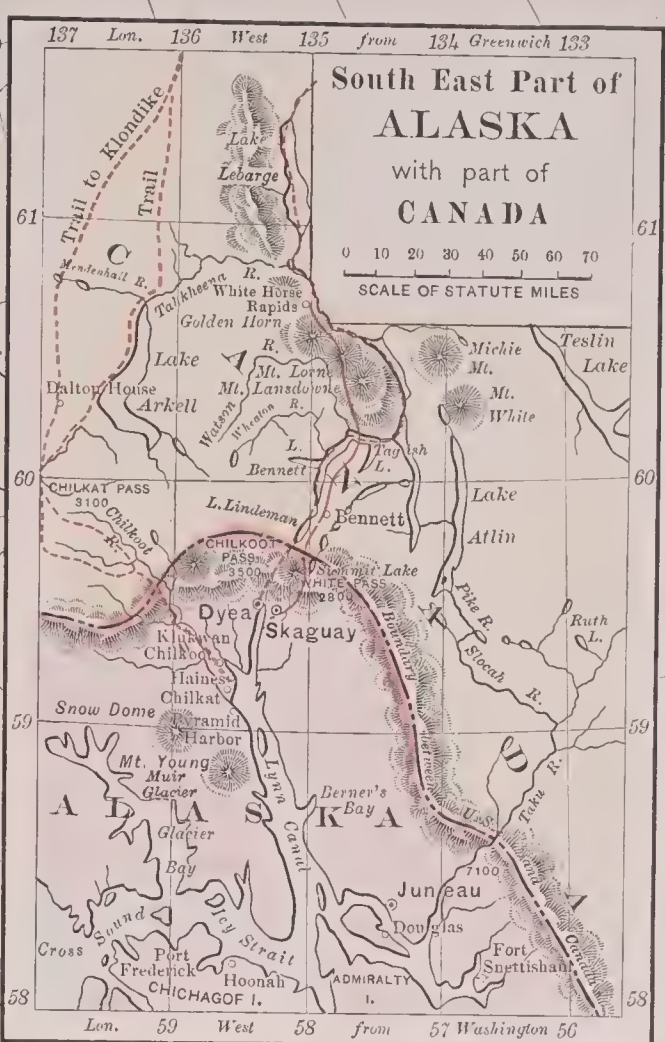
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tiful *Alauda cristata*, or crested lark, is another common bird of Europe. The shore-lark (*Otocoris alpestris*) is widely diffused in the cooler parts of Europe, Asia, and North America, and is the only one of the family common on this continent. The larks are largely terrestrial in habit, feeding on insects and the like. Among related birds, they are distinguished by the long straight claw of the hind toe, and by the absence of a sharp ridge on the posterior edge of the tarsus.

Revised by DAVID S. JORDAN.

Alaux, JEAN: historical and decorative painter; b. at Bordeaux, Jan. 15, 1786. Pupil of Vincent and Guérin. Director of the French Academy in Rome, 1846-53; member of the Institute, 1851; Legion of Honor, 1841. Notable pictures and decorations at the Museum of Versailles. D. in Paris, Mar. 2, 1864.

W. A. C.

Al'ava: one of the Basque provinces in Spain; bounded N. by Biscay and Guipuzcoa, E. by Navarre, S. by Logroño, and W. by Burgos. Area, 1,205 sq. miles. The country is mountainous, but fertile, especially along the shores of the Ebro. The chief products are fruit, wine, grain, and hemp. Here are also several mineral springs. Chief town, Vitoria. Pop. (1887) 92,893.

Alb [Lat. *alba* (sc. vestis), fem. of adj. *albus*, white]: a long white linen vestment worn by those in sacred orders in the Roman Catholic Church at the more solemn functions. It symbolizes the purity which the wearer should bring to the discharge of his office.

Al'ba, DUKE OF: See ALVA.

Alba (anc. *Alba Pompeia*): a town of Italy, province of Cuneo, on the Tanaro, 30 miles S. E. of Turin (see map of Italy, ref. 3-B). Wine, silk, grain, cheese, and oil are the staple productions of the district, in which are also quarries of marble and rock salt. It has a cathedral founded in 1486, and is the seat of a bishop. Pop. of the commune, 12,259.

Albace'te: province of Spain; comprises the N. part of the kingdom of Murcia and a portion of New Castile; bounded N. by Cuenca, E. by Valencia, S. by Murcia, and W. by Ciudad Real. Area, 5,972 sq. miles. It has on the N. W. the Sierra de Alcaraz, and the surface is diversified by mountains, hills, and fertile valleys. It is drained by the river Segura, which rises within its limits. Among its staple products are grain, wine, tobacco, oil, cattle, and sheep. Capital, Albacete. Pop. (1887) 229,492.

Albacete: a town of Spain; capital of a province of the same name: 172 miles by rail S. E. of Madrid (see map of Spain, ref. 17-G). It has manufactures of knives and other steel goods, and considerable trade. Large cattle fairs are held here in September. Pop. (1887) 20,533.

Albacore: See the Appendix.

Alba Lon'ga: a very ancient city of Latium, in Italy; founded, according to tradition, by Ascanius, son of Æneas, several centuries before the foundation of Rome. It was situated near the Alban lake, about 16 miles S. E. from Rome. Its remains have been discovered.

Al'ban, SAINT: one of three Christian martyrs who are said to have suffered in England about 286 A. D., during the Diocletian persecution. St. Alban was the protomartyr of Britain. Bede gives his story in his *Eccles. History*, bk. i. c. 7.

Albanen'ses [from *Alba*, a town of Piedmont]: that division of the Catharists who believed in absolute dualism. They taught that the world was created by the evil spirit. See CATHARI.

Alba'ni, ALESSANDRO: Italian cardinal, a nephew of Pope Clement XI.; b. at Urbino in 1692. He made a rich and celebrated collection of statues and other works of art at Rome. D. in 1779.

Albani, MARIE EMMA (Lajeunesse): singer; b. at Chambly, near Montreal, Canada, in 1851. In 1864 she sang in the cathedral in Albany, N. Y.; studied two years in Paris, and made her *début* as an opera singer in Messina in 1870; called herself Albani, out of compliment to the city of Albany, N. Y. Sang in Florence in the winter of 1871-72. She made a great success in Ambrose Thomas's *Mignon*. She sang in St. Petersburg, in London, in Paris, and in the U. S. In 1878 she married Ernest Gye, the operatic manager, and made a tour of the U. S. in 1883. B. B. VALLENTINE.

Alba'nia: the ancient name of a country bounded on the E. by the Caspian Sea, and comprising the modern Daghestan and Shirvan. Its inhabitants were often defeated, but never conquered, by Rome.

VOL. I.—7

Albania [called *Shkiperi* by the natives, and *Arnaoutlik* by the Turks]: the southwestern part of European Turkey; lies between lat. 39° and 43° N., and is bounded on the W. by the Adriatic and Ionian seas. Its length N. and S. is about 290 miles, and its width varies from 40 to 90. It nearly coincides with the ancient Epirus. The surface is mountainous, being occupied with nine ridges that are nearly parallel. The highest peaks rise about 8,000 feet above the level of the sea. Among the remarkable features of Albania are its subterranean rivers and its beautiful lakes. The chief articles of export are wool, horses, timber, and maize. The Albanians are rude and warlike mountaineers, more addicted to robbery than industry. They are probably descended from the ancient Illyrians and Epirotes. Their language belongs to the Indo-European family, and has several strongly marked dialects. The inhabitants are often called *Arnaoots* or *Arnavuts*, and *Skipetar*. Their dress resembles that of the Highlanders of Scotland. Pop. estimated at 1,400,000. Besides these, a large number of Albanians live in Greece and other parts of the Levant.

Albanian Language: the language of the Albanians, spoken in a variety of dialects in Albania proper, in various parts of Greece, in Southeastern Italy, and Sicily. The dialects of Albania divide themselves into two main groups: the northern or Gegan (north of river Scumb); and the southern or Toscan. The old idea that Albanian is a debased offshoot of the Greek has now been thoroughly disproved; it is an independent branch of the Indo-European stock, and leans in its characteristics rather toward the Slavic family of languages than the Greek. (See Meyer, G., in *Bezenberger's Beiträge*, vol. viii. 185.) Thus it resembles the Slavic languages in developing medials out of the Indo-European medial aspirates: cf. *biér*, carry, Lat. *fero*, Sanskrit *bhárāmi*; *derg*, door, Gr. *θύρα*, Lat. *fores*; also in its treatment of the two *k* series; the velar *k* is represented in Albanian by *k*, the palatal by *s*. Contrast *katër*, four, Lat. *quattuor*, Skr. *catvāras*, etc., with *vise*, places, Lat. *vicus*, Gr. *οἶκος*, etc. The investigation of the language and the determination of its position have been rendered peculiarly difficult by the great masses of loan-material from Latin, Slavic, Turkish, and modern Greek sources which have almost buried the original elements out of sight. Of the 5,140 caption-words in Meyer's etymological dictionary of the language, 1,420 prove to be of Latin origin, 1,180 Turkish, 840 Greek, 540 Slavic, and only about 400 inherited from Indo-European. During the Roman occupation of Illyria, in the days of the empire, the Albanian barely escaped the fate of the languages of Spain and Gaul. Not only words but formative and inflexional elements were adopted from the Latin to such an extent that the language became half Romance in character. For instance, Latin suffixes like *-arius* (Alban. *-ár*), *-imen* (Alban. *-ím*), *-tór* (Alban. *-tore*) become a vital possession of the language, and are applied to other than Latin words. The Latin endings of the imperfect *-ābam*, *-ēbam*, *-ībam*, appear as *-ova*, *-eva*, *-iva*. The form of the optative is derived exclusively from the Latin pluperfect subjunctive in *-vissem*. Even pronouns, conjunctions, prepositions, and adverbs are among the borrowed material; thus, *e = et*, *a = aut*, *kuš = quis*, etc. The influence of Greek, the Slavic languages, and Turkish is later and much less far-reaching, being limited to the vocabulary.

For practical introduction to the language, the best book is Gustav Meyer's *Kurzgefasste Albanesische Grammatik* (1888), which contains also reading exercises and a vocabulary. For the scientific study of the language the following works by the same author are important: *Etymologisches Wörterbuch der Alban. Sprache* (1891); *Albanesische Studien* (2 pts., 1883-84); *Die lateinischen Elemente im Albanesischen*, Gröber's *Grundriss*, i. 804 ff.; *Ueber Sprache und Literatur der Alban.*; *Essays und Studien*, 49 ff.; *Einfluss des Lat. auf die Alban. Formenlehre*; *Miscell. di filologia e linguistica* (Flor. 1886). Also, Miklosich, *Albanesische Forschungen* (3 vols., 1870-71); Schuchhardt, *Albanesisches und Romanisches*, Kuhn's *Zeitschr.*, xx. 241; Von Hahn, *Alban. Studien* (1854); and Reinhold, *Noctes pelagicae* (1855).

BENJ. IDE WHEELER.

Alba'no: a lake and mountain in Italy; about 14 miles S. E. of Rome. The lake, which is 6 miles in circumference, occupies the crater of an extinct volcano, and is 1,000 feet deep or more. The lake has no natural outlet, but discharges its waters through an artificial tunnel cut through tufaceous rock. This tunnel or "emissary" was undertaken by the Romans in 397 B. C. It is one of the most remarkable re-

mains of ancient Roman engineering. It is 6,000 feet long. Alba Longa stood on the N. E. margin. From the east shore of this lake rises Mt. Albano or Monte Cavo, which is over 3,000 feet high, and commands an extensive and magnificent prospect. On its summit are the ruins of the temple of Jupiter Latialis.

Albano (anc. *Alba'num*): a city of Italy, on or near Lake Albano, and on the Via Appia, 18 miles by rail S. E. of Rome (see map of Italy, ref. 6-E). It occupies the site of Pompey's villa, is celebrated for beauty of scenery, and is a favorite summer residence of the wealthy citizens of Rome. Here is a museum of antiquities and a large convent. Pop. 7,364.

Al'bany, or **Al'bainn**: an ancient name of the Highlands of Scotland. It is supposed that Albany or Albion (*q. v.*) was the original name given to the whole island by its Celtic inhabitants, and that it was afterward restricted to the northwestern part of Scotland, when the Celts had retired from the other parts of Britain. The title of Duke of Albany was given to the second sons of several kings of Scotland and England.

Albany: a small maritime division of the southeastern province of Cape Colony, South Africa; about 450 miles E. of Cape Town; area, 1,685 sq. miles. It is traversed by Great Fish river. The soil produces maize, barley, cotton, and other commodities. Capital, Grahamstown. Albany sends two representatives to the House of Assembly. Pop. (1891) 9,359 whites, 13,976 blacks.

Albany: town, railroad junction and capital of Dougherty co., Ga. (for location of county, see map of Georgia, ref. 6-G); on the right bank of Flint river, 106 miles S. S. W. of Macon. It is in the center of a district raising sugar-cane, rice, corn, and cotton. Large quantities of cotton are here shipped by rail. The Flint river is navigable to this point only at high water. Pop. (1870) 2,101; (1880) 3,216; (1890) 4,008; (1900) 4,606.

Albany: town, railroad junction and capital of Gentry co., Mo. (for location of county, see map of Missouri, ref. 1-D); on Grand river, 52 miles N. E. of St. Joseph. It has manufactures of furniture, brooms, wagons, harnesses, lumber, etc., graded schools, a grist-mill, a foundry, and a machine-shop. Pop. (1880) 979; (1890) 1,334; (1900) 2,025.

Albany: city, important railroad and commercial center; capital of New York and seat of government of Albany County (for location of county, see map of New York, ref. 5-J); on the west bank of the Hudson, 145 miles N. of New York city, and 164 miles (or 201 by railroad) W. of Boston, in lat. 42° 39' 49" N., lon. 73° 44' 33" W.

Original Site.—The place was first occupied by the Dutch in 1614 as a trading-post, but an actual settlement was not effected till May, 1624, on the arrival of eighteen Walloon families. During the same year a small fort (called Fort Orange, or Aurania) of logs and earth was built. In 1626 a war between the Mohawks on the west and the Mohegans on the east broke up the settlement, and the families were transferred to New Amsterdam, at the mouth of the river. Settlement was resumed in 1630 by Dutch families under the patron system, the settlers renting their lands of the patroon or lord of the manor. The village was called Beverwyck, then Williamstadt, and in 1664 it was called Albany, after the Duke of York and Albany, afterward James II. Till the Revolution it was the center of a large Indian trade. The colony continued to be inhabited by the Dutch, brought over largely by the Van Rensselaer family, who secured, in 1629, 24 miles square on both sides of the river, and leased the lands to settlers. Feudal tenure was abolished in 1787. After the Anti-rent war in 1846 the State prohibited leases of agricultural land for a longer period than twelve years. It was incorporated as the city of Albany in 1686, and became the capital of New York in 1797.

Modern Changes.—The city, which has a river-frontage of 4 miles, extends back over an alluvial plain up the sides of the hills to and upon the table-land 150 feet high, about 5 miles W. The view of the city from the east bank of the river is picturesque and imposing, from the full exposure of the public edifices, with their domes and steeples, the Helderberg and Catskill Mountains being visible in the S. W.

Streets, Public Buildings, and Institutions.—The principal streets are Broadway and Pearl Street, which run parallel with the river, and State Street, which ascends the hill to the Capitol, and thence to the limits of the city proper westward. Washington Avenue runs parallel to it, W. on the N. side of the Capitol, beginning at the City Hall, and

joins Central Avenue, which continues to W. boundary of the city. There are 81 miles of paved streets, of which 69 miles are of granite block, brick, asphalt, and macadam.

The chief public edifices and institutions are the Capitol, of which the cornerstone was laid in 1871, built of drilled granite, 4 stories high, 300 feet wide and 400 long, and occupies a prominence 155 feet above the level of the Hudson. It contains halls for the Assembly, the Senate, the Court of Appeals, the State Library, and rooms for the State officers (cost, including \$543,179 for the site, \$23,721,903.14); the marble State-hall (1842) also contains State departments; the new City Hall, of granite and red sandstone, with a picturesque tower (1882); U. S. Custom-House and Post-Office (1882); 5 hospitals, 3 free dispensaries, Dudley Astronomical Observatory, State Museum of Natural History (1797); State armory (10th battalion, N. G. N. Y.), theaters, and public halls. There are 73 churches, the largest and most imposing being the cathedral of the Immaculate Conception (R. C.), and the cathedral of All Saints (P. E.).

The penitentiary, opened in 1848, receives annually, mostly for short terms, over 1,000 prisoners, and has usually been self-supporting. Washington Park contains 90 acres, with a lake 1,700 feet long, and carriage-drives of 5½ miles. Beaver Park, on the south side, occupying the extensive and picturesque ravines about Martinville, contains 78 acres. Entire city park system contains 305 acres. The charitable institutions are numerous. The beautiful Rural Cemetery, about 4 miles from the city northward, contains 281 acres. Adjoining are St. Agnes (R. C.), containing 112 acres, and Beth Emeth (Hebrew), 25 acres.

Education.—Albany has a high school for both sexes; 21 public schools; 3 boys' academies and 5 for girls; a medical college, a law school and a college of pharmacy, departments of Union University, and a State normal college. There are 13,134 pupils in the public schools and 4,500 in other schools. The Albany Institute is a society formed in 1791 for the advancement of science. It was merged with the Historical and Art Society (1901) under the style of Albany Institute and Historical and Art Society. The Dana Natural History Society (women), organized in 1868, is oldest of its class in U. S. The State Library has, with the law department (1901), 448,488 vols., 250,000 manuscripts, and 166,869 pamphlets; the 9 other public libraries, 59,020 vols.

Albany city has 3 state and 6 national banks, with a combined capital stock of \$2,150,000; surplus and undivided profits, \$2,782,609; individual deposits, \$9,478,735; loans and discounts, \$13,843,281. There are 7 savings banks, with \$52,514,632 in deposits; surplus, \$4,707,357; open accounts, 77,354. There are 9 shirt factories, 4 stove foundries, with an output in 1900 of 50,000 stoves valued at \$750,000; 4 knit-goods factories, 2 piano manufactories, a gas-meter works, one of the largest in the country; one billiard ball company, manufacturer of the celluloid billiard ball; the Albany perforated wrapping-paper company, the embossing company, the largest manufactory of dominoes and alphabet blocks in the U. S.; 2 cracker bakeries; 10 breweries, 12 iron foundries, and 3 candy manufactories. The lumber trade of 1900 amounted to \$8,000,000.

Albany is the center of a large industrial territory. There are 122 passenger and 250 freight trains sent from its Union railway depot daily.

There are 2 joint-stock and one mutual fire-insurance companies—The Albany Ins. Co., \$250,000, and Commerce Ins. Co., \$200,000 capital, and Mutual Fire Ins. Co., \$209,810 assets—one trust company, and one safe deposit company. Total mail matter handled (1900) 31,412,276.

The city is supplied with water from an artificial lake in the sand plains W. of the city, and also by pumping water from the river into elevated reservoirs after it has undergone thorough sand filtration. The fire department has 11 steam-engines, 3 trucks, 7 chemical engines, and a fire-alarm telegraph system. Pop. (1790) 3,506; (1870 with extended limits) 76,216; (1880) 90,758; (1890) 94,923; (1900) 94,151.

Revised by JAMES H. MANNING.

Albany: city: at junction of three railroads; capital of Linn co., Or. (for location of county, see map of Oregon, ref. 3-C); on the Willamette river, at the mouth of the Calapooia. Steamboats can ascend to this point for eight months in the year. Albany has a collegiate institute, Roman Catholic academy, woolen mills, electric lights, and is a manufacturing center. Pop. (1880) 1,867; (1890) 3,079; (1900) 3,149.

Albany, LOUISA MARIA CAROLINE, Countess of: b. at Mons, Sept. 27, 1753; daughter of Gustavus Adolphus,

Prince of Stolberg Gedern. On Mar. 28, 1772, in Paris, she married by proxy, and on Apr. 17 (Good Friday), 1772, at Ancona in person, the Young Pretender, Charles Edward Stuart, a grandson of James II. of England, then 52 years old and a habitual sot. The Young Pretender was called in Italy the Count of Albany, hence her title. After keeping up the wretched relationship for eight years she eloped with the poet Vittorio Alfieri, and lived with him openly as his mistress till his death in 1803. The Pretender had died in 1788, but she and Alfieri did not marry. She was received into the highest society, nevertheless, even in England. After Alfieri's death she lived with a young French artist named Fabre, and to him she bequeathed the curiosities given her by the Young Pretender and by Alfieri, together with other treasures, and these form the foundation of the notable Musée Fabre at Montpellier. D. at Florence, Jan. 29, 1824. See ALFIERI. See her life by Von Reumont (Berlin, 1860).

Albatross: a web-footed bird of the sub-family *Diomedinae*, allied to the petrels; remarkable for their great size and powers of flight. The wandering albatross (*Diomedea exulans*) is the largest of all oceanic birds, having wings which measure 12 feet or more from tip to tip, but



Albatross.

are narrow in proportion to their length. They wander over the open oceans, and often follow ships for days without resting. "Sometimes for a whole hour together," says the Duke of Argyll, "this splendid bird will sail or wheel round a ship in every possible variety of direction, without requiring to give a single stroke to its pinions." The wandering albatross is mostly confined to southern seas, rarely occurring as far north as the Tropics of Capricorn, although stragglers have reached Europe. Besides the above, there are the sooty albatross, *Diomedea fuliginosa*, of Eastern Asia, and the *Diomedea chlororhynchus*; and still other species are described, several of which are found in the North Pacific, but none on the Atlantic of the U. S. Revised by DAVID S. JORDAN.

Albay: a town in Luzon, one of the Philippine islands, 258 miles S. E. of Manila; the capital of a province (see map of East Indies, ref. 3-H). Pop. 19,546. Pop. of the province, 257,533.

Albemarle: a town of France. See AUMALE.

Albemarle, GEORGE MONK, Duke of: a famous English general, chiefly known to history as the principal agent in the restoration of the Stuarts in 1660, generally known in his own time as "Old Monk," and described by Guizot as a "person capable of doing great things, though himself not a great man." He was born of an ancient Devonshire family, at Potheridge, the residence of his father, Sir Thomas Monk, near Torrington, Dec. 6, 1608. He joined the army in order to escape punishment for mishandling a sheriff who was about to arrest his father for debt. In 1625 he engaged in the expedition against Spain, the unsuccessful attempt to capture Cadiz, made by a relative of his, Sir Richard Greenville, took part in the following year in the attack upon the isle of Rhé, and served ten years in the Netherlands, and afterward in England, first on the king's, then on Cromwell's side. After the defeat of the royalist cause Cromwell appointed Monk a lieutenant-general and chief of artillery, in which capacity he did such service at the battle of Dunbar that Cromwell made him general-in-chief of the army in Scotland. In 1652 he took part in the commission which drew up a pact of union between England and Scotland, and went to Scotland as governor in 1654; in which position he had great difficulties in maintaining his rule against the Presbyterians. The royalists had already some hopes of his support, and Charles sent him secret overtures in 1655. Monk delivered this letter up to Cromwell. After the death of the dictator, Monk declared in favor of Richard Cromwell, and assumed the authority of a defender of public order only when Lambert threatened to establish a military despotism. On the 1st of Jan., 1660, he marched over the border with 6,000 men, joining Fairfax at York, and marched into London on the 3d of Feb., without drawing sword from scabbard. At first he kept every one in

the dark as to his intentions. On Feb. 21 he recalled the Presbyterian members expelled from Parliament in 1648, thus creating a majority for the king. He held negotiations with Charles, and Parliament declared the latter king on the 8th of May. Charles gave Monk the offices of privy councilor, chamberlain, and Lord-Lieutenant of Devon and Middlesex, besides creating him Duke of Albemarle. In 1666 the Duke of Albemarle commanded the naval expedition against Holland, was beaten by De Ruyter in the three days' conflict at Dunkirk, but defeated the Dutch admiral at the North Foreland. D. in England, of the dropsy, Dec. 3, 1669. Revised by C. K. ADAMS.

Albemarle Sound: in the N. E. part of North Carolina, extends from the mouth of the Roanoke river 60 miles eastward to a narrow island which separates it from the Atlantic. Its average width N. and S. is about 12 miles. It communicates by narrow inlets with Pamlico and Currituck sounds. The water in it is nearly fresh. Its greatest depth is 24 feet; average depth, 20 feet.

Alberic I.: a ruler of Rome; b. in the beginning of the tenth century; son of a Lombardian noble. He became margrave of Camerino, and, through his marriage with the celebrated Marozia, ruler of Rome. He was banished by John X. from Rome, and was murdered at Orta in 925. His son, Alberic II., was a powerful and wise ruler, and died in 954, after a reign of twenty-three years. He was succeeded by his son, Ottaviano, who was elected pope under the name of John XII. in 956.

Alberoni, GIULIO, Cardinal: an ambitious Italian; b. at Fiorenzuola, near Piacenza, May 31, 1664. He began his public career as envoy of the Duke of Parma to the court of Madrid, and, having gained the favor of Philip V., became prime minister of Spain in 1715, and a cardinal in 1717. His foreign policy was so audacious and violent that nearly all the powers of Europe combined against Spain. Among his offensive acts was the invasion of Sardinia in time of peace. He was removed from office in 1719, and banished from Spain. D. at Piacenza, June 26, 1752. See Bersani, *Storia del Cardinale Giulio Alberoni* (1862).

Albers, JOHANN FRIEDRICH HERMANN: German physician; b. at Dorsten, Prussia, Nov. 14, 1805; became in 1831 Professor of Pathology in Bonn, established a celebrated asylum for insane and nervously affected persons in Bonn, and in 1856 became director of the pharmacological cabinet of the university. D. at Bonn, May 12, 1867. He published, among other works, *Handbuch der allgemeinen Pathologie* (2 vols., 1842-44); *Lehrbuch der allgemeinen Arzneimittellehre* (1853); and *Die Spermatorrhöe* (1862).

Albert: a French revolutionist and mechanic, whose original name was ALEXANDRE MARTIN; b. at Bury (Oise), Apr. 27, 1815. He founded in Paris in 1840 a journal called *L'Atelier* (The Workshop), and was a member of the provisional government formed in Feb., 1848, and was prominent in the defense of Paris in 1870.

Albert: Archbishop of Magdeburg and Elector of Mentz; b. at Brandenburg, June 28, 1490; created cardinal, 1518; and d. at Aschaffenburg, Sept. 24, 1545. Being granted by the pope the privilege of selling indulgences in his diocese, he employed the Dominican Tetzl in that service, and the shameless manner in which the latter conducted it called forth Luther's famous ninety-five theses. See his life by J. May (Munich, 1868-75, 2 vols.). See LUTHER, MARTIN.

Albert I.: King of Saxony; b. April 23, 1828; eldest son of King Johann I. and of Queen Amalie, daughter of King Maximilian I. of Bavaria. As crown prince he took part in the campaign in Schleswig-Holstein in 1849, was made lieutenant-general in 1853, and general in 1857, commanded the Saxon army in the war against Prussia in 1866, received the command of the twelfth army corps after the admission of Saxony into the North German Union, took part in the battles of Rezonville, Gravelotte, and Sedan in the Franco-German war of 1870, and received the command of the fourth army (of the Meuse). In July, 1871, he was created field-marshal of the empire, and soon after field-marshal of Russia. King Albert succeeded to the throne, at the death of his father, Oct. 29, 1873. He married, June 18, 1853, Queen Caroline, b. Aug. 5, 1833, daughter of Prince Gustav of Vasa. He has a civil list of 2,940,000 marks per annum, or about \$700,000; but the royal domains, consisting chiefly in extensive forests and some rich mines, became the property of the state in 1830.

Albert I.: Archduke of Austria; b. in 1248; son of the Emperor Rudolph of Habsburg. He was elected Emperor of Germany in 1298, but his title was contested by Adolphus of Nassau, who had occupied the throne. These rivals fought a battle, in which Adolphus was killed. Albert, who was noted for his cruelty and avarice, was assassinated at Windisch, May 1, 1308, by his nephew, John the Parricide. See his life by Mücke (Gotha, 1866).

Albert I.: Margrave of Brandenburg; surnamed THE BEAR; b. at Ballenstädt about 1106. He was the founder of the House of Brandenburg. D. Nov. 18, 1170.

Albert V.: a son of Albert IV.; b. Aug. 10, 1397; became Duke of Austria in 1404. He was chosen King of Hungary in 1437, and Emperor of Germany in 1438. His title as emperor was Albert II. D. near Vienna, Oct. 27, 1439.

Albert VII.: Archduke of Austria; son of the Emperor Maximilian II.; b. Nov. 13, 1559. He was appointed governor of the Netherlands in 1596 by Philip II. of Spain, whose daughter Isabella he married April 18, 1599. In 1600 he was defeated by Maurice of Nassau, who fought for the Dutch republic. The war was suspended in 1609 by a long truce. D. in July, 1621.

Albert (OF BRANDENBURG): first Duke of Prussia, a grandson of the preceding; b. at Ansbach, May 16, 1490. He was elected grand master of the Teutonic Order 1511, and was the last who held that office. In 1525 he became a Protestant and Duke of Prussia, which he held as a fief of the King of Poland. D. at Königsberg, Mar. 20, 1568.

Albert Edward: See EDWARD VII.

Albert Edward Nyanza: an African lake; one of the sources of the Nile; discovered by Stanley; lat. 1° S., lon. 30° E. It is about 40 miles across, and lies in a crescent, open northward, and about 50 miles from point to point. It is 100 miles N. W. of Victoria Nyanza, on the line between the Congo Free State and British East Africa. It drains by the Semliki river into the Albert Nyanza, and between these two lakes lie the Ruwenzori Mountains, which reach an altitude of 18,000 feet, and which Stanley believes to be the ancient "Mountains of the Moon." The lake was named after Albert Edward, Prince of Wales, in recognition of his interest in African geography. M. W. H.

Albert, EUGEN, d': pianist; b. in Glasgow, April 10, 1864; pupil of E. Pauer in London, and later of Liszt; author of overtures, concert pieces for the piano, an opera, *The Ruby*, etc.; is classed as a performer with Rubinstein and Liszt.

Albert Francis Augustus Charles Emmanuel, better known as *Prince Albert*: Prince of Saxe-Coburg-Gotha and consort of Queen Victoria; b. at Rosenau, near Coburg, Aug. 26, 1819. He was a son of Duke Ernest I. His marriage with Victoria was celebrated Feb. 10, 1840, soon after which he obtained the rank of field-marshal in the British army. He patronized science and art, was a liberal promoter of benevolent institutions, and acquired great influence in public affairs as the prudent and trusted adviser of the queen. In 1857 he received the title of prince consort. D. in London, Dec. 14, 1861. His death was lamented as a national loss. Compare Morton, *The Prince Consort's Farms* (1863); Grey, *The Early Years of the Prince Consort* (1867); *Leaves from the Journal of Our Life in the Highlands from 1848-61*; Theodore Martin, *Life of the Prince Consort* (Lond. 1875-80, 5 vols.).

Albert, FREDERICK RODOLPHE: Archduke of Austria; eldest son of Archduke Charles and Princess Henrietta of Nassau; b. Aug. 3, 1817. He married, in 1844, Princess Hildegard of Bavaria; d. April 2, 1864. He entered the army at the age of twenty; served in Hungary, Moldavia, and Silesia, and commanded a division in Italy, in 1849; fought with great distinction in the battles of Mortara and Movara. He was military and civil governor of Hungary from 1851 till 1860. He assumed the command of the 8th Army-corps at Vincenza in Oct., 1860, and on his appointment as field-marshal, April, 1863, was placed in command of the Austrian army during a leave of absence given to Field-Marshal Benedek. June 24, 1866, he won the brilliant victory at Custozza, and, returning to Austria, raised a new army of 200,000 men to repel the Prussian invasion of Bohemia. To him is due a great part of the credit for the terms secured from Prussia in the peace of 1866. July 13, 1866, he was made commander-in-chief of the Austrian army. He retained the title till Mar., 1869, when he exchanged it for that of inspector-general. D. in Arco, Aus-

tria, Feb. 18, 1895. Published *Responsibility in War* (1869), translated into French, and in English included in W. J. Wyatt's *Reflections on the Formation of Armies* (1869).

Albert Nyanza: a lake of Central Africa; head-waters of the White Nile: lat. 2° N., lon. 31° E.; about 100 miles long by 25 miles broad; 2,400 feet above sea-level. It receives the Semliki river from the Albert Edward Nyanza at the southern end and the Somerset river from Victoria Nyanza at the northern; a short distance from the mouth of the Somerset the waters of the lake empty into the White Nile. This lake was discovered in 1864 by Baker, who partially explored it, but erred in confounding its southwestern extremity with Albert Edward Nyanza and making it about 300 miles long, an error perpetuated on the maps for a quarter of a century. Later discoveries have shown that a group of lofty mountains, the Ruwenzori, lie between the two lakes.

M. W. H.

Albert, PAUL: French critic and literary historian; b. at Thionville, Dec. 14, 1827; made Professor of Literature in the Collège de France in Oct., 1878. His thesis for the doctor's degree in 1858 (*Saint Jean Chrysostome considéré comme orateur populaire*) was crowned by the French Academy. He has published *l'Histoire de la littérature romaine* (1871); *La littérature française depuis ses origines jusqu'à la fin du 18^e siècle* (3 t., 1872-79). Since his death two volumes, entitled *La littérature française au 19^e siècle*, have been brought out by his son. D. in Paris, June 21, 1880.

A. R. MARSH.

Alber'ta [named after the Princess Louise (more fully, Louise Caroline Alberta), Marchioness of Lorne]: a district of the Northwest Territories, and a future province of the Dominion of Canada. It lies E. of the Rocky Mountains and N. of the U. S. boundary, with Assiniboia and Saskatchewan on the E., Athabasca on the N., and British Columbia on the W. Area, 106,500 sq. miles. Pop. (1885) 15,533, of whom 2,855 were English, Scotch, and Welsh; 924 Irish, 831 French, 109 German, 9,418 Indian, and 1,237 half-breeds. The Athabasca and Saskatchewan rise in this district, while the extreme N. drains into the Peace river, and the extreme S. into the Missouri. The country consists of great plains gradually rising toward the W. from 2,000 to 4,000 feet, interrupted by occasional hills, and culminating in the backbone of the Rocky Mountains—here not very high. It is a great grazing country, except that severe cold occurs in winter, and stock must be protected and fed. The blizzard and chinook (*qq. v.*) are characteristic features of the winter climate.

The Canadian Pacific R. R. crosses Alberta from E. to W. near the southern border, and surmounts the Rocky Mountains at Kicking Horse Pass (5,323 feet). Capital, Calgary; chief towns, Edmonton, Lethbridge, Banff, the latter a health resort at the foot of the mountains. The production in pelts is large, but decreasing. It includes musk rat, deer, beaver, martin, mink, lynx, and wolf. Very little timber is produced. The fishing and mineral products are small. In 1885 the district contained 13,500 horses, 61,000 cattle, 17,000 sheep, and 4,000 swine. Pop. (1891) 25,277. M. W. H.

Alber'ti, JEAN: b. at Assen, Holland, Mar. 6, 1698; became minister at Harlem, and afterward Professor of Theology in Leyden; wrote theological works, and edited first volume of Hesychius's *Lexicon*. D. at Leyden, Aug. 13, 1762.

Alberti, LEON BATTISTA: Italian architect, poet, and writer on art; b. at Venice (or, as some say, at Florence), Feb. 18, 1404. He was employed as an architect by Pope Nicholas V.; completed the Pitti Palace at Florence, and built the church of St. Francis at Rimini, and the larger church of St. Andrea in Mantua. He was one of the two men (see BRUNELLESCHI) who introduced the classical style of design into Italy. He was a famous organist. His *Treatise on Architecture* (*De Re Ædificatoria*, 1485) is highly commended. D. in Rome, April, 1484 (others say 1472). See his life by Mancini (Florence, 1882).

Albertinell'i, MARIOTTO: Italian painter; b. in Florence, Oct. 13, 1474; was a pupil of Roselli, and a friend and imitator of Fra Bartolommeo, with whom he painted several pictures. Among his most celebrated paintings are the *Visitation of Mary and Elizabeth*, in Florence; *The Virgin Mary with Saint Domenico*, in the Academy at Florence; *Saint Catherine* and the *Virgin Mary with the Child*, in the Louvre. D. in Florence, Nov. 15, 1515.

Al'bertite: an asphaltic mineral found in Albert co., New Brunswick. The veins now remaining are small and

of little value. For a number of years prior to 1865 it was imported into Portland and Boston, and used in the preparation of illuminating oils—a use from which it was finally displaced by the discovery of petroleum. It occurs in veins nearly vertical that intersect the Albert shales, which are very rich in fossil remains of fish. It is a brilliant black mineral resembling jet, but softer, being easily cut with a knife. Subjected to distillation it yields a distillate composed mainly of the marsh gas or paraffine series of hydrocarbons. It is not at present of commercial importance. See ASPHALT and BITUMEN.

S. F. PECKHAM.

Albert Lea: city and railroad junction; capital of Freeborn co., Minn. (for location of county, see map of Minnesota, ref. 11-E); 128 miles W. of the Mississippi river, 108 miles S. of Minneapolis. It is beautifully situated between two lakes, one of which bears its name, and the surrounding country of undulating prairie and timber is charmingly picturesque. An abundance of game has made it a popular resort. It has a public park, library association, 16 churches, a young woman's college, a Lutheran academy, a high school, and 15 manufactories; numerous artesian wells yielding chalybeate waters, water-works, and electric lights. Pop. (1880) 1,966; (1885) 3,365; (1890) 3,305; (1900) 4,500.

EDITOR OF "STANDARD."

Albert Memorial: a large and costly monument erected in Hyde Park, London, in memory of Prince Albert, shortly after his death, from the designs of Sir George Gilbert Scott.

Alber'tus Mag'nus (i. e. Albert the Great), sometimes called *Albert von Bollstätt*: b. at Lauingen, Suabia, 1193; became a Dominican 1223; lectured for many years at Cologne and at Paris, and wrote numerous works on theology, logic, philosophy, and other subjects. In 1254 he was chosen provincial of the Dominican Order, and in 1260 became Bishop of Ratisbon. The episcopal office, however, was very uncongenial to him, and after the lapse of two years he was allowed to resign and retire to Cologne. He was reputed one of the most learned men of the Middle Ages, hence called by his contemporaries "Doctor Universalis," and was regarded as a magician by some of his contemporaries, for in the estimation of that superstitious period extraordinary ability implied a league with the devil. The great scientific exploit which made his name celebrated was the introduction of the complete system of Aristotle to the understanding of his age, which he effected by a kind of paraphrasing or loose reproduction, not of the Greek originals, but of the Arabic versions and commentaries, *De Prædicamentis, Super Octo Libros Physicorum*, etc. D. at Cologne, Nov. 25, 1280. Thomas Aquinas was one of his disciples. (See PHILOSOPHY.) Cf. his life, by J. Sighart (Regensburg, 1857; Eng. trans., Lond. 1876). His works, edited by Jammy, appeared at Lyons, 1651, 21 vols.; n. e. more complete, in 36 vols., by Borgnet (Paris, 1890, *sqq.*).

Al'bi, or **Al'by** (Lat. *Albi'ga*): an old city of France; capital of the department of Tarn; seat of an archbishop; on the river Tarn, and on a hill 42 miles N. E. of Toulouse (see map of France, ref. 8-F). It has a museum of natural history, a college, a normal school, a cathedral, a public library, and a theater; also manufactures of coarse linens, tablecloths, and cotton goods. The Albigenes derived their name from this town, which suffered much in the religious wars of France. Pop. (1881) 20,379; (1897) 21,490.

Albia: city; capital of Monroe co., Ia. (for location of county, see map of Iowa, ref. 7-H); 100 miles by rail N. W. of Burlington, and about 65 miles S. E. of Des Moines. The county is mostly underlaid with coal of a good quality, and mines have been opened in numerous places. Pop. (1880) 2,435; (1885) 2,142; (1890) 2,359; (1895) 2,588; (1900) 2,889.

Albigen'ses [from *Albi'ga*, the Latin name of Albi, a town of France, which was their starting-place]: an anti-sacerdotal sect in the south of France, allied to the Catharists. They derived their creed from the PAULICIANS (*q. v.*), but exactly what it was is now impossible of statement, as we have only the exaggerated and perverted statements of their foes to go upon. The one fact which led to their extinction was their opposition to the Church of Rome. They were apparently moral and orderly, and their opposition sprang from their belief in that Church's spiritual degeneracy. In the middle of the twelfth century they took possession of the church buildings, drove the Roman Catholic priests away, elected priests and bishops of their own, and finally held a great synod at Lombers, near Albi, 1165, in order to perfect their organization. The Roman *curia* was

startled at these proceedings. They were condemned by Councils held in 1165, 1176, 1178, 1179, but more vigorous measures were then taken. In 1208 Pope Innocent III. proclaimed a crusade against these reformers and against Raymond VI., Count of Toulouse, one of their principal leaders. A large army was led against them by Count Simon de Montfort. The war was carried on with great bitterness of feeling on both sides, and with little intermission, till 1229, when a treaty between the contending parties was concluded at Paris. Many of the Albigenes emigrated to other countries, while others perished in the Inquisition, which was established about the same time that the pope proclaimed his crusade. The name gradually disappears in the early part of the fourteenth century. See Faber's *Inquiry into the History and Theology of the Ancient Vallenses and Albigenes* (Lond. 1838); Hefele's *Conciliengeschichte*, v.; and N. Peyrat, *Histoire des Albigois* (2 vols., Paris, 1880-82).

Albi'na: a former city of Multnomah co., Or. (for location of county, see map of Oregon, ref. 1-C); on Union Pacific R. R. and Willamette river, opposite PORTLAND (*q. v.*), with which it was consolidated in 1891.

Albi'no [Port., from the Lat. *albus*, white]: a person who has congenitally a great deficiency or an absence of pigment in the hair, skin, and eyes. The complexion is very light, the hair often snowy white, the eyes red. Albinism in the human species may be observed in white and black races, and in the Negro is sometimes partial, patches of the skin having the normal color. Such patches of white skin may occur as an acquired disease, in which case the term vitiligo is applied. Interesting examples of albinism were those known as the Cape May albinos, where Negro parents had six children—three albinos, and the other three black. Albinism is frequent among Zuñi Indians and other tribes in Arizona. A degree of nyctalopia (day-blindness) is common among albinos. Elephants, birds, mice, and other animals sometimes exhibit the phenomena of albinism, which is often hereditary.

Revised by WILLIAM PEPPER.

Al'bian: the ancient Celtic name of Great Britain. The name, said to signify "white island," is supposed by some, though without good reason, to have been given on account of the chalky cliffs of Kent.

Albion: on railroad; capital of Noble co., Ind. (see map of Indiana, ref. 2-F, for location of county); about 26 miles N. W. of Fort Wayne; is situated in a farming country. Pop. (1870) 476; (1880) 926; (1890) 1,229; (1900) 1,324.

Albion: city and railroad center of Calhoun co., Mich. (for location, see map of Michigan, ref. 8-I); on the Kalamazoo river; 37 miles S. of Lansing, 96 miles W. of Detroit, and 20 miles W. of Jackson; on the Michigan Central, Lake Shore and Michigan Southern R. R. It is the seat of Albion College, under the control of the Methodist Episcopal Church. The city has fine primary-school buildings, besides an excellent central school, large flouring and other mills, door, sash, and blind factories, a tannery, and extensive agricultural tool manufactory, malleable-iron works, carriage-factory, harness-factory, machine shop and furnace, and a library. Pop. (1880) 2,716; (1890) 3,763; (1900) 4,519.

EDITOR OF "RECORDER."

Albion: capital of Orleans co., N. Y. (for location of county, see map of New York, ref. 4-D); on the New York Central R. R. and Erie Canal; 30 miles W. of Rochester; has a brick court-house, a jail, public parks, a free library, 7 schools, 8 churches, 5 newspapers, fine opera-house, electric lights, grain and fruit warehouses, and several important manufactories of mowing-machines, plows, carriages, shoes, soap, etc. Pop. (1880) 5,147; (1890) 5,773; (1900) 5,749.

EDITOR OF "HERALD."

Albion, Dane co., Wis. (for location of county, see map of Wisconsin, ref. 7-D); is situated in an important tobacco-growing region. Albion Centre is the seat of Albion Academy, under the patronage of the Seventh-Day Baptist denomination. Pop. of township in 1870, 1,142; (1880) 1,351; (1885) 1,518; (1890) 1,516; (1900) 1,590.

Albistan', or **El Bostan'** (i. e. the garden): a town of Asiatic Turkey, pashalic of Marash; in a plain; on the river Sihun, near the northern base of Mt. Taurus; 32 miles N. N. W. of Marash (see map of Turkey, ref. 5-II). It has several mosques, and a trade in wheat. Pop. 9,000. Here the Egyptian Sultan Bibars defeated the united Turks and Mongolians in a great battle on April 16, 1277.

Al'bite [from the Lat. *al'bus*, white]: a silicate of alumina and soda, sometimes called soda felspar. It is a constituent of granite, being associated with true felspar, from which it may be distinguished by its greater whiteness and translucency. It also occurs in syenite and greenstone.

Albo, JOSEPH: Jewish scholar of Spain; d. 1428. He took part in the public discussion between Jews and Christians held before Benedict XIII. in 1412. He continued the work of Maimonides (*q. v.*). According to him, the fundamental dogmas of Judaism are the existence of God, the law of Moses, and the future life. C. H. TOY.

Al'boin: the founder of the Lombard kingdom in Italy; was a son of Alduin, whom he succeeded in 543 A. D. He conducted an army of Longobards into Italy in 568, and conquered the northern provinces. He married Rosamund, a daughter of King Cunimund, King of the Gepidae, whom he had killed, and whose skull was made into a drinking-cup from which Alboin forced Rosamund to drink, June 8, 573 A. D. Rosamund in revenge had him assassinated that day.

Albo'ni, MARIETTA: opera singer; the most celebrated contralto of the nineteenth century; b. at Cesena, Romagna, Italy, Mar. 10, 1823; studied under Mme. Bertolotti in Bologna, and later under Rossini; made her first appearance at La Scala, Milan, 1843, and sang with great success in Europe and in the U. S. She married Count Pepoli, after whose death, in 1863, she retired from the stage. She afterward married Capt. Charles Zieger. She sang in Rossini's mass in 1871, and also on the celebration of Rossini's centenary, Feb. 29, 1892, when she declared that she would never sing again, even in her own home. D. in Paris, June 23, 1894. D. E. HERVEY.

Al Borâk' (i. e. the lightning, so called on account of its fleetness): the name of the fabulous milk-white creature on which Mohammed is said to have made journeys to the celestial regions.

Albornoz', GIL ALVAREZ CARILLO, or **Ægid'ius de Albornoz'**: a Spanish cardinal; b. at Cuenca, 1310. He was appointed (1339) Archbishop of Toledo by Alfonso XI. of Castile, whose life he saved in a battle against the Moors, and made cardinal 1350. In 1353 Pope Innocent VI. sent him as legate to Italy, where he distinguished himself by his military and political talents, and restored the authority of the pope over many cities. D. at Viterbo, Aug. 24, 1367.

Al'brecht: the name of many German princes and others. See ALBERT.

Al'brechtsberger, JOHANN GEORG: a learned contrapuntist; b. at Klosternenburg, near Vienna, Feb. 3, 1736; became director of the choir of the Carmelites in Vienna; organist to the court in 1772; musical director at St. Stephen's cathedral in Vienna in 1792, and died Mar. 7, 1809. He published *Gründliche Anweisung zur Composition* (1790; 3d ed. 1821). He was the instructor of Beethoven and other eminent musicians.

Albret, JEANNE, d', zhaan dal'brā: Queen of Navarre; b. at Pau, Jan. 7, 1528; daughter of Henry II. of Navarre, and Margaret, sister of Francis I.; married Antoine de Bourbon (1548); was celebrated for personal beauty and strength of character; embraced Calvinism and succeeded in retaining her kingdom; declared Protestantism established in her dominions, 1567; with her children, Henry and Catharine, and a small band of Huguenots, joined Coligny at La Rochelle, 1569; was regarded after the assassination of Condé as the only remaining support of the Huguenots; wrote both in prose and verse, some of her sonnets having been published. D. in Paris, June 9, 1572. C. H. THURBER.

Al'bright, JACOB: divine of the Lutheran Church; b. near Pottstown, Montgomery co., Pa., May 1, 1759. He founded, in 1808, the EVANGELICAL ASSOCIATION (*q. v.*). D. at Mühlbach, Lebanon co., Pa., in May, 1808.

Albuera, La, laa-aäl-bwā'ra: a village of Spain; in Estremadura; on a small river of its own name; 13 miles S. E. of Badajoz (see map of Spain, ref. 17-C). Here on May 16, 1811, the British under General Beresford defeated the French under Marshal Soult, who lost nearly 9,000 men. The allies lost about 7,000. Pop. about 600.

Albufera, al'-boō-fa'y'ra: a coast lagoon near Valencia, Spain; abounding with fish and fowl, its banks studded with rice plantations; owes its fame to the defeat (1811) of the Spanish by MARSHAL SUCHET (*q. v.*). The lake and domain were conferred on him by Napoleon, with title of Duc d'Albufera.

Albu'men, or **Albumin** [Lat. *albu'men*, the white of an egg, from *albus*, white]: in chemistry, an organic compound of great importance, which, besides being the characteristic ingredient in the white of an egg, abounds in the serum of the blood, in chyle, lymph, the juice of flesh, and forms an important part of the skin, muscles, and brain. In Bright's disease it is found in considerable quantity in the urine. "It is obvious," says Liebig, "that albumen is the foundation, the starting-point, of the whole series of peculiar tissues which constitute those organs which are the seat of all vital actions." Albumen is also found in small quantities in most vegetable juices.

When heated to a temperature from 140° to 160°, albumen coagulates and becomes insoluble in water. It is also coagulated by alcohol and most of the acids. It contains the elements carbon, hydrogen, oxygen, nitrogen, and sulphur, and has a very complex composition. The fibrine of the muscles and the albumen of blood contain the same elements in about the same proportion.

Egg albumen differs from serum albumen by being precipitated by ether.

Coagulated albumen is white, opaque, and elastic. It dries to a brittle, translucent, horny mass, which when placed in cold water swells up to its original form.

The white of an egg is recommended as an antidote to corrosive sublimate, mercuric chloride, as it forms mercuric albuminate, which is insoluble in water. As it is, however, slightly soluble in saline solutions, the physician should also secure vomiting, to remove the mercury from the stomach. Albumen is much used for clarifying sirups and other liquids. When boiled with them, it coagulates to flocks, entangling the suspended impurities, and carrying them either to the surface as a scum or to the bottom as a sediment. In cooking, the white of egg is employed; in sugar-refining, bullock's blood. Albumen is also used for preparing the surface of paper for photographic printing, and for making a cement with lime.

Egg and serum albumen are now manufactured in large quantities by simply drying the natural fluids in thin layers in warm air, taking care that the temperature shall not be so high as to coagulate the albumen, and thus render it insoluble. The chief application of this albumen in the arts is in calico-printing. It is employed in fastening certain colors upon the fibers of cotton cloth, especially pigments such as ultramarine, chrome yellows and oranges, Guignet's green, etc., and also the aniline colors. The pigments or colors are simply mixed with a solution of albumen, printed on the cloth, and fixed by steaming, which coagulates the albumen and renders it insoluble. A dark-colored, inferior quality of serum albumen, sold under the name of "dried blood," is used by sugar-refiners to clear the solutions of raw sugar.

All albuminoids found in animals owe their origin to processes that take place in plants. See ALBUMINOIDS.

Revised by IRA REMSEN.

Albumen: the old name for the food stored up in the seed of the young plant. See ENDOSPERM.

Albumin: See ALBUMEN.

Albu'minoids, or **Proteids**: an extensive class of organic bodies found in animals and plants. They form the chief constituents of blood, muscles, nerves, glands, and other organs of animals; and though present in plants in much smaller proportions than cellulose, starch, sugar, etc., they still play a most important part in plant-life. Their exact constitution has not been determined. Analysis shows them to contain—

Carbon,	50-55 per cent.
Hydrogen,	6.9-7.5 "
Nitrogen,	15-18 "
Oxygen,	20-24 "
Sulphur,	0.3-2.0 "

They are amorphous, more or less soluble in water, insoluble or nearly so in alcohol, insoluble in ether, soluble in excess of strong acetic acid, soluble in alkalies, and soluble in strong mineral acids. From their solutions they are precipitated by excess of mineral acids, by potassic ferrocyanide with acetic or hydrochloric acid, by acetic acid in presence of a considerable quantity of alkaline or alkaline earthy salt, gum-arabic or dextrine, by mercuric nitrate, Millon's re-agent.

They have been classified as follows:

I. Albumens, soluble in water: 1. Serum albumen; 2. Egg albumen.

II. Globulins, insoluble in water, soluble in very dilute acids and alkalies, soluble in dilute solutions of sodic chlo-

ride and other neutral salts: 1. Myosin; 2. Globulin; 3. Fibrinogen; 4. Vitellin.

III. Derived albumens, insoluble in water and in solutions of sodic chloride; soluble in dilute acids and alkalies: 1. Acid albumen; 2. Alkali albumen, or albuminate casein.

IV. Fibrin, insoluble in water, sparingly soluble in dilute acids and alkalies, and in neutral saline solutions.

V. Coagulated albuminoids.

VI. Amyloid substance, or lardacein.

VII. Peptones, produced by the action of the gastric juice on all albuminoids.

For further information on this important class of bodies see Hoppe-Seyler, *Handbuch der physiologisch-chemischen Analyse*; the *Handwörterbuch der Chemie*, 2t. Auf. II., p. 124; and *A Dictionary of Applied Chemistry*, T. E. Thorpe.

Revised by IRA REMSEN.

Albuminuria, ăl-byu-mi-nyu'ri-a [from *albumin-* and the Lat. *urina* (from Gr. *οὔρον*) urine]; the condition in which albumin occurs in the urine, and a most important symptom of disease. This condition was first recognized by one Nicholas Cotunius in 1770, and by him described as "coagulable urine." Later the relation to forms of dropsy and then to Bright's disease was determined. The connection between Bright's disease and albuminuria is of the greatest importance, but it is to be remembered that this symptom may occur in a variety of other conditions and in health. Of particular interest are those cases of "cyclic albuminuria" in which albumin appears in the urine at definite periods of the day or at longer intervals. These cases occur in boys at the age of adolescence, more rarely in girls, and their nature is obscure. After persisting for some length of time the albumin disappears from the urine and no further symptoms are noted. Again in certain persons there may be periodical albuminuria coincident with attacks of indigestion. In others exercise, cold bathing or a variety of causes bring about the temporary appearance of this symptom. It has been found by experiment that tying the emulgent veins of the kidneys in lower animals causes albuminuria by obstructing the flow of blood; and a similar explanation may be offered for the occurrence of the symptom in man in heart disease, tumors in the abdomen, or some cases of pregnancy, in all of which the outflow of blood from the kidneys is impeded. Besides the above a great variety of conditions may be accompanied by albuminuria, independent of kidney disease. The explanation of the occurrence in Bright's disease itself is not entirely settled. In some cases it may be due to disease changes which cause obstruction of the blood-vessels within the kidney; in other cases it may be disease of the vessels themselves which permits a ready escape of albumin from the blood; in still other cases degeneration of the epithelium lining the renal tubules may be the cause of the transudation. The loss of the albumin, however it occur, is doubtless of itself partly the cause of some of the other symptoms of Bright's disease, such as progressive weakness and anæmia. In certain rare cases of the disease albuminuria may be so slight as to escape detection by our ordinary tests. In others the amount of albumin is so great that on boiling the urine in a test-tube a solid coagulum results which remains in the tube on inverting it.

Besides the ordinary form of albuminuria, in which serum albumin and globulin, the albumins of the blood, appear in the urine, there are various modified forms, in which other albumins occur. In the cases due to indigestion egg albumin is sometimes found in the urine. Again peptones, hemialbumose, and various other forms occur, but are as yet little understood and require special tests for their detection.

Albuminuria is recognized by various tests, of which the two following are most useful: (1) On boiling the urine, mildly acidified with nitric or acetic acid if not already acid in reaction, a coagulation of greater or less distinctness is manifest. The test is made more delicate if the upper portion of the fluid in the test-tube is heated. The contrast of the coagulated with the non-coagulated portion is easily detected. (2) If strong nitric acid be poured into a test-tube, and on the surface of this from a pipette held in an almost horizontal direction a little of the urine, a ring of coagulated albumin will appear at the junction of the two liquids.

The treatment of albuminuria depends entirely upon the condition which causes it. In all cases hygienic measures are of prime importance.

WILLIAM PEPPER.

Albuquerque, al-boo-ker'kay: a town of Spain; province of Badajoz, 26 miles N. of Badajoz (see map of Spain, ref.

17-C). It is 9 miles from the frontier of Portugal, is built on high ground, and is defended by a very strong fortress situated on a mountain. The town was taken in 1705 by the allies of Charles, who was a claimant of the Spanish throne; but it was restored to Spain in 1715. It has a castle and manufactures of cotton and wool. Pop. 7,214.

Albuquerque: town; capital of Bernalillo co., N. M. (for location of county, see map of New Mexico, ref. 10-R); on the Rio Grande, and the Atch., Top. and S. Fé and the Atlantic and Pac. railways; 75 miles S. W. of Santa Fé, the capital of the Territory; at an elevation of 5,000 feet above sea-level. It is in a gold, silver, iron, and coal mining region; has an extensive trade in wool, hides, grain, and wine; is substantially built; and has improved water-works, gas and electric light plants, street-railway, a national bank with capital of \$150,000, a territorial bank with capital of \$75,000, and 3 daily and 3 weekly newspapers. Pop. (1880) 2,315; (1890) 3,785; (1900) 6,238. EDITOR "MORNING DEMOCRAT."

Albuquerque, or **Alboquerque**, AFFONSO, de (surnamed THE GREAT and THE PORTUGUESE MARS): a celebrated general; b. at Alhandra, near Lisbon, in 1452, was related to the royal family. After he had distinguished himself in several expeditions to Africa and the East Indies, he was appointed viceroy of the Indies in 1509. He took the city of Goa in 1510, and conquered Malacca, in which he obtained booty of great value, in 1511. In 1513 his fleet entered the Red Sea, which had never before been navigated by Europeans. He captured the rich emporium of Ormuz in 1515. Having been removed from command, he died at Goa Dec. 16 of that year. He is said to have been eminent for justice and other virtues, which, combined with his military skill, greatly increased the power of Portugal in India.—BRAS AFFONSO ALBOQUERQUE, a natural son of the preceding, was born at Alhandra in 1500. He was a naval officer, noted for his integrity and public spirit. He wrote a narrative of his father's campaigns, *Commentarios do grande Affonso d'Albuquerque*. D. in 1580. English translation by the Hakluyt Society (Lond. 1875-83), and letters which were published in Lisbon, 1884.

Albuquerque, JERONYMO, de: Portuguese soldier; b. about 1514; emigrated to Pernambuco about 1535, and took part in various wars between the colonists and the Indians. On Jan. 2, 1548, he was captured by the Cahatés, but succeeded in gaining their friendship, married the daughter of their chief, and finally brought about the pacification of this powerful tribe. D. at Olinda, near Pernambuco, Feb. 26, 1594. H. H. SMITH.

Albuquerque Maranhão, JERONYMO, de: Brazilian soldier; son of Jeronymo de Albuquerque and the Indian Maria do Espirito Santo, daughter of the Cahaté chief Arco Verde; b. in Pernambuco in 1548. He early accompanied his white father or Indian grandfather in war expeditions, and became an adept in predatory warfare; as leader of an incursion from Pernambuco he conquered Rio Grande do Norte in 1598-99; passed to Ceará in 1613; recovered Maranhão from the French (June 17, 1614), and was soon after made captain-general of that province. D. at Maranhão, Feb. 11, 1618. See Macedo, *Anno Biographico Brasileiro*, tome i, p. 177; Porto Seguro, *Historia Geral do Brazil*; Denis, *Introduct.* to his edition of *Yves d'Evreux*, etc. H. H. SMITH.

Albur'num [from Lat. *albus*, white], or **Sapwood**: that part of the wood of exogenous trees which is most recently formed and is contiguous to the bark. It is of a white or pale color, whence its name is derived. It gradually hardens with age, and is converted into duramen or heart-wood, which is more valuable than alburnum.

Alcæus (Ἀλκαῖος): one of the nine lyric poets of the Alexandrian canon; b. at Mytilene about 600 B. C. A man of war, a bitter partisan, a hearty hater, a thorough aristocrat, he was a sworn foe of the tyrant Myrsilus and of the wise and moderate stadtholder Pittacus. He composed in the fiery Æolic dialect, and the alcaic meter, which bears his name, is full of movement. Even the scant fragments, one of which is addressed to Sappho, breathe passion and energy. To Horace he was a paragon, and in some of Horace's best known odes we have reflexes of Alcæus. Fragments in Bergk's *Poete Lyrici Græci*. B. L. GILDERSLEEVE.

Alca'ic Me'ter: in Greek and Latin poetry, a logæedic (see LOGÆDIC) measure, named after Alcæus. The greater alcaic consists of a preliminary syllable, a trochaic dipody, an irrational dactyl (see DACTYL), and a catalectic trochaic

dipody; the lesser alcaic of two irrational dactyls followed by a trochaic dipody.

1. For | tē's cre | a'ntur | fo'rtibus | e't bo | nī's.
2. De'deco | ra'nt bene | na'ta | cu'pæ.

Alcaide: See **ALCAYDE**.

Alcala' de Hena' res: a city of Spain; in the province of Madrid; on the river Henares; 21 miles by rail E. of Madrid (see map of Spain, ref. 15-F); built in 1083 near the site of the ancient Complutum. It was the seat of a celebrated university founded by Ximenes, which has been removed to Madrid. After this removal Alcalá (which had 22,000 inhabitants in 1768) rapidly declined. Cervantes was born here in 1547. The celebrated Complutensian Bible was printed at Alcalá in 1514. Pop. 12,317.

Alcala' la Real': a city of Spain; in the province of Jaen; stands in an elevated glen about 2,700 feet above the sea, and 24 miles S. W. of Jaen (see map of Spain, ref. 19-E). It has a court-house, several convents, a hospital, etc. Pop. 15,901.

Alcal'de [Span. adaptation of Arab. *al-gā-dī*, the judge]: the title given by the Moors, Spaniards, and Spanish-American nations to a judicial or administrative officer; is sometimes erroneously confounded with *alcayde*. *Alcalde pedáneo* signifies justice of the peace.

Alcarnenes, al-kam'e-neez: sculptor of the fifth century B. C. Ancient writers have great praise for his work, and it has been assumed that he was a pupil of Phidias. Since the discovery of the sculptures at Olympia, which are stated by Pausanias to be his work, it is thought rather that he was a contemporary and rival of Phidias. The Olympia sculptures, indeed, are earlier in style and more nearly archaic in character than those of the Parthenon. These sculptures, which were a part of the temple of Zeus, are extremely powerful and vigorous; the western pediment contained the battle of the Centaurs and Lapithæ, and the metopes are of varied subject connected with the labors of Hercules.

RUSSELL STURGIS.

Al'camo: a town on the island of Sicily, in the province of Trapani, 24 miles S. W. of Palermo; has a college and picturesque ruins of an old castle (see map of Italy, ref. 9-E). Pop. 39,016.

Alcántara (i. e. the bridge): a town of Spain; province of Cáceres; on the left bank of the Tagus, near the Portuguese boundary (see map of Spain, ref. 16-C). Here are ruins of a grand bridge built by the Emperor Trajan in 103 A. D., of which a triumphal arch 40 feet high still remains. The Duke of Alba here defeated the Portuguese in a great battle on Aug. 25, 1580. Pop. 3,300.

Alcántara, Order of, also called the **Order of Saint Julian**: a religious order of Spanish knighthood, founded in 1156 at Alcántara for the defense of the Christians against the Moors. In 1495 the office of grand master of this order was united to the Spanish crown; in 1835 it was changed from an ecclesiastical to a court order. Their crest was a pear-tree.

Alcatraz' (or Alcatrazes) Island, sometimes called Pelican Island: in the bay, 2½ miles N. of San Francisco, Cal. Length, 1,650 feet; height, 130 feet. It is fortified, and commands the entrance of the Golden Gate. On its summit is a lighthouse 36 feet high, in lat. 37° 49' 27" N., lon. 122° 24' 19" W.

Alcava'la, or Alcaba'la [Span. adaptation of Arab. *al-gabālah*, the tax; cf. Fr. *gabelle*]: a tax formerly imposed in Spain and her colonies on all property sold, and payable as often as it changed hands. This tax, which was at first 10 and afterward 14 per cent. *ad valorem*, was very injurious to the prosperity of the country.

Alcayde [Span. adaptation of Arab. *al-gā'id*, the captain]: a jailer or inferior magistrate among the Spaniards, Portuguese, and Moors.

Alca'zar Kebîr' (the great castle): a decayed city of Morocco; 83 miles N. W. of Fez (see map of Africa, ref. 2-B). Pop. in 1864 about 25,000; now only about 6,000. Near it is a bridge (*Alcántara*) where Sebastian, King of Portugal, was defeated and killed, Aug. 4, 1578.

Alces'tis: in classic mythology, a daughter of Pelias and the wife of Admetus, King of Thessaly. The poets feigned that she prolonged the life of her husband by suffering voluntary death as his substitute, and was rescued from Hades by Hercules. The story of her devotion is the subject of one of the tragedies of Euripides.

Al'chemy [from Arab. *al-kīmīā*: *al*, the + *kīmīā*, loanword from Gr. *χημία*, art of transmuting metals, probably so called from native name of Egypt, *Khami*]: the occult science or art of transmuting the baser metals into gold. Some writers suppose that alchemy originated in Egypt, the ancient name of which was *Chem* (dark, mysterious), and that it was introduced into Europe by the Arabs. The origin of alchemy seems to be connected with the widespread notion that the manifold forms of matter have a common basis, and that the individual properties of material bodies are due to formative force separable in thought, if not in fact, from this common substratum. Hence it followed that if this first matter could be dissolved or separated from all special formative forces, and the special "form" of gold or other precious substance discovered and got under control, these or any material body could be produced at will. From this point of view we may understand the reason of the alchemists' search for the "universal solvent" and for the special "forms" of things. The union of the *materia prima* and the "form" of gold would produce the actual metal. In like manner, if the vital principle or form of the bodily organization could be found and controlled, the tendencies to disease and decay in the bodily organization could be resisted. Hence the search after the elixir of life and the philosopher's stone. It was this search after "forms" and the *materia prima* which so vitiated the method of the Middle Age investigators. It was a reaction against this false analysis of Aristotle which led to the bitter opposition to his name and doctrines which marked the rise of modern science in Europe. When belief in the reality of the Aristotelian analysis passed away, alchemy ceased.

In the Middle Ages the alchemists expended immense labor and time in experiments, the object of which was to discover the philosopher's stone and an elixir vitæ (the elixir of life) which could cure all diseases and restore old people to youth. Many useful discoveries were the results of these visionary pursuits, in which the most eminent men of those times took part. Roger Bacon (1214-92) was a believer in the doctrine that base metals can be transmuted into gold. The works which he wrote on alchemy are the oldest extant European writings on that subject. Among the other famous alchemists were Basil Valentine, R. Lully, and Paracelsus. As late as the sixteenth century many men of superior intellect devoted their time and money to alchemy, and hoped to discover the grand arcanum. According to Liebig, "The great (Francis) Bacon, Luther, Benedict Spinosa, and Leibnitz believed in the philosopher's stone, and in the possibility of the transmutation of metals." (*Familiar Letters on Chemistry*.) The same writer affirms that "alchemy was never at any time anything different from chemistry. It is utterly unjust to confound it, as is generally done, with the gold-making of the sixteenth and seventeenth centuries. Among the alchemists there was always to be found a nucleus of genuine philosophers, who were often deceived in their theoretical views; whereas, the gold-makers, properly so called, knowingly deceived both themselves and others." See **CHEMISTRY**.

Alcia'ti, ANDREA: Italian lawyer; b. at Alzato near Milan, May 8, 1492. He lectured on law at Bourges from 1528 to 1532, after which he was Professor of Law at Bologna, Pavia, and Ferrara. He wrote, besides other works, *Commentaries on the Digest*, and a book of emblems. D. in Pavia, Jan. 12, 1550. Erasmus said of him, as Cicero said of Scævola, "He was the most jurisprudent of orators, and the most eloquent of lawyers." His complete works appeared, Basel, 1546-49, 6 vols., and were several times reprinted.

Alcibiades, al-si-bi'a-deez, or al-si-bee'a-deez: famous Athenian general and politician; b. of a noble family about 450 B. C.; son of Cleinias. He was educated at the house of his mother's second cousin, the illustrious Pericles, and inherited a large estate. From nature he received great personal beauty and transcendent abilities, with strong passions and proclivities to licentious habits. As a favorite pupil and companion of Socrates, he enjoyed in his youth great advantages for the cultivation of his mind. (See **SOCRATES**.) In 421 B. C. he began his political career as the leader of the democratic party and an opponent of Nicias, who advocated peace with Sparta. Having induced the Athenians to send a great expedition (in 415 B. C.) against Syracuse, the ally of Sparta, he was chosen to command it, in conjunction with Nicias and Lamachus. Soon after the fleet had reached Sicily, Alcibiades was recalled to defend himself against a charge of sacrilege, but he escaped to

Sparta, and in his absence was condemned to death by the people of Athens. He acquired much influence with the Spartans, whom he aided in their operations against his native country, but several jealous Spartan leaders having conspired against him, he fled to the Persian satrap Tissaphernes, and again changed sides. The next scene in the drama of his eventful and wayward career presents him as the commander of the Athenian fleet in 412 B. C. He defeated the Spartans at Abydos in 411, and at Cyzicus in 410 B. C. Having by these and other victories restored the naval supremacy of Athens, he returned in triumph to the capital in 407, and regained his popularity. He was removed from the command in 406, in consequence of a reverse which his fleet suffered in his absence, and he again went into exile. He sought refuge in Phrygia, where he was assassinated by night in 404 B. C. See Plutarch's *Life of Alcibiades*; Grote's *History of Greece*, vol. viii.; Thirlwall's *History of Greece*.

Alcidamas (Ἀλκιδάμας): pupil of Gorgias and rival of Isocrates. Of the two declamations attributed to him, the one *Against the Sophists* is clever and interesting. Text in Blass's second edition of *Antiphon*, p. 193. See F. Blass, *Attische Beredsamkeit*, ii. 345-63.

Alciphron (Ἀλκιφρων): a Greek epistolary writer, about 180-200 A. D., of whom we have 118 fictitious letters representing the manners and opinions of various classes of society. The material is drawn largely from the New Comedy; the style is pure for the period. Valuable edition by Bergler, reproduced with additions by Seiler (1856).

Revised by B. L. GILDERSLEEVE.

Alcira, aal-thee'ra: an ancient walled town of Spain; on an island in the river Jucar; in the province of Valencia; 25 miles S. of Valencia (see map of Spain, ref. 17-I), has two fine stone bridges, besides an iron railway-bridge. Near it is a curious cavern. Pop. 16,146.

Alcmæon'idæ, THE: one of the most prominent families of ancient Athens; expelled from the city in 596 B. C., their chief, Megacles, having committed sacrilege by allowing Cylon and his partisans to be massacred, though they had sought refuge in the temple of the Eumenides. The family went to Phocis, but its immense wealth and connections with some of the most powerful families in Greece enabled it to return to Athens after an exile of about thirty years. Then followed the long and turbulent contest with Pisistratus, in which the Alcmæonidæ were once more driven from Athens. During this their second exile they spent a great deal of their wealth in rebuilding the temple of Apollo in Delphi, which was burnt down in 548 B. C., and the magnificence with which they accomplished this great undertaking made them so popular throughout all Greece that the Spartans finally restored them by armed force. Among the famous members of the family were Clisthenes, Pericles, and Alcibiades.

Alcman (Ἀλκμάν): Spartan lyric poet; b. at Sardis; was originally a slave. He flourished about 650 B. C., and became a free citizen of Sparta. He wrote songs called *Parthenia*, also bridal hymns and other erotic poems which were greatly admired. The small fragments of his works increased by recent discoveries are contained in Bergk's *Poetæ Lyrici*.

Alcme'ne (Gr. Ἀλκμήνη): a daughter of Electryon and Anaxo, the daughter of Alcæus. She is said to have been the mother of Heracles by Zeus. Hera, jealous of Alceme, delayed the birth of Heracles for seven days, that Eurystheus might be born first, and thus be entitled to greater rights, according to a vow which Zeus had made. There are different accounts of her death. According to Plutarch, Agesilaus opened her tomb at Haliartus in Bœotia, and carried her remains to Sparta.

Alcock, Sir RUTHERFORD, K. C. B., D. C. L., F. R. C. S.: British consul and minister; b. in London in 1809; was a surgeon in the navy in Portugal, 1833-34; inspector of hospitals under Sir de Lacy Evans in Spain, 1835-37; auditor of accounts of the English-Spanish legion, 1839-44; became British consul at Foo-Chow, 1844; at Shanghai, 1848; and at Canton, 1858. In 1859 he was transferred to the diplomatic service and became minister to Japan, whence he was transferred to China, 1865, where he remained until 1871. He was the author of *Notes on the Medical History of the British Legion in Spain* (1838); *Capital of the Tycoon* (2 vols., Lond., 1863); *Art and Art Industries in Japan* (1878), etc. He was created a K. C. B. in 1862. D. Nov. 2, 1897. R. L.

Alcohol [from Arab. *al-koh'l*; *al*, the + *koh'l*, fine powder for coloring the eyelids, etc. Term extended in early Euro-

pean chemistry to any very fine powder, and later applied to fluids as the quintessence, spirit]: a limpid, colorless liquid which has a hot, pungent taste, and is the essential principle of all spirituous liquors and intoxicating drinks. It is the product of the fermentation of sugar or saccharine substances, and is extracted by distillation from spirituous liquors, such as whisky and brandy, which contain nearly 50 per cent. of water. Pure alcohol is very inflammable, has a strong affinity for water, is a powerful solvent, boils at 173° F., and has been congealed at an extremely low temperature (about 200° F. below zero). It is composed of carbon, oxygen, and hydrogen, its composition being expressed by the formula C₂H₆O. In medicine, alcohol is used as a stimulant or excitant, mostly in the form of wine, brandy, or whisky. In pharmacy, alcohol is extensively used as a solvent; its solutions are called tinctures. The strongest alcohol that can be procured is termed absolute alcohol or anhydrous alcohol; it is prepared by removing the last few per cent. of water by quicklime.

Alcohol can be built up from its elements in the laboratory by starting with acetylene, which can be made by passing a powerful electric current between carbon poles surrounded by hydrogen. Acetylene, which has the composition C₂H₂, takes up hydrogen and forms ethylene, C₂H₄. This unites with sulphuric acid to form ethyl-sulphuric acid, which, when distilled with water, yields alcohol and sulphuric acid.

The alcohol of commerce varies in strength from *proof spirits*, which contain 50 per cent. by volume, to *cologne spirits*, which contain from 93 to 95 per cent. It is manufactured from a variety of materials which contain either sugar or starch, such as molasses, beets, potatoes, Indian corn, etc. See WHISKY.

Intoxicating beverages owe their peculiar effects on the system chiefly to the alcohol they contain. They are divided into fermented liquors and distilled liquors or spirits. Fermented liquors include (1) *wine* made from saccharine fruits, such as the grape, apple, and pear; and (2) *beer* made from materials which contain starch, usually barley. Distilled liquors are made from the refuse of the grape—*brandy*; or from molasses—*rum*; or from cereals or potatoes—*whisky*. *Gin* is alcohol flavored with juniper berries. See FERMEN-TATION, WINE, CIDER, BEER, RUM, BRANDY, WHISKY, and GIN.

Revised by IRA REMSEN.

Alcoholism: See INTOXICATION.

Alcoholom'etry [from *alcohol*, and the Gr. μέτρον, a measure]: the method of estimating or ascertaining the amount of absolute alcohol in a given quantity of spirits. This may be done—(1) by determining the specific gravity of the spirits, provided they contain nothing besides water and alcohol. The specific gravity of water being 1, that of pure or absolute alcohol is 0.7938 at 60° F. Tables have been carefully prepared showing the percentage of alcohol corresponding to different gravities between these extremes. (See GRAVITY, SPECIFIC.) If the spirits contain sugar, etc., they must be purified by distillation before determining the gravity. (2) The percentage of alcohol may be determined by observing the boiling-point. Water boils at 212° F., absolute alcohol at 173° F. (3) By observing the tension of the vapor. The first method is always employed in practice.

Alcohols: compounds that have the same general properties as ordinary alcohol or "spirits of wine." The most familiar example is a compound obtained by heating wood, and hence known as "wood spirit." Its chemical name is methyl alcohol. Ordinary glycerin also belongs to this class, and fusel oil is a mixture of alcohols, all of which are more complex than ordinary alcohol. The alcohols differ very much from one another in their properties. Thus some are liquid, others are solids; some act upon the system in the same general way as ordinary alcohol, others do not; some are good solvents for organic compounds, others are not. But in their chemical behavior they are much alike. Their reactions are such as to show that they are closely related to water, in the same way that ordinary alcohol is. Water consists of hydrogen and oxygen in the proportion represented in the formula H₂O. If half the hydrogen is replaced by a group consisting of carbon and hydrogen, the product is an alcohol; thus ordinary or ethyl alcohol is represented by the formula C₂H₅.OH, methyl alcohol by CH₃.OH, etc. The group represented by the formula OH is the same as that contained in water. There are much more complex alcohols than those represented above, but the general statements hold good for all.

IRA REMSEN.

Alcoran: See KORAN.

Alcorn, JAMES LUSK: See the Appendix.

Alcott, AMOS BRONSON: transcendental philosopher; formerly one of the principal contributors to *The Dial*; b. at Wolcott, Conn., Nov. 29, 1799; removed to Boston in 1828, and finally settled at Concord, Mass. He acquired some reputation as an educational reformer, but became chiefly distinguished for his conversational powers. He held formal "conversations" on a wide range of speculative and practical themes in the principal cities of the U. S. Published *Conversations with Children on the Gospels* (1836); *Tablets* (1868); *Concord Days* (1872); *Table Talk* (1877); *New Connecticut* (1881); *Sonnets and Canzonets* (1882); *Ralph Waldo Emerson, his Character and Genius* (1882). D. Mar. 4, 1888.

Alcott, LOUISA MAY: daughter of the preceding; b. at Germantown, Pa., Nov. 29, 1832. In early life she was a teacher; during the civil war a hospital nurse. She published her first book, *Flower Fables*, in 1855, but it was not till 1868, when her *Little Women* appeared, that she attracted much attention. In *Little Men* (1871), *Joe's Boys* (1886), and her later stories, as a delineator of American child-life, she achieved great popularity. D. at Boston, Mass., Mar. 6, 1888. See her *Life* (1889). S. M. J.

Alcove [Fr. *alcôve*, viâ Span., from Arab. *al-gobbah*; *al*, the + *gobbah*, vaulted space]: in architecture, a recess in an apartment, separated by an estrade or partition of columns, and occupied by a bed of state; a recess in a library or a lateral apartment for books.

Alcoy: a city of Spain; in the province of Alicante, 30 miles N. of Alicante (see map of Spain, ref. 17-I). It is built on uneven ground among the hills, and has manufactories of paper and woolen goods. About 200,000 reams of paper are made here annually. A large part of this paper is consumed in the form of cigars (*papelitos*). Pop. about 35,000.

Alcuin, Ælwin [called by himself *Albinus*, and by his friends *Flaccus*]: b. at York, England, about 735. He studied in the famous Cathedral School of York under Archbishop Egbert, and particularly Aelbert, Egbert's relative, and the real head of the school. He thus acquired the best culture of his time, becoming familiar both with the Latin classics and with the Christian Fathers. In 766, when Egbert died and Aelbert became archbishop, Alcuin became virtual head of the school; in 778, on Aelbert's resignation, he was made titular head. In 781, being on his way home from Rome, he met Charlemagne, and was invited by him to become the head of the famous Schola Palatina (School of the Palace), the peripatetic school, made up of the royal family and the courtiers—and frequently attended by Charlemagne himself, who asked very keen questions. He accepted, and was thenceforth the intimate friend and adviser of Charlemagne, teaching in his school, attending closely to the ecclesiastical policy of the empire, and having a large influence upon the grandiose plans which make memorable the reign of Charlemagne. In 790 he visited England, remaining two years; in 801 he retired to the abbey of St. Martin, at Tours, where he lived and taught until his death, May 19, 804. He was a constant writer, producing various theological treatises, school-books, poems, and letters (of great importance for the history of Charlemagne's reign). Though not a man of striking originality, his influence upon the intellectual development of Europe can hardly be overestimated. From him and his school may almost be dated the educational development of the modern world. See *B. Flacci Albini seu Alcuini opera cura et stud. Frobenii* (2 tom. in 4 vols., 1777); Lorentz, *Alcuin's Leben* (1829, Eng. trans. by Slee, 1837); Monnier, *Alcuin et Charlemagne* (1863); Werner, *Alcuin und sein Jahrhundert* (1876); A. Ebert, *Geschichte der Literatur des Mittelalters* (vol. ii. 1880); J. B. Mullinger, *The Schools of Charles the Great and the Restoration of Education in the Ninth Century* (Cambridge, 1877); A. F. West, *Alcuin and the Rise of Christian Schools* (N. Y., 1892). A. R. MARSH.

Aleyona'ria: an order of coral-polyps, including the fan-corals, the red coral of commerce, the sea-pens, organ corals, etc., characterized by the possession of eight branched tentacles around the mouth, and the same number of uncalcified mesenteries or partitions of the body cavity. The skeletons formed by this group of corals vary greatly. They usually consist of an axial stem either horny or calcareous and simple or much branched, surrounded by a thinner

crust which is fleshy or friable. In the organ-pipe coral, the skeleton consists of parallel hollow tubes joined by thin horizontal plates. DAVID S. JORDAN.

Aley'one, or **Haley'one** (Gr. Ἀλκωνη): in classic mythology, a daughter of Æolus and the wife of Ceyx. She was so inconsolable for the death of her husband that she threw herself into the sea. Tradition adds that Ceyx and Aleyone were changed into kingfishers to reward their mutual devotion.

Aleyo'nium [Gr. ἀλκωνειον, from ἀλκων, kingfisher, so called from supposed resemblance to nest of kingfisher]: a genus of zoöphytes belonging to the order *Aleyonaria*, presents a curious polyp mass and star-like pores, through which polyps protrude themselves. The *Aleyonium digitatum* abounds on the shores of Great Britain. The *Aleyonium carneum* is found along the American coast from Cape Cod northward.

Aldan': a river of Siberia; the largest tributary of the Lena; rises in the Yablonoi mountains, near the frontier of the Chinese empire. Flowing northeastward and afterward in a N. W. direction, it enters the Lena about lat. 63° N., and nearly 60 miles below Yakutsk. Length about 400 miles, in considerable part navigable.

Ald'borough: a town of England; in the West Riding of Yorkshire; about 16 miles N. W. of York (see map of England, ref. 6-H). It occupies the site of the town of *Isurium* of the Romans, and is noted for its ancient remains, consisting of interesting ruins of aqueducts, extensive buildings, tessellated pavements, etc. Pop. 2,265.

Aldeb'aran [from the Arabic *al*, the, and *dabarân*, following, i. e. the Pleiades]: a star of the first magnitude in the constellation of Taurus, otherwise called α Tauri. It is the brightest star of a group called the Hyades.

Al'degonde, SAINT: See MARNIX.

Al'degre'ver, or **Aldegraef**, HEINRICH: German painter and engraver; b. probably at Paderborn in 1502; became a citizen of Soest and decided adherent of the Reformation; was a pupil and imitator of Albert Dürer. Among his numerous engravings are *The Labors of Hercules* and a portrait of Luther. Specimens of his painting are very rare, the only undoubted one being a portrait in the gallery at Berlin. D. at Soest after 1555.

Al'dehyde [from *al*, first syllable of *alcohol*, and *dehyd*, first two syllables of *de-hydrogenatus*, deprived of hydrogen]: a compound formed by abstracting hydrogen from alcohol. The change is effected by the action of oxygen, this element uniting with a part of the hydrogen of the alcohol to form water, and leaving aldehyde. In purifying alcohol it is passed through filters of bone-black. The air contained in the pores of these filters oxidizes a part of the alcohol that first passes through, and therefore the "first runnings" contain aldehyde. Large quantities of aldehyde were at one time obtained in this way. It is a volatile liquid of a marked and characteristic odor. It is easily changed to a substance of the same composition, known as *paraldehyde*, which finds application in medicine. IRA REMSEN.

Al'den, EDMUND KIMBALL, D. D.: Congregationalist; b. at Randolph, Mass., Apr. 11, 1825; graduated at Amherst College, 1844, and at Andover Theological Seminary, 1848; He was pastor at Yarmouth, Me., 1850, at Lenox, Mass., 1854, at South Boston, 1859, and secretary of the American Board of Commissioners of Foreign Missions from 1876. D. Apr. 30, 1896. GEORGE P. FISHER.

Alden, JAMES: rear-admiral, U. S. N.; b. at Portland, Me., Mar. 31, 1810; entered the navy as a midshipman, Apr. 1, 1828. In command of the steamer South Carolina, he engaged the batteries off Galveston, Tex., Aug. 3, 1861, and commanded the steamer Richmond in the engagement with Forts St. Philip and Jackson, and at the capture of New Orleans, Apr. 24, 1862, and during the passage up and down the Mississippi river by Vicksburg, June 28 and July 15, 1862; in the engagement at Port Hudson, Mar. 14, 1863; commanded the Brooklyn at the great victory over forts, rams, and gunboats in Mobile bay, Aug. 5, 1864, and in both the Fort Fisher fights, Dec., 1864, and Jan., 1865. In 1869 he was appointed chief of the Bureau of Navigation, and in 1871 to the command of the European station. He retired from active service in 1873. D. at San Francisco, Cal., Feb. 6, 1877.

Alden. JOSEPH. D. D., LL. D.: b. at Cairo, N. Y., Jan. 4, 1807, and graduated at Brown University, 1828; studied theology at Princeton, and was ordained pastor of a Congregational church at Williamstown, Mass. (1834); was a professor in Williams College (1835-52), in Lafayette College, Pa. (1853-57), president of Jefferson College (1857-67), and principal of the New York State Normal School at Albany (1867-82). He was a voluminous writer, especially on educational topics. D. in New York, Aug. 30, 1885.

Alden. WILLIAM LIVINGSTON: author: b. Oct. 9, 1837; educated at Lafayette and Jefferson colleges; founder of New York Canoe Club; introduced canoeing into the U. S.; author of *Canoe and Flying Proa* (1880); *The Moral Pirates* (1881); *Life of Columbus* (1882); *The Cruise of the Canoe Club* (1883), etc.

Al'denhoven: market-town of Prussia; in the Rhine province (see map of German Empire, ref. 5-C). Here the Austrians defeated the French on Mar. 1, 1793, and the French defeated the Austrians on Oct. 2, 1794. Pop. 1,100.

Al'der [O. Eng. *alor*, Germ. *erle*, O. Nor. *öltr*, related Lat. *alnus*, O. Bulg. *jelicha*]: a tree or shrub of the genus *Alnus* and family *Betulaceæ* or *Cupuliferae*. The alders are natives of the temperate parts of Europe and North America. The wood of the common alder of Europe (*Alnus glutinosa*) is used by turners and joiners, affords good charcoal for the manufacture of gunpowder, and is valuable for mill-wheels and the piles of bridges. The alder is prized as an ornamental tree in landscapes. The *Alnus cordifolia*, a native of Italy, is a large and beautiful tree. The alders of the Eastern U. S. are shrubs or small trees, but *Alnus oregona* of the west coast grows to the height of 60 to 70 feet. For the black alder, see WINTERBERRY. C. E. B.

Alderman [O. Eng. *aldormann*, *aldor*, parent, patriarch, chief (subst. from *ald*, old) + *mann*, i. e. the *man* holding a patriarch's position]: the title of a municipal officer or magistrate in the corporations of England and the U. S. Aldermen were first appointed in 1242. The London court of aldermen exercises judicial and legislative authority in the corporation. In New York city the term is applied to the members of the city council, who are elected by the people. In some cities they are magistrates, in others councilors.

Alderney, awl'dér-ni, or **Aurigny**: an island in the English Channel, 7 or 8 miles from Cape la Hague, France (see map of France, ref. 2-C). It belongs to Great Britain, and is about 4 miles long; area, 3 sq. miles. Guernsey, another of the Channel islands, is about 15 miles from this place. The people of Alderney are mostly of French extraction. This island produces a celebrated breed of small cows. It is separated from France by the Race of Alderney, a dangerous strait about 8 miles wide. It is politically a dependency of Jersey. Pop. (1861) 4,932; (1871) 2,738; (1881) 2,048; (1891) 1,843.

Al'dershot Camp: a permanent camp formed in 1855 for the improvement of the British army in tactics and in evolutions on a large scale. It is situated on Aldershot Heath, on the confines of Surrey, Hampshire, and Berkshire. The area of ground appropriated to this purpose is 7,063 acres. A thriving town has naturally sprung up near the camp. Pop. 20,000 (7,000 military).

Al'dine Editions: See MANCIUS ALDUS.

Al'drich. NELSON WILMARTH: b. at Foster, R. I., Nov. 6, 1841; received an academic education; president Providence (R. I.) common council 1872; member Rhode Island General Assembly 1875-76, and was Speaker of its House of Representatives in 1876; was member of the Forty-sixth Congress, and re-elected; was elected, Oct. 5, 1881, U. S. Senator; re-elected in 1887 and again in 1893.

Aldrich. THOMAS BAILEY: poet and story writer; b. at Portsmouth, N. H., Nov. 11, 1836. Lived in his youth in Louisiana, then in New York, where he was for a time a clerk, then a proof-reader, and afterward attained eminence as a writer and editor. Wrote for the *Home Journal*, *Atlantic Monthly*, and other periodicals, and has published *The Ballad of Babie Bell* (1856); *Cloth of Gold* (1874), and several other volumes of verse; besides *The Story of a Bad Boy* (1870); *Marjorie Daw* (1873), etc., in prose. He was editor of the *Atlantic Monthly* from 1881 till 1892.

Revised by HENRY A. BEERS.

Al'dridge. IRA: a Negro tragedian; b. in Maryland about 1810; was in his youth a personal attendant of Edmund Kean. He performed with success in Great Britain and

other countries of Europe. He received medals or tokens of honor from the King of Prussia and the Emperor of Austria. D. at Lodez, Poland, Aug. 7, 1867. He was called the "African Roscius."

Aldrovan'dus. ULYSSES: Italian naturalist; b. at Bologna, Sept. 11, 1522. He graduated as doctor of medicine in 1553, and became Professor of Natural History at Bologna in 1560. Having expended much time and money in collecting specimens and in the study of nature, he began in 1599 the publication of his *Natural History* (13 vols.), of which three volumes on birds and one on insects appeared during his life. The other volumes were edited by several persons after his death. His *Natural History* is a laborious and ill-digested compilation. D. at Bologna, Nov. 10, 1607.

Ale: a sort of beer; a fermented liquor produced from malt. Ale contains more alcohol than common beer, and is a favorite beverage of the British. Scotch ale and Burton ale have a high reputation. There are three varieties of malt liquor in general use in this country—ale, porter, and lager beer. All are prepared from malt, which is barley that has been allowed to germinate (sprout), and has then been dried by artificial heat. Hops are added to give the aromatic bitter flavor. The lower the temperature at which the malt is dried the lighter will be the color of the malt and the beverage. Ale and lager beer are made from light, porter from dark-colored malt. Ale and porter are fermented at temperatures of from 65° to 90° F., while lager beer is fermented at from 46° to 50° F.

In the manufacture of ale the first fermentation is checked at such a point as to leave a considerable quantity of saccharine matter in the liquor. By the subsequent fermentation in the barrels or bottles this is changed to alcohol and carbonic acid, the latter substance causing the characteristic effervescence. See BEER.

Aleander. HIERONYMUS, or, in Italian form, *Girolamo Aleandro*: a learned Italian cardinal; b. at Motta, Feb. 13, 1480. He was appointed librarian of the Vatican in 1517, and was sent by Leo X. as papal nuncio to Germany in 1520, to counteract the influence of Luther, and to him is mainly due the condemnation of Luther at the Diet of Worms. His own report of the Diet is an important source. See Brieger, *Aleander und Luther* (Gotha, 1884). In 1538 he was made a cardinal by Paul III., when he took the title of St. Chrysostom. D. at Rome, Jan. 31, 1542. S. M. J.

Alecsandrescu. GRIGORIE: Roumanian poet; b. at Tirgovesti, Wallachia, in 1812; was sent in consequence of political agitations to a convent, where he wrote his most celebrated work, *The Year 1840*, in which he gives expression to the hopes of his party. In 1859 he was for a few months Minister of Finance, afterward acting with the Liberal opposition, which he effectively aided with his poems and fables. A second edition of his collected works appeared in 1863, about which time his mind became affected and nothing more appeared from his pen. D. at Bucharest, 1886.

Revised by E. S. SHELDON.

Alecsandri. VASILE: Roumanian poet; b. in Northern Moldavia in 1821; took part in the Liberal movement of 1848; was Minister of Foreign Affairs for a few months in 1859-60; and later resided partly in Jassy and partly in Paris. Among his writings are *Doine și lacrimioare* (Elegies and Laments, 1853), dramatic works, and, most important of all, his collections of the popular songs of Roumania, of which a first series appeared in 1852, a second in 1853, the whole being published under the title *Poesii populare ale Românilor* (Bucharest, 1866). Three volumes of his *Poesii* were published at Bucharest in 1876, and a short poem, *Cantul gintei latine* (The Song of the Latin Race), appeared in 1878, with translations into French and Italian. Several of his poems have been translated into English, French, and German. He was Roumanian minister at Paris from 1885 to 1890. D. at Mircești, Moldavia, Sept. 4, 1890.

E. S. SHELDON.

Alectorides. al-ek-tor'i-deez [Gr. ἀλέκτωρ, a cock]: an order of birds containing the cranes, rails, and their allies, the trumpeters, sun-bitterns, kagu, carriama, and bustards (see these headings for details). The last four are often omitted, being transferred to other orders. The group corresponds very nearly to the *Geranomorphæ* of Huxley. Its members are characterized by a schizognathous palate, truncate posterior end of mandible, tufted oil-gland, and absence of powder-down patches. The narial openings are schizorhinal in the cranes, holorhinal in the rails. The sternum

is typically long and narrow, posteriorly entire or two-notched. The young are born downy and are soon able to run. The name is unfortunate, both from its etymology and from the fact that the birds considered as typical by Nitzsch are, as stated, usually placed elsewhere. *Paludicola* is a better term for the group. F. A. LUCAS.

Ale'do: on railroad; capital of Mercer co., Ill. (for location of county, see map of Illinois, ref. 4-B). It is the seat of a college. Coal, stock, and grain are the principal shipments. Pop. (1880) 1,492; (1890) 1,601; (1900) 2,081.

Aleman'ni (i. e. all men): certain German tribes who formed a confederacy against the Romans about 200 A. D., and at that time lived on the Main. They invaded Gaul in the reign of Julian the Apostate, who gained a victory over them in 357 A. D. Having been defeated by Clovis in 496, their confederacy was dissolved. From this word is derived the French *Allemand*, signifying German.

Alembert, JEAN LE ROND, d', daǎ'laǎn'bār': French geometer and philosopher; b. in Paris, Nov. 16, 1717; an illegitimate son of M. Destouches-Canon and Madame de Tencin. Having been abandoned by his mother in the street, he was nursed by the wife of a glazier, and continued to live with her for about forty years. He received from his father an annual pension of 1,200 livres, and was educated in the Mazarin College, which he entered in 1730. His favorite study was mathematics. In 1741 he was admitted into the Academy of Sciences, and in 1743 produced his celebrated *Treatise on Dynamics*, which opened a new epoch in mechanical philosophy, by the demonstration of the principle "that there is an absolute equality at all times between the entire amount of force applied and the sum total of the effects produced." His treatise *On the Theory of the Winds* gained the prize of the Academy of Berlin in 1746. In 1752 Frederick the Great offered him the presidency of the Royal Academy of Berlin, which he declined. D'Alembert was associated with Diderot as joint editor of the famous *Encyclopédie*, for which he wrote an admirable "Preliminary Discourse," and many mathematical articles. He was admitted into the French Academy in 1754. He formed a *liaison* with the accomplished Mademoiselle l'Espinasse, who lived with him twelve years. He showed his independence and indifference to riches by refusing, in 1762, the invitation of Catherine II. of Russia, who offered him a salary of 100,000 francs to direct the education of her son. In 1772 he was elected secretary of the French Academy. He was an intimate friend of Voltaire, and assumed toward Christianity the attitude of a skeptic—i. e. a doubter and candid inquirer—while he openly avowed his hostility to the Church of Rome. His moral character is generally represented as noble and benevolent. Among his works are *Researches on some Important Points of the System of the Universe* (3 vols., 1754-56); *Mélanges of Literature and Philosophy*; *Elements of Philosophy* (1759); and eulogies on the members of the French Academy who died between 1700 and 1772. He died in Paris on the 29th of Oct., 1783. An edition of his works was published by Bossange in 5 vols., 8vo, 1821. "His literary works," says Lacroix, "constantly directed to the perfection of reason and the propagation of correct ideas, were highly appreciated by all good judges. They are all remarkable for a pure diction, a neat style, and strong or pithy thought."

Alemte'jo (i. e. beyond the Tagus): ancient administrative province of Portugal; bounded N. by Beira, E. by Spain, S. by Algarve, and W. by Estremadura and the Atlantic. Area, 9,431 sq. miles. It is intersected by the Gaudiana river, and is washed by the Tagus, which forms part of the northern boundary. The climate is hot and dry, the surface is hilly, and the soil of the northern and eastern valleys is fertile. The chief productions are wheat, maize, barley, grapes, rice, and figs. Capital, Evora. Pop. (1881) 367,169.

Alenear', JOSÉ MARTINIANO, de: Brazilian jurist and novelist; b. in Ceará, May 1, 1829; d. at Rio de Janeiro, Dec. 12, 1877. He is best known by his numerous romances of Indians and colonial life, which have given him, rather undeservedly, the title of the "Brazilian Cooper"; among the best of these are *O Guarany*, *Iracema*, *O Sertanejo*, and *As Minas de Prata*. Under the cognomen G. M. he published *Diva*, *Luciola*, and *Senhora*, romances of society life in Rio de Janeiro, which are much the best of his works. H. H. SMITH.

Aleuçon, ǎ'laǎn'sōn': city of France; capital of the department of Orne; situated on the Sarthe and in a plain, 65 miles by rail W. S. W. of Paris (see map of France, ref. 4-D). It is well built and handsome, has a cathedral, a public library, and a church about 1,000 years old. Here are manufactures of various articles, including muslin, leather, and a celebrated lace called point d'Aleuçon. Pop. (1881) 17,237; (1886) 17,550.

Alep'po, called by the Arabs **Ha'leb** [anc. *Chal'ybon* and *Beræ'a*]: an important city of Syria, and one of the chief emporiums of the Ottoman empire; on the Kowek, about 55 miles E. of Antioch; lat. 36° 11' N., lon. 37° 10' E.; 1,300 feet above the sea (see map of Turkey, ref. 6-11). It is surrounded by limestone hills, and presents a picturesque appearance. The houses are well built of stone, mostly in the Saracenic style, with richly ornamented walls and ceilings. In the environs are celebrated gardens about 12 miles in extent. Aleppo has a castle, a Mohammedan college, and many Christian churches. It has an extensive trade in cotton and silk stuffs, tobacco, wine, oil, indigo, etc., and is visited by large caravans from Bagdad, Diarbekir, Mosul, and Armenia. It was a great emporium of trade during or before the Middle Ages. Its prosperity was greatly injured by the earthquake of 1822, which destroyed a large part of the city and about two-thirds of the inhabitants. The population, which before that event was more than 200,000, was about 70,000 in 1880; in 1892, estimated at 120,000.

Alesandrian Codex: See CODEX ALESANDRINUS.

Ale'sia (Gr. Ἀλεσία): the fortified capital of the Gallic tribe Mandubii; built, according to a legend, by Hercules. Here the last desperate battle for freedom was fought by the Gauls, under Vercingetorix, against the Romans, under Julius Cæsar, in 52 B. C. The Gauls were completely defeated and the city destroyed. Alesia was rebuilt, and again destroyed by the Northmen in 864. It was on the present Mont Auxois, at the foot of which the modern town of Alise is situated.

Ale'sius [Gr. ἄλη, roaming]: the name given, probably by Melanchthon, to Alexander Alane; b. in Edinburgh, Scotland, Apr. 23, 1500; was Canon of St. Andrews, became Protestant, went to Germany in 1532, and again in 1540; was made professor at Leipzig, and died there Mar. 17, 1565. He was active in the negotiations between the Lutherans and Anglican theologians in 1536, and translated the Book of Common Prayer into Latin.

Alessan'dria: a province of Northern Italy; bounded N. by Novara, E. by Pavia, S. by Genoa, and W. by Cuneo and Torino. Area, 1,976 sq. miles. The country consists partly of large fertile plains and partly mountains, and is traversed by the Tanaro, the Scrivia, and the Bormida. Chief town, Alessandria. Pop. (1890) 778,137.

Alessandria (sometimes called *del'la Pa'ghia*, from its first houses having been roofed with straw): a fortified city of Italy; the capital of the province of the same name; on a plain on the river Tanaro, and on the railway from Turin to Genoa; 46 miles E. S. E. of Turin (see map of Italy, ref. 3-B). It was built by the Lombard league in 1168 to serve as a bulwark against Frederick Barbarossa. Its present name was given to it in honor of Pope Alexander III. It was called Cesarea for a time, and was unsuccessfully besieged in 1174 by Frederick Barbarossa. By the peace of Utrecht it was ceded to Savoy, having belonged at different times to the houses of Montferrat and Milan. Bonaparte greatly enlarged and strengthened its fortifications during the French occupation (1800-14). The citadel of Alessandria was taken in 1849 by the Austrians after the battle of Novara. The town is well built, has a cathedral, a royal college, several hospitals, and about fourteen churches. Here are manufactures of silk, linen, and woolen goods, and other articles. Two miles S. E. of this place is the village and battle-field of Marengo, where Napoleon defeated the Austrians in 1800. The citadel is regarded as one of the largest and strongest fortresses in Europe. Pop. 31,000.

Aleurone, a-lyu'rōn: a nitrogenous substance found in the cells of many seeds. In the pea and bean it is mingled with starch, while in the wheat grain it fills a layer of cells constituting the inner bean. It is often called "gluten," and is highly nutritious. C. E. B.

Aleu'tian (or **Aleu'tan**) **Islands**: a group of 150 or more islands, sometimes called the **Catharine Archipelago**; in the North Pacific, extending in a row from the peninsula of Alaska toward the S. point of Kamchatka (see map of Alaska,

ref. 5-B). They were discovered in 1728 by Bering, and were carefully explored by Capt. Krenitzin in 1760. In 1878 Capt. Cook surveyed the E. part of the group. They are rocky and volcanic, having some active volcanoes, and are inhabited by rude natives, who subsist by fishing and hunting. The rock is covered only with a thin layer of argillaceous soil. The vegetation is very insignificant, and agriculture is almost completely unknown. The climate is harsh, subject to sudden changes, and very unfavorable to cultivation. Few trees are found on the islands; only some stunted shrubs of birch, willow, and alder. The inhabitants are of a race essentially Esquimaux. They are small, but well shaped, with swarthy faces, black eyes, and straight black hair. By Russian missionaries they have been converted to Christianity, but their religious and moral ideas are very little developed. They are described as unchaste, unreliable, and entirely destitute of self-control. These islands are part of Alaska, and belong to the U. S. They are divided into three groups—the Aleutian, nearest to Kamchatka, the Andreanof or Andreanofian, the middle group, and the Fox islands, nearest to Alaska. Unimak, the largest of the Fox islands, is about 50 miles long. The seal, the sea-otter, and the Arctic fox are the chief prizes of the chase. Pop. about 2,500.

Ale'wife [Folk etym. corruption of *aloof*, possibly the native American name]: the *Clupea pseudoharengus*, a species of American fish belonging to the family of *Clupeidæ*, and nearly allied to the herring and the shad. It abounds in the Chesapeake bay, and is found along the Atlantic coast of the U. S. from North Carolina to Cape Cod. In the spring the alewives ascend the rivers to deposit their eggs. They are often wrongly confounded with the true herring (*Clupea harengus*), which they much resemble.

Alexan'der, surnamed THE GREAT: third Macedonian king of the name, the most famous of all military heroes; son of Philip, the celebrated King of Macedon, and Olympias, the daughter of the King of Epirus, who claimed descent from Achilles. At the age of fifteen Alexander was placed under the instruction of Aristotle, and soon distinguished himself by his rare intellectual powers, and by his rapid advancement in every kind of knowledge. His descent from Achilles, for whose character and achievements he cherished an enthusiastic and misplaced admiration, appears to have given his mind an early direction toward military glory. Among all books the *Iliad* was his favorite, and we are told that every night a copy of that poem was placed, along with his sword, under his pillow. King Philip had such confidence in his son's courage and capacity that he left him, although only sixteen years of age, the regent of his kingdom during his expedition against Byzantium. At the age of eighteen years Alexander greatly distinguished himself in the battle of Chæronea, and the victory won by the Macedonians on that occasion was due in no small measure to the valor of the young prince. On the death of Philip, in 336 B. C., Alexander, not yet twenty years of age, succeeded to the throne. Several of the states which his father had subjugated deemed this a favorable opportunity for recovering their liberty, but the courage and celerity of Alexander defeated all their schemes. While, however, the young king was engaged in reducing the Triballi, the Thebans raised the standard of revolt. He instantly directed his march toward Bœotia; Thebes was taken by storm, the houses were leveled to the ground, and the citizens who had escaped slaughter in the assault sold as slaves, excepting only the posterity of Pindar, the celebrated Theban poet, and those who had opposed the rebellion. Not long after, at an assembly of the Grecian states held at Corinth, Alexander was chosen generalissimo of the Greek and Macedonian troops destined for the invasion of Persia. Early in the spring of 334 B. C. he entered Asia with an army of about 35,000 men, including 4,500 cavalry. At the river Granicus the Persians sought to prevent his passage. The Macedonians, though fighting at a great disadvantage, gained a signal victory. At Gordium he attempted to untie the famous knot, for he had been told that the empire of the world had been prophesied to him who should succeed in this attempt. But having for some time tried in vain, he at last drew his sword and cut it, saying that this was the only way to untie it. It is said that those whose office it was to decide upon the interpretation of the prophecy, either sincerely or from motives of policy, declared that the Macedonian king had fulfilled it. Having received reinforcements in 333 B. C., he engaged Darius, the Persian king, who commanded at the river Issus an army of 600,000 men. The

Persians were defeated with immense slaughter; the mother, wife, and two daughters of Darius were taken captive, but were treated with the greatest respect and kindness by the conqueror. After this great success scarcely any of the cities of Asia presumed to offer resistance to his victorious arms. But Tyre, then a powerful maritime and commercial city, had the courage or temerity to oppose his progress. The city was taken after a most determined resistance, which lasted seven months, but the conqueror fixed an indelible stain upon his reputation by his merciless cruelty toward the conquered Tyrians, thousands of whom were cruelly slaughtered, and the rest, numbering nearly 30,000, were sold into slavery. Gaza soon after met with a similar fate. Alexander then advanced into Egypt, where the people, weary of the Persian domination, welcomed him as a liberator. In Egypt, on one of the principal mouths of the Nile, he founded a city called Alexandria.

He next visited the temple of Jupiter Ammon, situated on an oasis in the desert of Libya, with the hope, it is said, that the god would acknowledge him to be his son. This having been done through the priest of the temple, he again turned his thoughts to the invasion of Persia, where Darius had succeeded in collecting another army of more than a million men, with not less than 40,000 cavalry. Alexander had scarcely more than 40,000 infantry and 7,000 horse. The opposing armies met at Gaugamela, not far from Arbela, in 331 B. C. The Persians were defeated with prodigious slaughter. Not long afterward Darius was murdered by Bessus, one of his satraps. As the dying king, covered with wounds, lay extended in his chariot, Alexander came up; at the tragic spectacle the conqueror could not restrain his tears. He caused the body of Darius to be taken to Persepolis, where it was interred in the tombs of the Persian kings. Bessus having been taken and put to death, Alexander carried his victorious banners beyond the Jaxartes (now called the Sihon, or the Sir Daria), subdued Sogdiana, and married Roxana, the daughter of a Bactrian prince whom he had conquered. After this he turned his thoughts to the invasion of India. He crossed the Indus 327 B. C., formed an alliance with Taxiles (or Taxilus, as the name is sometimes written), an Indian king, and advanced to the banks of the Hydaspes (now the Jhyum), where he encountered Porus at the head of an immense army, accompanied by a multitude of elephants. After a sanguinary battle the Indian king was totally defeated and taken prisoner. Alexander's favorite horse, Bucephalus, having been mortally wounded in this battle, the conqueror founded a town on the spot where he was buried, which he called Bucephala. Taking one city after another, he had advanced as far as the Hyphasis (now called Gharra), when his troops, alike uninfluenced by his menaces and his entreaties, positively refused to go any farther. Being thus under the necessity of returning, he committed the fleet which he had ordered to be built on the Hydaspes to Nearchus, while he himself proceeded by land through what is now Baluchistan to Susa. His army encountered in this march incredible hardships and suffering, so that many soldiers perished from thirst and hunger. Having arrived at Susa, he married as his second wife a daughter of Darius. As he was forming schemes for the extension and improvement of his empire, he died, June, 323 B. C., at Babylon, in the thirty-third year of his age.

It would be unjust to Alexander to regard him merely as a great and successful military hero. He possessed some moral qualities of a high order, especially generosity and magnanimity. Many of his views of state policy were liberal and enlightened. But all that was most excellent and admirable in his character was impaired and vitiated by mistaken ideas of the dignity and glory which belonged to a great king. As his passions were stronger than his intellect, extraordinary as the latter undoubtedly was, they gradually acquired, during his long career of uninterrupted success, an almost unlimited ascendancy over him. His uniform prosperity may be said to have been his greatest misfortune. Being a stranger to the "sweet uses of adversity," it was impossible for him to see his own character and conduct in their true light. After his unparalleled successes had turned his brain, regarding himself as little less than a god, he could not brook the slightest freedom of speech, even from his most faithful and most meritorious officers. In a paroxysm of ungovernable rage he slew his friend and foster-brother Clitus, who had once saved his life; after which a grief, scarcely less violent than his anger had been, took possession of his soul, so that if he had not been restrained he would probably have taken his own life.

Pope (in *The Temple of Fame*) sums up his career and character in one short line :

The youth who all things but himself subdued.

See Arrian's *History of Alexander's Expeditions*; Quintus Curtius's *Life of Alexander*; Williams's *Life and Actions of Alexander the Great* (1829); Droysen's *Geschichte Alexanders des Grossen von Macedonien* (1833); Geier's *Alexandri Magni historiarum scriptores aetate supparet*, containing the fragments of contemporaneous historians (1844); Holm's *Griechische Geschichte*, vol. iii. (1891).

Revised by C. K. ADAMS.

Alexander I., pope: a Roman by birth, became Bishop of Rome in 109 A. D. D. at Rome in 119.—**ALEXANDER II.** (ANSELMO BADAGIO) was elected pope in 1061. He declared William the Conqueror the true heir to the English crown. D. at Rome in 1073.—**ALEXANDER III.** (ROLANDO RANUCCIO BANDINELLI), one of the ablest men that ever sat on a papal throne, was a native of Sienna. He was elected pope in 1159. He was involved in a long contest with Frederick Barbarossa, and with the anti-popes who were supported by that emperor. Having been twice compelled by his enemies to leave Rome, he was in 1163 acknowledged pope by a council at Tours. The emperor, whom he had excommunicated in 1167, made his submission soon after the battle of Legnano, and was absolved. Thomas à Becket, who had been encouraged by Alexander in his resistance to Henry II. of England, was, after his assassination, canonized by the pope. According to Voltaire, Alexander proclaimed that no Christian should be held as a slave. He is said to have been the first who reserved to the Holy See the right of canonization. D. at Civita Castellano, Aug. 30, 1181. (See Reuter's *Geschichte Alexanders III. und der Kirche seiner Zeit.* (1860, 2 vols.).)—**ALEXANDER IV.** (RINALDO DI ANAGNI) became pope in 1254. D. at Viterbo, May 12, 1261.—**ALEXANDER V.** (PIETRO FILARGI) was chosen pope in 1409. D. at Bologna, May 3, 1410.—**ALEXANDER VI.** (RODRIGO LENZUOLI BORGIA), b. at Jativa, in Valencia, in Spain, in 1431; was a nephew of Pope Calixtus III. He became a cardinal in 1456, and was chosen pope in 1492. Before his election to the papacy he had several illegitimate children, among whom were the infamous Cæsar and Lucretia Borgia. Among the events of his pontificate were the introduction of the index of prohibited books and the burning at the stake of Savonarola. D. at Rome, Aug. 18, 1503. His character was an infamous compound of cruelty, treachery, licentiousness, and other vices.—**ALEXANDER VII.** (FABIO CHIGI) was b. at Sienna, Feb. 13, 1599, and became pope in 1655. He embellished Rome with architectural works. D. at Rome, May 22, 1667.—**ALEXANDER VIII.** (PIETRO OTTOBONI) was b. in Venice, April 19, 1610, and elected pope in 1689. He assisted the Venetians in a war against the Turks. D. at Rome, Feb. 1, 1691.

Revised by S. M. JACKSON.

Alexander I.: King of Scotland; younger son of Malcolm Canmore; began to reign in 1107. He was an able ruler. He died at Stirling, April 27, 1124; was succeeded by his brother, David I.—**ALEXANDER II.**, b. at Haddington, Aug. 24, 1198, succeeded his father, William the Lion, in 1214. He married a sister of Henry III. of England in 1221. He is said to have been a wise and able prince. D. on the island of Kerrera, opposite Oban, July 8, 1249.—**ALEXANDER III.**, of Scotland, b. in 1241, was a son of the preceding, and became king in 1249. He married, in 1251, Margaret, a daughter of Henry III. of England. His reign was peaceful and prosperous. He fell with his horse over a precipice between Burntisland and Kinghorn, and was killed, Mar. 16, 1286.

Alexander I. (or **Alexander Pau'lovitch**): Emperor of Russia; son of Paul I. and Maria, a princess of Würtemberg; b. at St. Petersburg, Dec. 23, 1777. He married, in 1793, Elizabeth, a daughter of the Crown Prince of Baden, and succeeded his father, who was assassinated Mar. 24, 1801. He promoted civilization, education, industry, and trade. His foreign policy was pacific until he joined a coalition against Napoleon in 1805. In December of that year the Russian and Austrian armies were defeated at Austerlitz. After the Russian armies had sustained several other defeats, the war was ended by the treaty of Tilsit in 1807. Alexander then became the friend and ally of Napoleon, and declared war against England. But, alarmed by the insatiable ambition of Napoleon, he resolved upon a change of policy, and formed an alliance with England and Sweden.

Russia was invaded in 1812 by Napoleon, who took Moscow, but his army was soon compelled to retreat, and nearly all perished with cold and hunger or were taken prisoners. After the abdication of Napoleon, Alexander entered Paris with the victorious armies in 1814, and exhibited more generosity and clemency toward the French than the other allies showed. He again entered Paris in triumph in July, 1815, and in the same year formed, with the Emperor of Austria and the King of Prussia, a coalition called "the Holy Alliance," the tendency of which was reactionary and hostile to the cause of liberty. The professed object of this alliance was to promote religion and peace. As he advanced in years he became more contracted and less liberal, a prey to hypochondria and suspicion. His projects of reform were abandoned, a rigid censorship of the press was maintained, and all liberal or progressive tendencies were repressed. He died without issue at Taganrog, Dec. 1, 1825, and was succeeded by his brother Nicholas. See RUSSIA.

Alexander II., **ALEXANDER NIKOLAI EWITCH ROMANOFF**: Emperor of Russia; the fourteenth sovereign of the reigning dynasty, the eldest of the Czar Nicholas's four sons, was b. on the 29th of April, 1818. His education was intrusted, under the czar's own close inspection, almost exclusively to native Russians, foremost among whom stood the poet Joukovski, the generals Kavelin and Fredericks, and, before traveling abroad, the prince was sent on a progress through European Russia in order to acquaint himself with the country. He subsequently visited Germany, Italy, and Great Britain, and on his return, bringing back with him a host of new impressions, he was admitted, only a lad of eighteen, to the czar's conferences with his native ministers and foreign envoys. Five years later, on the 28th of April, 1841, at the age of twenty-three, he married the Grand Duchess of Hesse-Darmstadt, called by the Russians Maria Alexandrowna ("Mary, the daughter of Alexander").

Alexander II. ascended the throne on the 2d of March, 1855, during the Crimean war, which France, Great Britain, and Turkey had waged against Russia. He ended the war as soon as possible, but several years were required to restore the empire to its normal condition. In 1861 followed the serf emancipation, which prominently brought the new czar before the world and earned him his popular title of "the Liberator"; in 1863 followed the Polish rebellion, which was put down with wanton cruelty, the czar placing the destiny of the Polish people in the hands of men equally devoid of mercy and of justice—the Count de Berg and Mouravieff, the latter known by the nickname of "the hangman." But, with this single exception of the Polish war, the nine years which elapsed after the abolition of serfdom became the brightest in the Russian history of the nineteenth century. Military colonies, oppressive statutes, all kinds of crippling restrictions, were abolished. The press began to make itself heard. Immigration was encouraged, agriculture developed, foreign inventions were adopted, foreign authors and institutions studied. Female education received a sudden impetus, and the senseless restrictions on travel were removed. On the 27th of Sept., 1866, Princess Dagmar of Denmark, the bride-elect of the hereditary grand duke, landed, and in 1867 the czar himself appeared at the Paris Exhibition. Meanwhile the works of national reform followed each other—the redistribution of land, the development of the railway system, the establishment of trial by jury, the abridgment of military service, and many others.

But reaction was not slow to appear. The revolutionary attitude of the five great universities of St. Petersburg, Moscow, Kieff, Dorpat, and Kazan, and the ill-timed petition of Moscow for free trade and the liberty of the press, startled the Government into the belief that it had gone too far. At the same moment, the terror of victorious Germany from without, and that of the Nihilist conspirators from within, appeared to necessitate an immediate increase of strength, and in an instant all was changed.

But even this violent change could not deprive Russia of the substantial progress which she had already made. At the Czar's accession in 1855 she possessed only 419 miles of railway; in 1870 she could count 7,123. In 1855 the total number of factories in European Russia was 17,536, representing a yearly value of 350,000,000 rubles (\$262,500,000); the estimates for 1870 gave 23,721 factories, producing annually 500,000,000 rubles. In 1855 Russia's export trade averaged \$30,000,000; in 1870 \$256,500,000. The term of military service extended in 1855 over the enormous space of twenty-

five years, while in 1870 it was limited to ten years. The press, the bar, the local administration, had all been considerably remodeled, and the village schools began to raise the 49,000,000 Russian peasants from mere soulless beasts of burden into thinking and reasoning men.

Only for a time the newly awakened spirit of the country was diverted from the channel of home reform into that of foreign conquest. On Oct. 31, 1870, when neither Great Britain, France, nor Turkey was able to resist, Prince Gortschakoff informed the various cabinets that Russia felt compelled to deviate from the stipulations of the Treaty of Paris and keep a fleet of sufficient capacity in the Black Sea. The Khiva expedition of 1873 completed the conquest of Central Asia, and the Montenegro troubles of 1874, the Herzegovinian insurrection of 1875, were appeals to Russia to gird herself for a fresh crusade against the Crescent. In April, 1877, the war of liberation began. The czar returned to St. Petersburg in triumph, but a triumph which was not unalloyed. The war burdens were enormous. Russia was compelled to make considerable modifications of her first programme, and Austria's complete occupation of Bosnia irritated the Pan-slavists. Thus all things combined to produce a fresh explosion of the spirit of Nihilism, and a season of uprisings, assassinations, and terror ensued. Several attempts were made by Nihilists on the emperor's life. The fifth one was successful. On Mar. 13, 1881, while he was returning from a parade at about two o'clock in the afternoon, two bombs were thrown at the sleigh, one of which exploded at the emperor's feet, inflicting wounds from which an hour and a half later he expired in the imperial palace. See Nihilism.

Revised by C. K. ADAMS.

Alexander III.: Emperor of Russia; b. Feb. 26 (Mar. 10, new style) 1845; second son of Emperor Alexander II. After the death of his elder brother, Nicholas, in 1865, he became the heir-apparent to the throne, and married, on Nov. 9, 1866, the Princess Maria Dagmar (on her rebaptism into the Eastern Church called Maria Feodorovna), daughter of Christian IX., King of Denmark. In 1877 he was in command of the army of Biela, but in that capacity he did nothing of note, and was finally superseded. Toward the end of 1879 he came to an open rupture with his father on account of his opposition to the reactionary policy of the latter. On the assassination of Alexander II., in 1881, he shut himself up in Gatschina, and was not crowned till May 27, 1883; the excesses of the Nihilists resulted in making his rule like that of his father. His reign was conservative, and, although vigorous in consolidating and extending his empire, his policy was one of peace. He sternly repressed Nihilism, and many attempts were made on his life. In support of the Greek Church he was all but fanatical; in 1890-91 thousands of Jews were expelled from Southern Russia. His bravery, sincerity, and uprightness were unquestioned. D. at his estate, Livadia, in the Crimea, Nov. 1 (new style), 1894, and was succeeded by his eldest son, Nicholas.

Alexander, ARCHIBALD, D. D.: divine; b. near Lexington, Rockbridge co., Va., Apr. 17, 1772. He became president of Hampden-Sidney College in 1796, and pastor of the Pine Street Presbyterian church in Philadelphia in 1807. In 1812 he was chosen the first Professor of the Theological Seminary of Princeton, N. J., then just founded. He was distinguished as a pulpit orator and as a writer on theology. Among his works are *Outlines of the Evidences of Christianity* (1824); a *Pocket Dictionary of the Bible* (1829); and *Outlines of Moral Science* (1852). The first of these works has been translated into several languages. He married, in 1802, Janet Waddell, a daughter of a well-known blind preacher. D. at Princeton, N. J., Oct. 22, 1851.

Alexander, GEORGE, D. D.: Presbyterian minister; b. at West Charlton, N. Y., Oct. 12, 1843; was educated at Charlton Academy, Union College, and Princeton Seminary. He was pastor of the East Avenue Presbyterian church, Schenectady, N. Y., 1870-83, and during the last six years of that time was Professor of Logic and Rhetoric in Union College. In 1884 he became pastor of the University Place Presbyterian church, New York city, and leader in an important missionary work in the tenement-house district further S. in the city.

W. J. BEECHER.

Alexander, JAMES WADDELL, D. D.: divine; eldest son of Archibald Alexander; b. near Gordonsville, in Louisa co., Va., Mar. 13, 1804; graduated at Princeton, 1820; and became in 1833 Professor of Rhetoric at the College of New Jersey (Princeton). From 1844 to 1849 he was pastor of the Duane Street Presbyterian church in New York. From 1849

to 1851 he was Professor of Church History in the Princeton Theological Seminary. In 1851 he took charge of the Fifth Avenue Presbyterian church in New York city. D. at Red Sweet Springs, Va., July 31, 1859. He was a man of various culture, and had uncommon unction and power as a preacher. He wrote the life of his father (1854), published numerous articles in the *Princeton Review*, and a number of volumes, such as *Discourses on Christian Faith and Practice*, and *Sacramental Discourses*.

S. M. J.

Alexander, JOHN HENRY: b. at Annapolis, Md., June 26, 1812; published a *Treatise of Mathematical Instruments* (1835); *Contributions to the History of Iron* (1840); *Introits* (1844); *Dictionary of Weights and Measures* (1850); *International Coinage* (Oxford, 1857), and other works. D. at Baltimore, Mar. 2, 1867. See his life by W. Pinkney, 1867.

Alexander, JOSEPH ADDISON, D. D.: son of Archibald Alexander; b. in Philadelphia, Apr. 24, 1809; graduated at the College of New Jersey (Princeton) 1826, in which he was adjunct Professor of Ancient Languages 1830-33. In 1838 he went into the Theological Seminary in the same town as associate Professor of Oriental and Biblical Literature, and in one chair and another continued to serve the institution till his death at Princeton, Jan. 28, 1860. He made extraordinary attainments in the Semitic and other languages. He wrote much for the *Princeton Review*. His most important works are commentaries: *Isaiah* (2 vols., 1846); *Psalms* (3 vols., 1850); *Acts* (1 vol., 1857); *Mark* (1858). *Matthew* was published posthumously in 1860. See his life by H. C. Alexander (1869).

Alexander, WILLIAM, D. D., D. C. L.: Archbishop of Armagh and Primate of All Ireland; b. at Londonderry, Ireland, Apr. 13, 1824; educated at Oxford; became Bishop of Derry and Raphoe in 1867, and archbishop in 1896. Besides several volumes of poems: *The Waters of Babylon* (1869); *St. Augustine's Holiday* (1886); and sermons: *The Great Question* (1887), he has published: *The Divinity of our Lord* (1890); *Leading Ideas of the Gospels* (1871); *Witness of the Psalms to Christ and Christianity* (1877); commentaries on Colossians, Thessalonians, Philemon, and the Epistles of John in the *Speaker's Commentary*; and on the last named in the *Expositor's Bible* series (1889). He was Bampton lecturer in 1876, and in 1892 delivered a series of lectures in Columbia College, New York. The See of Derry was permanently endowed by him with £2,000 a year and the see house.—His wife (born Cecil Frances Humphreys) is the author of *Moral Songs, Hymns for Children, and Poems on Old Testament Subjects*, among which is the celebrated poem *The Burial of Moses*. She died Oct. 12, 1895.

Alexander, WILLIAM LINDSAY, D. D.: b. at Edinburgh, Scotland, Aug. 24, 1808; educated at the universities of Edinburgh and St. Andrews; became classical tutor in Blackburn Theological Seminary, and subsequently (1835) a Congregational minister at Edinburgh; Professor of Theology in the Congregational Theological College, Edinburgh, 1854, and a member of the Old Testament Revision Company, 1870. He was the author of several doctrinal and miscellaneous works, including *The Connection and Harmony of the Old and New Testament* (2d ed. 1853); a *Life of Dr. Wardlaw* (1856); *Christian Thought and Work* (1862); *Zechariah* (1885); *Biblical Theology* (1891). He was the editor of the 3d ed. of Dr. Kitto's *Biblical Cyclopaedia* (3 vols., 1862-66). D. in Edinburgh, Dec. 22, 1884. See his *Life* by Ross (1887).

Revised by GEORGE P. FISHER.

Alexander Æt'olus: learned scholar and poetic experimenter of the Alexandrian period; flourished about 280 B. C. (see GREEK LITERATURE); a star of the Alexandrian tragic Pleiad. Of his elegiac poems we have not inconsiderable fragments, which show his learning, elegance, and false ingenuity. The fragments are in Bergk's *Poetae Lyrici*. See Couat's *La Poésie Alexandrine*, p. 105.

Alexander Ba'las: usurper of the throne of Syria; was a person of low origin, and lived in the second century B. C. He pretended to be the son of Antiochus Epiphanes, and, with the aid of Rome and several Greek princes, defeated his rival Demetrius Soter in 150 B. C., and Demetrius was killed in the flight. After a short reign he was defeated by his father-in-law, and in 146 B. C. was murdered by an Arabian emir with whom he had taken refuge.

Alexander Jannæus: King of the Jews 104-78 B. C.; was the third son of John Hyrcanus, and received from his subjects the surname Thracides ("as cruel as a Thracian"). His reign was an almost uninterrupted series of revolts and

massacres: and when once, in despair, he asked the people what he should do to please them, he was answered, "Kill yourself." His wife, Alexandra, succeeded him, and reigned, by the aid of the Pharisees, in peace.

Alexander John I.: Prince of Roumania; b. Mar. 20, 1820; elected in 1858 to the assembly of Moldavia, became in the same year Minister of War of the united principalities, was elected in 1859 first Prince of Moldavia, and then Prince of Wallachia, in both cases by a unanimous vote, but had to pledge himself to complete the union of the two principalities, and then resign in favor of some European prince. But he was not recognized by Turkey until Dec. 23, 1861, as prince of both principalities, on which day the union of the two principalities under the name of Roumania was proclaimed. But, in consequence of several unpopular measures, the most prominent men of Roumania planned a revolution, and in the night of Feb. 23, 1866, entered his apartments and forced him to sign his resignation. After that time he lived in Vienna as a private citizen. He died at Heidelberg, May 15, 1873.

Alexander Karageorgevitch, kaã'raã-jor'je-vich': Prince of Servia; son of Czerny George (*q. v.*), the first Prince of Servia; b. at Topola, Oct. 11, 1806. After the death of his father he lived for several years in a kind of exile in Wallachia, but finally obtained permission from Prince Michael Obrenovitch to return to Servia, and was even appointed his aide-de-camp. After Prince Michael's deposition he was elected Prince of Servia in 1842. Russia protested against his election, but Mar. 27, 1843, he was again elected, and this time by a unanimous vote. The policy he pursued was one of peace. In spite of Russian and Austrian intrigues he succeeded in keeping clear of any serious embroilment; even in 1853 he preserved neutrality, in spite of the internal excitement prevailing in the country. Meanwhile, a complete system of primary education was established; the finances of the state were brought in order; good roads were built, giving access to new markets; and in ten years the exportation of the country more than doubled. In consequence, however, of his peace policy toward the foreign powers, he became obnoxious to the people, and was deposed Dec. 11, 1858. In 1868 he was accused of complicity in the murder of Prince Michael, his successor, and was sentenced in 1871 by the authorities of Austria, where he had resided since his deposition, to eight years' imprisonment and the costs. D. at Temesvar, Hungary, May 2, 1885.

Alexander Nev'ski (or **Nev'skoi**): Russian prince and hero; b. at Vladimir in 1219; was a son of the Grand Duke Yaroslaf II. He gained in 1240 a signal victory over the Swedes on the Neva; hence his surname. On the death of his father, about 1246, he became Grand Duke of Vladimir. D. at Gorodetz, Nov. 14, 1263. By the Russians he is regarded as a saint. In his honor Peter the Great, in 1712, built the Alexander Nevski monastery in St. Petersburg, on the spot where the hero and saint is said to have gained his great victory. The monastery is one of the greatest and richest institutions of the kind, forming a whole city by itself, and having nine churches, a theological seminary for 1,000 scholars, the residence of the metropoliite of St. Petersburg, etc.

Alexander of Aphrodis'ias: celebrated Greek commentator on Aristotle; lived at about the close of the second century after Christ. Like his masters, Herminius and Aristotle the Messenian, he tried to free the Peripatetic philosophy from the syncretism of Ammonius and others, and to restore the true interpretation of Aristotle's works. He contended that the human soul does not survive the death of the body, but is absorbed into the world-soul. This led to new commentaries on the part of the great Schoolmen in the twelfth and thirteenth centuries.

Alexander, JOSEPH, OF BATTENBERG: ex-Prince of Bulgaria; son of Prince Alexander of Battenberg (Hesse); brother of the late Empress of Russia; b. Apr. 5, 1857; served with the Russian army during the war with Turkey; elected hereditary Prince of Bulgaria by the Assembly of Notables at Tirnova, Apr. 29, 1879; invested with extraordinary legislative powers by a vote of the Grand National Assembly, July 13, 1881. In 1885 war was declared against Bulgaria by King Milan of Servia, and although the Bulgarian army was inexperienced and the smaller, Prince Alexander, by his personal bravery and strategic skill, won several victories, and King Milan was finally forced to sign a treaty of peace at Bucharest. Aug. 20, 1886, part of his

army, induced by Russian intrigue, revolted and forced Prince Alexander to sign his abdication. He was carried as a prisoner to Russian territory, but soon returned, and was greeted with great popular enthusiasm. He decided, however, that he could not make way against his Russian enemies, and abdicated. Jan. 11, 1889, the prince formally took the name of Comte de Hartenau, and in the month following married Fräulein Amalia Loisinger, an actress, and retired to his estate at Gratz, in Styria. D. at Gratz, Nov. 17, 1893.

Alexander of Hales (surnamed *Doctor Irrefragabilis*, *Doctor Doctorum*, and *Fons Vitæ*): one of the greatest of the Schoolmen (*q. v.*), and the first of them to study Aristotle as a whole in the light of Arabian commentary and bring to bear on each passage the light of all others. He was born in Gloucestershire, England; studied and taught in Paris, where he died in 1245. His *Summa Theologiæ* is based on the sentences of Peter the Lombard. W. T. HARRIS.

Alexander Seve'rus: Roman emperor; b. about 205 A. D. His original name was Alexianus Bassianus, but when, upon his removal to Rome, he was created cæsar, pontiff, consul, and *princeps juvenis* elect by his cousin, the Emperor Elagabalus, he assumed the name Marcus Aurelius Alexander, and added Severus afterward. In 222 A. D., upon the death of his cousin, Alexander was proclaimed emperor by the prætorians and confirmed by the senate. From 231 to 233 he waged war against the Persians; in 234 he marched into Gaul against the Germans, but was waylaid and murdered by some mutinous soldiers near Mayence, 235.

Alexan'dra, CAROLINE MARIE CHARLOTTE LOUISE JULIE: Queen of England; daughter of Christian IX., King of Denmark; b. Dec. 1, 1844. She was married Mar. 10, 1863, to Albert Edward, Prince of Wales, and became queen upon his accession as Edward VII. in 1901.

Alexan'dria [classical accentuation, *Alexandri'a*; Gr. *Ἀλεξάνδρεια*; Turk. and Arab. *Iskanderieh*]: an ancient and celebrated city and seaport of Lower Egypt, named from Alexander the Great, by whom it was founded in 332 B. C. (see map of Africa, ref. 2-E). It was situated on a low and narrow tract which separates Lake Mareotis from the Mediterranean, near the western mouth of the Nile, and 117 miles N. W. of Cairo. Lat. of Pharos, the Alexandria lighthouse, 31° 12' 9" N., lon. 29° 53' E. Soon after its foundation it became the capital of the Grecian kings who reigned in Egypt, and one of the most populous and magnificent cities in the world. It was a great emporium of commerce, for which its position between Europe and India was very advantageous. Before, as well as after, the Christian era this city was a celebrated seat of learning and philosophy. Here was founded by the Ptolemies, about 296 B. C., the celebrated museum, to which was attached the greatest library of antiquity, known as the *Alexandrian Library* (see MUSEUM and ALEXANDRIAN LIBRARY). Among the principal edifices was the Serapeion, or temple of Serapis. In front of the city stood a famous lighthouse called Pharos, on an island of the same name. It is supposed that during its greatest prosperity Alexandria had 600,000 inhabitants, a majority of whom were Greeks and Jews. Even after Egypt had been conquered by the Romans this city was second only to Rome in size and importance. About the period 300-640 A. D. it was a great focus of Christian theology and sectarianism. It was captured by the Saracen caliph Omâr about 640, and then its prosperity declined. The discovery of a passage to India by the Cape of Good Hope (1497) aided in its ruin, and the population in 1778 was only 6,000. The chief remains of its ancient grandeur are: a granite monolith erroneously called Pompey's Pillar; the Catacombs; and two obelisks named Cleopatra's Needles—one of these obelisks was taken to London, England, in 1877-78, and set up on the Thames embankment; the other was presented to the U. S. by Ismail Pasha, and was taken to New York city in 1880.

The modern city, which again became populous and important, is built near the site of the ancient, and on a mole or isthmus connecting the mainland with the island of Pharos. It is connected with Cairo by a canal and railway, and with Suez by a railway, which is continued from Cairo. In consequence of steam navigation, Alexandria again became a great emporium of the commerce between Europe and India. The chief articles of export are grain, sugar, drugs, cotton, gums, rice, dates, and hides. Steamers ply regularly between this port and Brindisi, Malta, and Constantinople. Newspapers are published here in the Italian, Greek, and French languages. Pop. (1897) 319,766, of whom some 50,000 are Greeks, Italians, French, Germans, and Swiss,

and other foreigners. Its new artificial harbor, with a break-water 2 miles long, begun in 1871, is one of the most important works of the kind in the Mediterranean. In consequence of the Egyptian revolution headed by Arabi Pasha, which broke out during the summer of 1882, culminating in the most revolting cruelties against the Christians, Alexandria was bombarded by the British, under Admiral Seymour, July 11 and 12, 1882. The forts defending the harbor were dismantled, and on July 13 the greater part of the city was practically a mass of ruins. Revised by C. K. ADAMS.

Alexandria: town, Glengarry co., Ontario, Canada (for location, see map of Ontario, ref. 2-1); on Canada Atlantic R. R.; has grist-mills, 3 saw-mills, 2 sash and door factories, furniture-factory, 2 carriage-factories, cheese-box factory, 2 newspapers, 5 Roman Catholic churches and a convent, a Presbyterian church. Pop. (1881) 1,200; (1891) 1,614; (1892) estimated 1,850. EDITOR OF "GLENGARRIAN."

Alexandria: town and railroad center; the capital of Rapides parish, La. (for location of parish, see map of Louisiana, ref. 9-C); on railroad and south bank of the Red river, 196 miles by railroad and 350 miles by water N. W. of New Orleans. It has a convent of the Sisters of Mercy and four prosperous institutions of learning, also a large trade in cotton, sugar, molasses, and hides, etc. Pop. (1870) 1,218; (1880) 1,800; (1890) 2,861; (1900) 5,648.

Alexandria: capital of Douglas co., Minn. (for location, see map of Minnesota, ref. 7-B); on railroad, 142 miles W. N. W. of St. Paul. It has a U. S. land-office, fine high school, 8 churches, and 3 newspapers. Has furniture, plow, and cutlery manufactories; and steam, grist, and saw mills. It is pleasantly situated amid beautiful lakes, and is surrounded by fine wheat-growing country, the wheat of this neighborhood taking first premium in 1891. Pop. (1880) 1,355; (1890) 2,118; (1900) 2,681. EDITOR OF "POST."

Alexandria: Jefferson co., N. Y. (for location of county, see map of New York, ref. 2-G); in a township of its own name, on the St. Lawrence river, 25 miles N. by E. of Watertown. Alexandria Bay (P. O. name) is a port which is visited by steamboats. It has a lighthouse. The township embraces a part of the Thousand isles, and is a great summer resort. It contains a glass-factory. Pop. of Alexandria Bay (1880) 587; (1890) 1,123; (1900) 1,511.

Alexandria: city; important railroad center; port of entry, and capital of Alexandria co., Va. (for location of county, see map of Virginia, ref. 4-I); pleasantly situated on the right bank of the Potomac, 6 miles below Washington. The river is here a mile wide, and forms a good harbor for the largest ships. An extensive shoe-factory has been in operation for a number of years, with flouring-mills, machine-shops, plaster-mills, and other industries. The city is noted for the number and excellence of its institutions of learning. Pop. (1880) 13,659; (1890) 14,339; (1900) 14,528.

Alexandrian Library: the largest and most celebrated library of antiquity; founded by Ptolemy Philadelphus, King of Egypt, about 275 B. C. He purchased many books at Athens, Rome, and other places. This library is said to have been partially destroyed by fanatical Christians about 395 A. D. According to some authorities, it was burned in 642 A. D. by order of the caliph Omār, who argued that if books agree with the Koran they are unnecessary; if they differ they should be destroyed. See Ritschl, *Die Alexandrinischen Bibliotheken* (1838).

Alexandrian Manuscript: See CODEX ALEXANDRINUS.

Alexandrian Period: See GREEK LITERATURE.

Alexandrian (or Alexandrine) School: a certain type of thought and culture which began to prevail in Egypt about 300 B. C., and which exercised a palpable influence on Christianity, added a new chapter to the history of Greek philosophy, and produced even a hitherto unknown form of Judaism. In Alexandria the East and West met for the first time peaceably, and even amicably, with each other, and compromises, often of the most curious description, were the natural results. All these various compromises—between the fantastic asceticism of India, the prophetic inspirations of Judaism, the imaginative reasoning of Greece, the positivism of the Romans, not to speak of the numerous minor peculiarities of spiritual character—had a certain character in common, which justly took its name after the place where it originated. But beyond this—an amalgamation of different civilizations, with the natural stimulus inherent in such a process—the Alexandrian school can hardly be said to have gone. It

produced no new ideas; its ideas it always borrowed. But it tried new combinations, and the results were often very surprising; and the style in which it presented its thoughts was new and long-enduring. The intercourse of the Jewish and Greek colonists who had previously settled in that country had given rise to a blending of the peculiar religious ideas of each. The Gnostics, whose system was a mingling of Oriental with Christian thought, originated chiefly in Alexandria; and Philo-Judaus, the foremost representative of the Jewish-Alexandrian philosophy, was also a native of that city, and his writings powerfully influenced the Christian teachers, like Athanasius, Gregory of Nazianzus, and other eminent Christian Fathers. This school was likewise renowned for the culture of mathematics and physical science, and numbered among its disciples Euclid, Aristarchus of Samos, and, according to some writers, Archimedes. The celebrated critic Aristarchus is said to have passed the greater part of his life in Alexandria, where he founded a school. With regard to correctness and elegance of expression the Alexandrian writers were highly distinguished, but they were deficient in life and spirit. In a school where imitation and rule took the place of inspiration, each generation became more artificial and lifeless than its predecessor, and both prose and poetry often became labored affectation. Special works on the history of the Alexandrian School have been written by Matter (2 vols., 2d. ed. 1840-44); Barthélemy St.-Hilaire (1845); Simon (2 vols., 1844-45); and Bigg's *Christian Platonists of Alexandria* (1887).

Revised by S. M. JACKSON.

Alexandrine: a poetical line or verse formed of six iambs; so called from an old French poem of the twelfth century on Alexander the Great, or, with less probability, from Alexander de Bernay, one of the authors of the poem. The last line of the Spenserian stanza is an Alexandrine. See Byron's *Childe Harold*. See also Vergil's *Georgics*, iii. 424. Drayton's *Polyolbion* (1612-22) is the only poem in English written wholly in Alexandrines.

Alexandrine Age: a period during which Alexandria was the principal center of literature and science in the world. It extended from about 300 B. C. to 600 A. D., and was represented by many eminent grammarians and critics, who excelled in correctness and elegance of style, but were deficient in genius and originality.

Alexandrite [named by Nordenskiöld after Alexander II. of Russia]: a variety of chrysoberyl, of a chrome or grass-green by day, but changing to a columbine or raspberry color by artificial light. It is found in gems up to 65 carats in weight, and valued up to \$2,000 each, in Kandy, Ceylon, and originally in large crystals at Takowaja, in the Ural mountains. See CHRYSOBERYL. G. F. KUNZ.

Alexandrof: town of Central Russia; in the government of Vladimir; 70 miles W. N. W. of the city of Vladimir. It contains a convent founded by Ivan IV., who is said to have also established here the first printing-press in Russia. Pop. 6,915.

Alexandro'pol (formerly *Gumri*): fortified town of the Caucasus; in the government of Erivan; on the Arpa-Chai river, 85 miles S. W. of Tiflis. The fort, which lies about 2,000 feet from the city, 300 feet above the level of the river, commands the entire vicinity, and can hold 10,000 men. Alexandropol is an important strategical point, as it is the key to Armenia. Pop. (1897) 30,735.

Alex'is, or Alex'ins: the name of several emperors who reigned at Trebizond (Trapezus) in the thirteenth, fourteenth, and fifteenth centuries. They belonged to the Comnenus family. See COMNENUS.

Alexis, or Alexins I.: Emperor of Constantinople; b. in 1048. Having distinguished himself by his military talents he was proclaimed emperor by his soldiers about 1080, in place of Nicephorus, who was then deposed. He showed himself an able and a crafty ruler. Some writers censure him for his failure to support the operations of the first crusade, which occurred in his reign. He died Aug. 5, 1118, and was succeeded by his son John.

Alexis Alexandrovitch: Grand Duke of Russia; younger son of the Emperor Alexander II.; b. in Jan., 1850. He visited the U. S., making an extensive tour in 1872, and meeting nearly everywhere a warm reception among the Americans.

Alexis Michaelovitch: Emperor of Russia; b. Mar. 10, 1629; succeeded his father Michael in 1645. He promoted

civilization and improved the laws. He was the father of Peter the Great. D. Jan. 29, 1676.

Alexis Petrovitch, or Petrewitsch: a Russian prince; son of Peter the Great; b. at Moscow, Feb. 28, 1690. He showed such a hostility to the reforms of his father that the latter resolved to exclude him from the throne. While Peter was traveling in Western Europe in 1717, Alexis fled to Vienna and Naples. He was soon brought back, and condemned to death on the charge of treason or rebellion. He died in prison, July 7, 1718. His son Peter became emperor in 1727.

Alexis, WILLIBALD: See HÄRING, WILHELM.

Alex'ishad: a watering-place of Germany; in the Harz Mountains, 9 miles from Ballenstädt (see map of German Empire, ref. 4-F); was established as a watering-place by the Duke of Anhalt-Bernburg in 1810. It has two springs—the Selke spring, which contains no carbonates, and very little carbonic acid gas, but large quantities of chloride and sulphate of iron, and is only used for bathing; and the Alexis spring, containing carbonate of iron, which is used for drinking. The scenery in the neighborhood is beautiful.

Alexis of Thuri: Greek comic poet; b. B. C. 392; one of the most important and prolific writers of the Middle Attic Comedy (see GREEK LITERATURE), though living as he did to the age of 106 he reached far into the period of the New Attic Comedy. The part of the parasite was considered his special invention. Fragments in Meineke, *Fragmenta comicorum Græcorum*, iii. 382 ff.; Kock, iii. 297 ff. (345 numbers).

Alfalfa: See LUCERNE.

Alfie'ri, VITTORIO, Count: Italian poet; b. at Asti, in Piedmont, Jan. 17, 1749, and inherited a large fortune. He was sent to the Academy of Turin, in which he learned little, and which he quitted about 1764. Recoiling with disgust and resentment from the stupid pedantry and tyranny of his teachers, he plunged into dissipation and neglected the cultivation of his mind. He passed many years in travel, for which he had a strong passion, and visited nearly all the countries of Europe, impelled by morbid unrest and love of excitement, rather than a rational resolution to complete his education. He began his literary career by the drama of *Cleopatra*, which was performed with applause in 1775. About this time he entered a more regular course of life, and devoted himself with passionate ardor to study and composition. It is stated that he commenced the study of Greek after he was forty years old. His literary success was promoted, as he affirms, by the influence of the Countess of Albany, the wife of the Young Pretender, Charles Edward Stuart. (See ALBANY, COUNTESS OF.) He passed many years in her society at Florence and Rome, and in France. He composed numerous tragedies, comedies, satires, and lyrical poems. His reputation is founded chiefly on his tragedies, among which we notice *Virginia*, *Filippo II.*, *Orestes*, *Abel*, *Mary Stuart*, *Myrrha*, *Octavia*, and *Saul*. His dramas, which display great energy of language and intensity of passion, and abound in noble sentiments, were well adapted to reform the national literature, which had become effete, insipid, and destitute of manly vigor. "The aim of his works," says Madame de Staël, "is so noble, the sentiments which the author expresses accord so well with his personal conduct, that his tragedies ought always to be praised as actions, even when they may be criticised as literary works." (*Corinne*.) Alfieri was liberal in politics, and ardently desired to improve the political and social condition of Italy by his writings. Among his works are an *Essay on Tyranny*, five odes on the American Revolution, and his interesting autobiography. He died at Florence, Oct. 8, 1803. His complete works were published at Pisa in 22 vols. 4to, 1808. A new edition of his dramatic works was published by Milanese (1855, 2 vols.). His life was written by Teza (1861). See also Tedeschi, *Studi sulle tragedie di Alfieri* (1869).
Revised by A. R. MARSH.

Alfon'sine (or Alphon'sine) Tables: the astronomical tables prepared by the order of Alfonso X. of Castile and Leon, at a cost of 400,000 gold ducats—about \$800,000. They were published in 1252.

Alfonso I. of Castile (or Alfonso VI. of Leon), surnamed THE BRAVE: son of Fernando I.; became King of Leon in 1065, and of Castile in 1073. Aided by the famous Cid, he defeated the Moors in several battles. He died in 1109.—ALFONSO VIII. of Castile (sometimes called ALFONSO III.), was born about 1155, and became king in 1158. He defeated the Sultan Mohammed An-Nâsir in a great battle in 1212.

D. in 1214.—ALFONSO XI. of Castile, b. in 1311; succeeded his father, Fernando IV., in 1312. He gained a great victory over the Sultan Aboul-Hassan at Tarifa in 1340. D. at Gibraltar in 1350.

Alfonso I.: King of Naples and Sicily; b. about 1385; was a son of Fernando I. of Aragon, whom he succeeded in 1416. On the death of Joanna II., Queen of Naples (1435), that kingdom was claimed by Alfonso and René of Anjou. After a long war between these rivals, Alfonso obtained the throne of Naples in 1442. He died June 27, 1458, and was succeeded by his son, Ferdinand I.

Alfonso I.: King of Navarre and Aragon; came to the throne in 1104; married the daughter of Alfonso I. of Castile, and proclaimed himself "Emperor of all Spain" in 1109; won many battles against the Moors, taking Saragossa in 1118. He also crossed the Pyrenees and captured Bordeaux in 1130, and Bayonne in 1131. D. in the cloister of San Juan de la Pegna, Valencia, Sept. 15, 1134. C. H. T.

Alfonso I.: first King of Portugal; b. about 1100; a son of Henry of Burgundy. Having gained a great victory over the Moors at Ourique in 1139, he assumed the title of king. He afterward took Lisbon, and became master of all Portugal. He died at Coimbra, Dec. 6, 1185, and left the throne to his son, Sancho I.

Alfon'so III. of Asturias, surnamed THE GREAT: began to reign in 866 A. D. He enlarged his dominions by victories over the infidels of Spain. D. at Zamora in 901.

Alfonso V.: King of Portugal; b. in 1432; was successful in wars against the Moors in Africa, and surnamed *Africano* on that account; but failed in his attempt to add Castile and Leon to his dominions. D. at Cintra, Aug. 28, 1481.

Alfonso VI.: King of Portugal; b. 1643; succeeded his father in 1656; on account of his vices was dethroned by his wife and brother in 1667; and d. in imprisonment at Cintra, Sept. 12, 1683.

Alfonso X.: called *El Sabio*, "The Learned"; b. Nov. 23, 1221; succeeded to the throne of Castile and Leon in 1252. He abandoned the warlike policy of his father, Ferdinand III., and it was chiefly owing to him that a favorable opportunity was lost for driving the Arabs from Spain. Having been elected German emperor by a faction of the German princes in 1257, his desire to maintain a splendid court forced him to resort to unjust and disastrous financial measures, which estranged his subjects from him and helped to prepare the way for the usurpation of his throne by his second son, Sancho, in 1282. He died as a fugitive in Seville, April 4, 1284. It is not to his capacity as a ruler, but to his extensive learning and literary activity, that Alfonso X. owes a distinguished position in Spanish history. His great interest in astronomy and natural science is attested by such compilations as the *Astronomical Tables*; his *Book of the Treasure*; in law, by *The Mirror of all Laws*, and especially by his well-known code named *Las Siete Partidas* (The Seven Divisions), which is, however, rather a series of essays on legislation, moral and religious, than a legislative monument such as the great statutes of Edward I. While in the *Chronicles*, which he caused to be written in Castilian, he laid the cornerstone of a national historiography, and in the translation of the Bible into Castilian, made under his direction, he greatly contributed toward making the Castilian dialect the language of the whole kingdom, he has also the great merit of having perfected and firmly established by the above-mentioned works the character of Castilian prose. Alfonso X. was also the warm friend of the Provençal troubadours, whose poetic forms he imitated in a number of lyric compositions still extant. In this lyric court-poetry, as well as in his 401 songs in honor of the Virgin Mary (published by the Spanish Academy in 1889), he did not employ the Castilian, but the Galician dialect, then in common use among all the troubadours of Western Spain. HENRY R. LANG.

Alfonso XII.: King of Spain; b. Nov. 28, 1857; son of Queen Isabel and of the Infante Francisco; educated at the Military Academy of Woolwich, England; on Dec. 31, 1874, Gen. Martinez Campos proclaimed him king; on Jan. 9, 1875, he landed at Barcelona and took command of the army; Jan. 23, 1878, he married Princess Maria de las Mercedes, b. June 24, 1860, youngest daughter of the Duke of Montpensier; became a widower June 26, 1878, and married, in second nuptials, Nov. 29, 1879, Archduchess Maria Christina of Austria, b. July 21, 1858. King Alfonso XII. died at Madrid, Nov. 25, 1885.

Alfonso XIII.: King of Spain under the regency of his mother, Maria Christina; the son of Alfonso XII.; b. May 17, 1886, after his father's death.

Alford, CHARLES RICHARD, D. D.: Anglican divine; b. 1816, at West Quantoxhead, Somersetshire, England; educated at Trinity College, Cambridge; ordained in 1840; principal Metropolitan Church of England Training College, 1854-64; Bishop of Victoria, Hongkong, 1867-72; author of *First Principles of the Oracles of God*; a charge on *China and Japan*; and numerous sermons and pamphlets.

Alford, HENRY, D. D.: poet, preacher, painter, scholar, critic, philologist, and theologian; b. in London, England, Oct. 7, 1810. He became a fellow of Trinity College, Cambridge, in 1834; incumbent of Quebec Street chapel, London, in 1853, and Dean of Canterbury in 1856. His most popular poetical work is *The School of the Heart, and other Poems* (1835), which was highly commended by the *Edinburgh Review* for Jan., 1836. He gained a high reputation as a biblical critic by his edition of the Greek New Testament (1844-52), in which he made much more use than his predecessors of the treasures of German learning, and thereby created an epoch in New Testament study. A revised edition of it appeared in 4 vols. (1859 *et seq.*). The *Contemporary Review* was inaugurated under his editorship, and was conducted by him from Jan., 1866, to Aug., 1870. Seven volumes of sermons preached in Quebec Street chapel were published at intervals of his busy life; also two volumes of *Hulsean Lectures*, delivered before the University of Cambridge. He published also a small volume entitled *The Queen's English*, which attracted no little attention. D. at Canterbury, Jan. 12, 1871. Revised by W. S. PERRY.

Alfred, surnamed THE GREAT; written also **Ælfred**, **Alured**, or **Alvred** (in Lat. *Ælfre'dus*): King of the West Saxons in England; b. in Berkshire in 848 or 849 A. D. He was a younger son of Ethelwolf, and succeeded his brother Ethelred in 871, when he found the country in a miserable condition. In the preceding reign the kingdom had been invaded and ravaged by an army of Danes, whom the Saxons were unable to resist. After the accession of Alfred these piratical incursions were continued or renewed, and nearly all of the kingdom was conquered by the Danes. Alfred was forced to flee from his court and conceal himself in the hut of a cowherd. Having by furtive measures raised a small army, he attacked and routed the Danes at Eddington in 878. Soon after this battle the Danish King Guthrum surrendered himself, was converted to Christianity, and remained a peaceable subject of Alfred, who now directed his attention to civil affairs. He founded or improved the British navy, rebuilt cities and forts, established schools, compiled a code of laws, and reformed the administration of justice. In that age of ignorance he was distinguished as a scholar, as well as a patron of learning. He translated several works from the Latin into Anglo-Saxon. About 893 he was recognized as the sovereign of all England. His kingdom was again invaded in 894 by an army of Northmen under Hastings, who is said to have had a fleet of 300 ships. Alfred defeated them in several battles, and finally drove them out of the island. He died at Winchester, Oct. 28, 901, and was succeeded by his son, Edward the Elder. Alfred is regarded as the wisest and greatest of all the kings of England. He was, says Freeman, "a saint without superstition, a scholar without ostentation, a conqueror whose hands were never stained with cruelty, a prince never cast down by adversity, never lifted up to insolence in the day of triumph." See Sharon Turner's *History of the Anglo-Saxons*, and Hughes's *Alfred the Great* (1878).

Alfred, ERNEST ALBERT: Duke of Edinburgh; second son of Queen Victoria of England; b. in Windsor Castle, Aug. 6, 1844; entered the royal navy Aug. 31, 1858; was married Jan. 23, 1874, to Grand Duchess Marie of Russia, the only daughter of Emperor Alexander II.

Alfred (or **Alured**) of **Beverley**: an English priest and historian; b. about 1100. He wrote a history of Britain in Latin, an abridgment of Geoffrey of Monmouth.

Alfred Centre, Allegany co., N. Y. (for location of county, see map of New York, ref. 6-D); 2 miles from Alfred station on the Erie R. R.; has an academy, and is the seat of Alfred University, a Seventh-Day Baptist institution. Pop. (1880) 513; (1890) 786; (1900) 756.

Alfreton: a market-town and parish of Derbyshire, England; 12 miles N. N. E. of Derby (see map of England, ref.

8-H). It is supposed to have been named in honor of Alfred the Great. Pop. 4,492.

Al'gæ [plu. of Lat. *alga*, a seaweed]: the general name of the seaweeds, etc., comprising many species which grow in salt or fresh water, and are greatly diversified in form, size, and structure. Some are too small to be seen by the naked eye, while the stem of the "giant kelp" of the west coast of America sometimes attain a length of from 1,000 to 1,500 feet. Having no true roots, they usually adhere to rocks or the sea bottom, and sometimes they float on the surface. Navigators frequently meet with masses of gulfweed (*Sargassum*) many miles in extent. An area of this kind in the Atlantic is said by Maury to be as large as the Mississippi valley. There are several such areas in the ocean, called SARGASSO SEAS (*q. v.*). Al'gæ are cellular in structure, are useful as manure, and some species, like Irish moss, are used as food. Kelp or barilla, made by burning seaweeds and other marine plants, yields soda and iodine. See VEGETABLE KINGDOM.

Revised by CHARLES E. BESSEY.

Algar'di, ALESSANDRO: Italian sculptor and architect; b. at Bologna about 1600; studied design under the Caraeci. His masterpiece in sculpture is a colossal work in relief in St. Peter's church, Rome, the subject of which is Pope Leo forbidding Attila to enter Rome. Among his works are statues of S. Filippo Neri and Innocent X. D. in Bologna, June 10, 1654.

Algarovil'la: an astringent substance procured from a tree called *Juga marthæ*, found in New Carthage, South America. It is a powerful agent for tanning leather.

Algar've (i. e. the western land), or **Faro**: the southernmost province of Portugal; bounded N. by Alemtejo, E. by Spain, and S. and W. by the Atlantic Ocean. Area, 1,872 sq. miles. The surface is mostly mountainous. The main exports are wine, salt, dates, and other fruits. The chief towns are Faro and Lagos. Pop. (1878) 205,901; (1881) 204,031.

Al-Gazza'li, or **Al-Ghazza'li**, ABU HAMED MOHAMMED: b. at Tus, Persia, in 1058; taught both in Nishapoor and in Bagdad; lived a while in Syria; visited Egypt; spent the latter part of his life in Tus, where he died in 1111. He was one of the most prominent of the Moslem theologians and philosophers, and a very prolific writer. See Lewes's *Biographical History of Philosophy*. J. R. J.

Al'gebra [mediev. Lat. (or Ital.) form of Arab. *aljebr*; *al*, the + *jebr*, reuniting, to *jabara*, restore]: an important branch of mathematics, sometimes called universal arithmetic, but it may be more properly described as a calculus of symbols. The symbols it employs are of three kinds: (1) those of quantity, known or unknown, which consist of ordinary numbers and letters of the alphabet; (2) those of operation, among which are +, -, ×, ÷, √, etc.; and (3) mere abbreviations for ordinary words. (See SIGN.) The combination of these symbols according to fixed laws leads to algebraical expressions or formulæ, in which actual computations are indicated rather than performed. The universality of algebra as compared with arithmetic consists in the fact that in the latter, computations being effected as they arise, all traces of the intermediate steps are obliterated, and the result is applicable to a single case only; whereas in algebra the formulæ contain implicitly the answers to an unlimited number of questions. Again, to the equivalence of two algebraical formulæ always corresponds a general theorem, which arithmetic can only *verify* in particular cases. Thus from the algebraical identity

$$(a+b)(a-b) = a^2 - b^2$$

we learn that the "product which results from multiplying the sum by the difference of *any* two numbers is equal to the difference of their squares."

The systematic notation, to which algebra owes its chief power as an instrument of research, has been of very gradual growth, and is still being extended. In the first known treatises on the subject, by Diophantus, who probably lived in about the fourth century of our era, the few symbols employed are mere abbreviations for ordinary words. The Arabians, who obtained their algebra from the Hindus, did little or nothing toward its extension, though their treatises, after being carried into Italy by a merchant of Pisa, Leonardo Bonacci (1202 A. D.), gave rise to important improvements. Scipio Ferreus, of Bononia, is said to have first solved the equation of the third degree (1505); but it was Tartaglia, or rather Cardan, who first gave the general solution of a cubic equation, and employed letters to denote the unknown quantities, the known ones being still mere num-

bers. Without extending algebraic notation, Ferrari, a disciple of Cardan, discovered the general solution of a biquadratic equation, and thus, unknown to himself, reached the barrier which, as has since been proved, will ever remain impassable to the searcher for *general* solutions of equations of the fifth and higher degrees. (See EQUATIONS.) Toward the middle of the sixteenth century algebra was introduced into Germany, France, and England, by Stifelius, Peletarius, and Robert Recorde, respectively. In doing so, the latter also invented the very convenient symbol of abbreviation =, and Stifelius the far more important symbols of operation +, -, $\sqrt{\quad}$. In the same century, through her far-famed son Vieta, France contributed still more to the progress of the science. Vieta introduced letters as symbols for known as well as for unknown quantities, and by the increased power thus acquired he laid the foundation of the general theory of equations. In this direction he was followed by Girard, Harriot, Descartes, and others; in short, the science now advanced rapidly toward its present state of perfection. It would be fruitless here to attempt to trace its progress. The reader may consult with advantage Hutton's *Mathematical Tracts*, vol. ii.; Bonnycastle's translation of Bossut's *Histoire des Mathématiques*; or the works of Montucla. See DETERMINANTS.

Revised by S. NEWCOMB.

Algeciras, aal'khaÿ-thee'ras (i. e. the Peninsula): a seaport of Spain: in the province of Cadiz; 6 miles W. of Gibraltar, from which it is separated by the Bay of Gibraltar; lat. 36° 8' N., lon. 5° 26' 5" W. (see map of Spain, ref. 20-D). Pop. about 14,000. Leather and charcoal are exported from this port. Here occurred a naval battle between the English and French in July, 1801.

Alger, HORATIO, JR.: Unitarian minister; b. at N. Chelsea (now Revere), Mass., Jan. 13, 1834; graduated at Harvard in 1852; studied divinity at Cambridge; was ordained over the Unitarian church at Brewster, Mass., in 1864; and settled in New York in 1866. He published *Bertha's Christmas Vision* (1855); *Paul Preston's Charge* (1865); *Do and Dare* (1884), etc. D. in Natick, Mass., July 18, 1899.

Alger, RUSSELL ALEXANDER: politician; b. at Lafayette, O., Feb. 27, 1836; admitted to the bar 1859; entered the Union army as a private; was breveted major-general of volunteers June, 1865; Governor of Michigan 1884; candidate for President in Republican National Convention 1888; elected commander-in-chief of the G. A. R. 1889; Secretary of War in McKinley's administration 1897. Resigned July 19, 1899.

Alger, WILLIAM ROUNSEVILLE: clergyman and author; b. at Freetown, Mass., Dec. 30, 1822; graduated at Harvard Theological School in 1847. Besides his most important work, *A Critical History of the Doctrine of a Future Life*, with the remarkable bibliography by Ezra Abbot, *Literature of the Doctrine of the Future Life* (1863), his *Genius of Solitude* (1865) and *Friendships of Women* (1867) have been admired. He has also translated Oriental poetry from the German. He has been since 1875 pastor of Unitarian churches in New York, Denver, and Boston.

Alge'ria (Fr. *L'Algérie*): a French colony in Northern Africa: between the Mediterranean and about lat. 37° N., and the meridians of 2° W. and 10° E. Area, 184,474 sq. miles. Boundaries: Mediterranean on the N., Tunis and Tripoli on the E., Sahara S., Morocco W. A protectorate is claimed over an enormous desert area to the S., extending to about lat. 15° N., and from meridian 8° W. to 13° E.

Topography.—Coast high and steep, with few good harbors; near the coast, Little Atlas Mountains; mountainous region, with coast streams and deep, fertile valleys. Back of these mountains an extensive arid plateau 2,000 to 3,000 feet high, declining toward the Sahara. Between this plateau and the desert, main Atlas chain, with wooded slopes. No large rivers.

Climate.—The climate is dry; the rainy season lasts from September to April, but the rains are not constant. The summer is almost rainless. The heat is not as intense as in some countries, but is protracted. The winters are pleasantly cold, making the colony an agreeable winter resort.

Soil and Vegetation.—The soil of the valleys and the Metidjah, or northern plain, is very fertile. Near the coast market vegetables are grown largely and exported to Europe. The valleys and plain produce wheat, barley, and tropical fruits. The grasses and reeds of the Shott or great plateau afford rich pasture to the Arab or Berber horses, cattle, asses and mules, and sheep. The esparto grass, extensively used in paper-making in France and Great Britain, grows

all over this plateau. The forests are of different species of palm, cedar, and cork-oak. The date-palm ripens its fruit in the S. The wild beasts, except the hyæna and jackal, are mostly exterminated. The minerals are iron, lead, copper, marble, sulphur, and salt.

Commerce.—In 1890 the imports were \$47,000,000, and the exports about \$52,000,000. The exports from and imports to France were nearly equal—viz., \$42,000,000. In 1891 there were 1,910 miles of railway in operation, including the Tunisian extension of 140 miles. In 1890 the telegraph lines, including branches into Tunis, were 4,310 miles in length, with 10,000 miles of wire.

Weights and Measures.—(1) Length: The metric system is established by law. The former unit of length was the (so-called) Turkish pik = 25.197 inches = 640 mm., which is not, however, that of Constantinople, nor equivalent to any of the various piks in use in the Levant. The so-called Moorish or Arabian pik = $\frac{3}{4}$ of the foregoing = 18.898 inches = 480 mm., was also used; but this is not the pik used in Morocco or in Arabia. Sub-multiple, the robi = $\frac{1}{8}$ pik.

(2) Volume: For liquid capacity the khoullé = 4.4027 gal. = 16.675 liters. For dry measure, the tarrie = 0.56295 U. S. bush. = 19.84 liters. Multiple, 16 tarries = 1 eaffiso. The saâ is a little less than 3 tarries; it is = 1.646 bush. = 58.0 liters.

(3) Weights: The rotl or rottolo is the unit, and has different values for different commodities. The rotl-kébir (large rotl), for honey, butter, oil, dates, and soap = 1.806 lb. avoirdupois = 0.81912 kilog.; the rotl-ghredouri, for fruits and leguminous vegetables = 1.34543 lb. av. = 0.61434 kilog.; the rotl-feudi, for precious metals and gems = 1.0968 lb. av. = 0.49743 kilog.; and the rotl-attari, for drugs and commodities generally = 1.20403 lb. av. = 0.54608 kilog. The rotl-feudi and the rotl-attari are subdivided into 16 ounces each, the rotl-ghredouri into 18 ounces, and the rotl-kébir into 24 ounces. The rotl-attari has a multiple by 100, called the kantar-attari, for commodities generally; a multiple by 110 for cheese, almonds, cotton, and some other things, called the kantar-fromage; a multiple by 166 for honey, butter, oil, soap, etc., called the kantar-beurre; and a multiple, called the kantar de lin, of 200 rotl-attari. There are a kantar-ghredouri and a kantar-kébir, each of 100 times the corresponding rotl. The kharouba or karob is a small weight for pearls and jewels = 3 grains = 0.1944 gramme; multiple, 24 karobs = 1 métiéal.

History.—The Numidians and Moors, who inhabited this region, soon came under the control of Carthage. On the fall of Carthage, 146 B. C., Algeria became a Roman colony, and enjoyed a great degree of prosperity till its conquest by the Vandals, in the middle of the fifth century. Two centuries later the Saracens became masters of the country, and the people gradually sank into a state of barbarism. In 1516 the ameer called in the pirates of Barbarossa to his help against the Spaniards, and they became masters of the country and acknowledged the suzerainty of Turkey. For three centuries the Algerine pirates were the terror of Southern Europe and the Mediterranean. In 1705 they renounced allegiance to Turkey, and their piracies grew more audacious for the next hundred years. Partially checked by Napoleon I., they returned to their bloody deeds after the peace, but in 1815 were compelled to sue for peace by a U. S. squadron. After a time they became bolder than ever, and France resolved to chastise them. After a three-years blockade of the ports of Algeria, the French bombarded and captured Algiers, July 5, 1830. The country was under French military control for forty years, and there was constant fighting with the Arabs and Kabyles. It was generally believed that the French rule had been a failure, and that the colony had cost much more than France would ever receive for it; but in 1871, after the suppression of a serious rebellion, Algeria was put under a civil administration. There has been since that time some trouble with the native tribes, but as a whole the civil administration has proved a success. A standing army is still maintained there of 60,000 men, but half of them are native troops. In 1881 a war commenced with the native tribes of Tunis, which resulted in the establishment of a protectorate over that country by France. After the Franco-Prussian war homes were offered to Alsatians who preferred to remain with France. Many took advantage of the offer, and the colony has since been prosperous.

Administration.—A civil governor-general now administers affairs, and Algeria is looked on rather as a part of France than as a colony. Military administration is now limited to the outlying parts in the Sahara. The laws are made by the French Chambers, and each Algerian depart-

ment sends 1 senator and 2 deputies to the National Assembly. The departments are 3 in number—Algiers in the middle, Constantine on the E., and Oran in the W. Education is well cared for. There is an academy at the city of Algiers with 223 students (1888), and there are 8 communal colleges and 1 college for girls. Order is well maintained, and crime is not more common than in France. The population is largely agricultural. Wheat, barley, grapes, tobacco, and alfa are the common crops.

Population.—The total population in 1891 was—in the civil districts, 3,636,967; in the military districts, 487,765; total, 4,124,732, or 22 to the sq. mile. The civil territory is being constantly increased by taking in parts of the military territory. Of the above population, 272,662 were of French extraction, 47,667 were naturalized Jews, and 3,567,223 were French indigenous subjects, besides foreigners, properly so called. In 1876 the population of Algiers (capital of the colony and of the department of Algiers) was 74,792; Oran (capital of Oran department), 67,681; Constantine (capital of Constantine department), 44,960; Bona, 29,640; Tlemçen, 28,204; Philippeville, 22,177; Blidah, 24,304; Sidibël-Abbès, 21,595.

Besides the Europeans there are eight different races found in Algeria. (1) The Kabyles, a race representing the ancient Berbers, probably the aborigines and possibly Aryan. They form a large part of the population, especially in the mountains. (2) The Arabs, common especially in the S. They are Bedouins or nomadic Arabs and are turbulent. (3) The Moors, a mixed race, common in towns near the seacoast. (4) The Jews, generally engaged in commerce in the towns. (5) The Turks; long dominant but never numerous, they have now about disappeared. (6) Kolougis, half-breed Turks by native women, not uncommon in the cities. (7) Negroes who were brought originally as slaves. (8) The Mozabites, an African race furnishing laborers for the coast towns.

WORKS OF REFERENCE.—Faidherbe, *L'Avenir du Sahara et du Soudan* (1866); Maltzan, *Drei Jahre im Nordwesten von Afrika* (1869); Fillias, *L'Algérie ancienne et moderne* (1875); Gaffarel, *L'Algérie, histoire, conquête, colonisation* (1883); Playfair's Murray's *Handbook of Algeria and Tunis* (1887); Playfair's *Bibliography of Algeria*, published by the Royal Geographical Society (1888); and numerous official publications by the French Government.

Revised by MARK W. HARRINGTON.

Alghero, or Algheri: a fortified town and seaport of Sardinia; 15 miles S. W. of Sassari (see map of Italy, ref. 7-B). It has a cathedral and several convents. Wine, grain, tobacco, coral, etc., are exported from it. Pop. of commune, 10,532.

Algiers' (Arab. *Al-Jezair'*, Fr. *Alger*): a seaport and city of North Africa; on the Mediterranean; lat. 36° 47' 3" N., lon. 3° 4' 5" E. (see map of Africa, ref. 1-C). It was formerly the capital of the Dey of Algiers, but since 1830 has been the capital of the French colony of Algeria. Built on the slope of a steep hill, which rises to the height of 500 feet, it presents from the sea an imposing appearance, which is partly owing to the whiteness of the houses. The old streets are mostly narrow and crooked, but several straight and elegant streets have been made since the French became masters of the city. The houses are built of stone and brick, have flat roofs, and are annually whitewashed. Among the public buildings are numerous mosques, several Roman Catholic churches, a fine cathedral and exchange, and a public library. The beauty and prosperity of the city have been much improved by the French, and its commerce has been greatly increased. Among the articles of export are wheat, coral, animal skins, and olive oil. Steam-vessels ply frequently between Algiers and Toulon and Marseilles. This city was for three centuries the rendezvous of the Algerine pirates, who, though few in number, defied the power of the greatest nations of Europe. It was bombarded by the English admiral Lord Exmouth in July, 1816, when a large part of the city was reduced to ruins, and was taken by the French in July, 1830. Pop. (1881) 64,714, exclusive of the military; (1886) 74,792.

Algo'a Bay: on the south coast of Africa; in Cape Colony, about 425 miles E. of the Cape of Good Hope. Here are a good harbor and a flourishing seaport called Port Elizabeth, situated at the mouth of the Zwartkops river. It was at Algoa Bay that the first immigrants landed in South Africa.

Algol: the star which in the ordinary nomenclature is known as β Persei (R. A., 3 h. 1 m.; Decl., 40° 33'). In recent times it has become the subject of some most remarkable discoveries. For more than a hundred years it has figured as a variable star, because at certain regular intervals, a little less than three days, its light gradually faded out during about four hours, until it was reduced from the second to the fourth magnitude. During the following four hours its light would be recovered, and the magnitude of the star would then remain unchanged for about two and a half days. It was long ago suggested that these variations might be due to the partial eclipse of the star by a dark body revolving around it, and passing between the earth and the star at every revolution. But the testing of this hypothesis seemed hopeless until the system of measuring the motion of stars in the line of sight, originally introduced by Dr. Huggins, of London, was brought to extreme perfection by Dr. Vogel, of Potsdam. The latter found by repeated measurement that before each eclipse the star was moving away from the earth, and after the eclipse toward the earth. Such an alternation of motion pointed directly to the action of a dark body revolving around it, the eclipse occurring as the body passes between the earth and the star. The time and amount of the eclipse, the time of revolution, and the velocity of the star as it receded and approached, led to the following approximate elements of motion:

Diameter of Algol.....	1,060,000 miles.
Diameter of satellite....	830,000 miles.
Distance of the bodies...	3,200,000 miles.
Orbital velocity.....	55 miles per second.
Masses.....	$\frac{1}{4}$ and $\frac{2}{3}$ of the sun's mass.

It thus appears that Algol is about as large as our sun, and, what is yet more remarkable, the eclipsing planet is nearly as large as the star itself; it may be regarded as certain that the volume of this invisible planet is thousands of times that of our earth, and, indeed, hundreds of times that of Jupiter.

Dr. Vogel's discovery has been supplemented by another, made by Mr. S. C. Chandler, of Cambridge. For some time it has been known that the period between two eclipses of the star is not uniform. It occurred to Mr. Chandler that this variation of the period might be explained by supposing that both Algol and its invisible satellite were revolving around a third dark body. When by moving in this orbit Algol was coming toward us, the period between two eclipses would be shortened, because the star would partly overtake the light by which we see it. When moving away from us, the period between the eclipses would be longer, because the light would have farther to travel after each eclipse. He therefore investigated the question whether observations on the position of the star showed an irregularity of proper motion which would be caused by such an orbital revolution. By discussing all the observations from 1750 till the present time, such a change was very strongly made out; yet it is so slight that the quantity of it can not be regarded as exactly measured. But the remarkable agreement between the parallax found by Mr. Chandler and the parallax we should expect a star of the second magnitude to have, were it equal to our sun in brilliancy, seems to leave no doubt of the correctness of the conclusion. The period of the revolution of Algol around the third body was fixed by Mr. Chandler at 130 years, but this is probably too short; indeed, until the star is observed through more than a complete revolution, it will be impossible to fix the length of the period with certainty.

We have thus acquired a knowledge of two immense dark bodies, not only forever invisible to human eyes, but incapable of producing any motion that can be detected by the ordinary telescopic measurement; yet the effect of whose attraction is shown by the spectroscope and by the laws of the motion of light. See *Astronomische Nachrichten*, vol. cxxiii.; and the *Astronomical Journal*, vols. vii. and xi.

S. NEWCOMB.

Algo'ma: a district of Ontario, Canada; formerly occupying the entire northwestern extremity from about lon. 81° westward, now extending only to 85° W., and from the North Channel, Lake Huron, to the Albany river on the N. It is well wooded and watered and rich in minerals, but has few inhabitants, except a sparse Indian population, and in the eastern part a sprinkling of farmers. Two branches of the Canadian Pacific Railway cross the district. M. W. H.

Algotometer: See RECORDING APPARATUS, PSYCHOLOGICAL, in the Appendix.

Algo'na: capital of Kossuth co., Ia. (for location of county, see map of Iowa, ref 2-F); on the East Fork of the Des Moines river, about 120 miles N. by W. of Des Moines; has Northern Iowa Normal school and is a wagon-manufacturing point and dairying center; it has two steam flouring-mills, a steam butter-tub factory, and a brick and tile factory. Pop. (1870) 860; (1880) 1,359; (1890) 2,068; (1900) 2,911.

EDITOR OF "COURIER."

Algon'kian Period: a division of geologic time preceding the Cambrian and preceded by the Archean. The name refers to a district in and about Canada, originally inhabited by Algonkins (*q. v.*). The Algonkian differs from all later periods in that it is not characterized by a fossil fauna. In its rocks have been found a few obscure fossils, besides tracks resembling those of marine worms; and presumptive evidence of abundant life exists in the presence of carbonaceous and calcareous deposits; but these indications do not suffice for the discrimination and classification of its rocks. The differentiation of life forms had progressed so far in the Cambrian period, immediately following, and some Cambrian species were so highly organized, that the evolutionist is unwilling to believe the history of life before that date shorter than its subsequent history. So, while there can be no hope of completely tracing the early development of life by means of vestiges preserved in the rocks, it is yet possible, or even probable, that faunas belonging to the Algonkian will be discovered. The Algonkian rocks have a thickness of many thousands of feet and are locally divided by unconformities into several distinct series. Consideration of the magnitude of the deposits and of the extent of intervening epochs of erosion, demonstrated by the unconformities between the series, leads to the belief that the Algonkian period may have equaled in duration the sum of several later periods, or even the whole time that has since elapsed. Certain of the series consist of sedimentary rocks in their ordinary condition, as sandstone, shale, limestone, etc.; others exhibit metamorphism in various degrees, and the same series may be unaltered in one region and metamorphic in another. Volcanic rocks are extensively interbedded in some districts, showing that igneous agencies were no less active then than now.

The type locality for Algonkian rocks is the Lake Superior region, where their title to a category separate from Archean was first demonstrated by R. D. Irving. (See ARCHEAN.) They comprise there three series—the Lower Huronian, 5,000 feet; the Upper Huronian, 12,000 feet; and the Keweenawan, 25,000 feet, each limited above and below by a great unconformity. Rocks of this period occupy great areas in Canada and the Hudson Bay country; they occur at many localities in our western mountains, in Texas, in the Black Hills, in the Adirondacks, and they probably occur in New England and in the Appalachian region. To this period are to be referred also rocks described in Great Britain, Scandinavia, France, Bavaria, etc. The literature of the subject is epitomized for America by C. R. Van Hise in *Archean and Algonkian*, Bulletin 86, U. S. Geological Survey (1892). See GEOLOGY, HISTORIC. G. K. GILBERT.

Algon'kins: one of the two great families of Indians that formerly occupied the valley of the Mississippi and the regions east of it. The Indians of New England belonged to the same linguistic stock. See Parkman's *The Jesuits in North America*; Baldwin's *Ancient America* (1872). See the articles on the ALGONQUIAN INDIANS and INDIANS OF NORTH AMERICA.

Algonquian Indians: the most widely extended of all the North American linguistic stocks, its territory stretching along the Atlantic coast from Labrador to Pamlico Sound, and westward from Newfoundland to the Rocky Mountains, with one or two tribes in the prairies farther to the S. In a general way the people of this stock had the Eskimauan and Athapasean tribes on their N., the Siouan tribes on their W., the Muskogean and eastern Siouan tribes on their S., with the Iroquoian tribes forming a linguistic island in their center. (See map under INDIANS OF NORTH AMERICA.) They were divided into a large number of tribes and bands, speaking about forty distinct languages and innumerable dialects.

The name Algonquin or Algommequin is derived, according to Trumbull, from *A'goumek*, "on the other side" (of the river), a term originally used to designate the Indians of the Ottawa river by their neighbors lower down on the St. Lawrence. Another form of the word occurs in Accomack, Virginia.

Divisions.—The principal Algonquian tribes and confederacies may be grouped as follows: *North Atlantic*—Micmac, Malecite, Abnaki (including Penobscot, Norridgewock and Arosaguntacook), Pennacook, Massachusetts, Wampanoag, Narraganset, Nipmuc, Pequot, Mohegan, Mahican (including Stockbridge), Metoac (including Montauk and Shinnecock), Wappinger. *South Atlantic*—Munsi, Leni-Lenape or Delaware, Shawano, Nanticoke, Conoy, Powhatan (including Mattaponi and Pamunkey), Mattamuskeet. *Interior*—Nascapi, Montagnais, Algonquin and Ottawa, Maskegon, Cree, Ojibwa, Misisaga, Miami, Piankishaw, Illinois (including Peoria and Kaskaskia), Sac, Fox, Kickapoo, Pottawatomi, Menomini. *Western*—Siksika or Blackfoot, Atsina, Arapaho, Cheyenne.

Early Migrations.—It is impossible to decide upon the original home and the early migrations of the Algonquian family, but the consensus of tradition shows that they regarded the North Atlantic coast region, from about the mouth of the St. Lawrence to the mouth of the Delaware, as their most ancient territory.

The westward movement of the Ojibwas, Crees, Ottawas, and Pottawatomis from the neighborhood of the Ottawa river to the upper lakes, the sources of the Mississippi and the Saskatchewan, has been chiefly within the historic period, and was due largely to the inroads of the Iroquois about the middle of the seventeenth century. Within the same period they have driven the Eskimo hundreds of miles to the N. along the shores of Labrador and Hudson Bay, and seem also to have pressed the Cherokees farther to the S. The advance of the Blackfeet, Cheyennes, and Arapahos into the prairies is comparatively recent, as they still retain distinct traditions of a time when they lived in a timber country and cultivated the soil.

History.—From their position along the eastern seaboard the Algonquian tribes were among the earliest to encounter the white immigration. Settlements were made almost simultaneously at widely separated points within their territory by French, Dutch, and English colonists. The result may be briefly stated. The contact with the whites, whether as allies or enemies, always brought about destruction or expatriation to the free warriors, and degradation to the few who remained behind. The early wars—the Pequot and King Philip's war in New England, the war between the Dutch and the tribes about Manhattan, and the long and merciless struggle between the Virginia colonists and the Powhatans—were carried on by the native proprietors of the soil, without aid or instigation from the outside, in the hope and expectation of driving the white intruder from the land. The result was that the coast tribes were dismembered and almost annihilated, and the remnants compelled to seek safety beyond the mountains. Then began another series of Indian wars, but under different auspices. France and Great Britain contended for the mastery in the New World, and the Indians, no longer able to stand alone, became the allies and tools of one or the other, according as interest or vengeance prompted. The Algonquian tribes, which had been driven from the seacoast into the western wilderness, ranged themselves almost to a man under the French banner.

Before the close of the French and Indian war the Algonquians had been driven from the seaboard across the Alleghanies. Their joining the British side in the Revolution resulted in their being driven across the Ohio, and Wayne's treaty in 1795 forced them still farther to the W. The war of 1812, in which again they joined the British against the U. S., left the broken and dispirited tribes unable to withstand the continued pressure. Under a systematic "plan of removal" the Government inaugurated a series of treaties, by which, before the year 1840, most of the native tribes were transported beyond the Mississippi. Among these were the Shawanos, Delawares, Miamis, Weas, Piankishaws, Kickapoos, Sacs, Foxes, Pottawatomis, the remnants of the Illinois, and others, leaving of the Algonquian tribes of the U. S. only the Ojibwas, Ottawas, Menomins, and portions of the Abnakis and Miamis in their old homes. The Algonquians of Canada have never been removed in such systematic style, but were simply assigned to limited reservations within their ancient territories, and have diminished but little, if any, in numbers since the advent of Europeans. Those in the U. S., however, have been reduced by war, disease, and successive removals, and whole tribes and confederacies have been swept out of existence. The present number of the Algonquians is about 100,000, of whom 37,000 are in the U. S. and 63,000 in Canada. The largest tribes are the Ojibwa and the Cree.

Tribal Histories.—The Micmacs of Nova Scotia, with the Malecites or Echemins of New Brunswick and the Abnakis of Maine, acted always in the colonial period as the firm allies of the French against the English, with whom it may be said they were constantly at war until the fall of Quebec. Long before that time, however, the southern Abnakis, with the remnants of the Pennacooks and others, abandoned the vicinity of the English settlements and removed in a body to the St. Francis river below Montreal. The others made treaties by which they were permitted to remain in their old homes, where they have since maintained themselves with a fair degree of prosperity. Those in Maine now number about 600.

The Southern New England tribes—Massachusetts, Wampanoags, Nipmucs, Narragansets, Pequots, Mohegans and Mahicans—are practically extinct, and will be remembered in history chiefly in connection with the Pequot and King Philip's wars. It was among these tribes that the first English settlements were made. Eliot translated the Bible into the Massachusetts dialect, and gathered a few hundred into "praying-towns," until the outbreak of King Philip's war in 1675 once more scattered them. War, emigration, and deportation as slaves to Bermuda and the West Indies rapidly depleted their numbers. In the eighteenth century another effort was made to convert the remnant, and a new mission was established at Stockbridge in Western Massachusetts. As a result of missionary work continued through two centuries the aborigines of Massachusetts have been reduced to a handful of mixed bloods along the coast and about 200 souls near Green Bay, Wis., 1,000 miles to the W. The Mohegans still have a small organization near Groton, Conn., while the Metoacs and Wappingers are extinct. A few mixed bloods, however, live along the east end of Long Island, at Gay Head on Nantucket, and about Narragansett bay.

The Munsis and Delawares, who formerly owned all New Jersey and the Delaware basin, began to settle on the Ohio before the opening of the French and Indian war. Here they were joined by the remnants of the Nanticokes and Conoys from Maryland, the Mahicans from the Hudson, and the Shawanos, who had originally lived in Tennessee and on the Savannah river, but moved north to be near their kindred. At the close of the Revolution the combined tribes were in possession of a large portion of Ohio and Indiana, which by successive treaties rapidly passed out of their hands. The main body of the Delawares and Shawanos, numbering together about 1,500, is now incorporated with the Cherokees in the Indian Territory. There are also a considerable number of Delawares and Munsis in Ontario, Canada. The Nanticokes and Conoys have disappeared.

The Powhatans of Virginia carried on unceasing war against the English colonists for forty years, until they were completely broken, and the final blow came in repelling the inroad of a mountain tribe, probably the Cherokees, about 1654, in which their chief and nearly all their remaining warriors were slain. A few mixed bloods, with more of the Negro than of the Indian element, still keep up organizations under the name of Pamunkeys and Mattaponies about 20 miles from Richmond, Va. The tribes about Albemarle Sound, among whom Raleigh made his first attempts at colonization, seem to have possessed but little stamina, and disappeared almost unnoticed. The Mattamuskeets were about the last to keep up a tribal form, but the Tuscarora war of 1712 completed their destruction.

The Miamis, Weas, Piankishaws and Illinois are nearly extinct. A few mixed bloods retain the names in the Indian Territory, and about 300 Miamis, more or less mixed, yet live in Indiana. The extinction of the Illinois is due largely to the war waged upon them by the lake tribes in revenge for the murder of Pontiac.

The Pottawatomis, Kickapoos, Sacs, and Foxes, formerly in Michigan, Illinois, and Southern Wisconsin, are now chiefly in Oklahoma, and still have a considerable population. A portion of the Kickapoos at one time drifted down into Mexico, but were brought back about twenty years ago.

The Menominis, Ottawas, and Ojibwas or Chippewas of the upper lakes have never been removed, but still retain about their original numbers on numerous reservations in Michigan, Wisconsin, and Minnesota. The same may be said of the Canadian Ojibwas, Crees, and Maskegons north and northwest of the Great Lakes, and the Montagnais and Nascapis of the lower St. Lawrence. As the country is still but thinly settled, they have remained almost undisturbed and undiminished within their original limits.

The prairie tribes of the Algonquian race—the Blackfeet, or Siksika (including the Piegans), Atsina, Arapahos, and Cheyennes—have suffered from wars and smallpox, but still retain strong organizations. The most numerous are the Blackfeet, who with the Atsina number about 8,000, of whom 2,000 are in Montana and the rest on the Canadian side of the boundary. A portion of the Cheyennes also live in Montana, but the main body is in Oklahoma. The Arapahos also are in two bodies, part living in Wyoming and the rest with their old allies, the Cheyennes, in Oklahoma. The two tribes, north and south, number together about 5,000. Those in Oklahoma sold their reservation in 1891, and have now taken lands in severalty. See INDIANS OF NORTH AMERICA.

Food Supplies.—The Algonquian tribes were mainly sedentary and to some extent tillers of the soil, with the exception of the Ojibwas, Crees, and others in the extreme north, and the Blackfeet, Cheyennes, and Arapahos on the prairies. These latter also, however, according to their own traditions, at one time cultivated the ground, although from the first European acquaintance with them they have subsisted entirely by the chase. The coast tribes planted their fields in the spring, and then retired into the interior to hunt the deer and other animals—including the buffalo, which once abounded in the prairies north of the Ohio—until their crops were ripe in the fall. The winter was usually spent in their villages, with occasional short hunting excursions into the neighboring forest. In the Ohio valley and the lake region the early spring was employed in collecting the sweet sap of the maple to make sugar. The tribes along the shores of the Chesapeake and Albemarle Sound depended largely upon fish, which they took in weirs of elaborate construction. Fish also formed an important part of the food supply along the lakes.

Corn was the main agricultural staple, and the Powhatan tribes raised enough to supply not only their own wants but also those of the Virginia colonists for several years after the founding of Jamestown, while in 1794 Wayne's army found one continuous plantation extending along the entire length of the Maumee. From the Algonquian tribes the whites learned to make hominy and johnny-cake, as well as maple-sugar. They also raised beans, pumpkins, etc., and used manure, it being the common practice along the coast to put a dead fish into each corn hill when planting.

House-building.—In their permanent villages the houses were oblong, and built to accommodate several families. In the North they were frequently made of logs, while in the South and West they were generally constructed of saplings bent over at the top to form an arched roof, and covered with bark or mats of rushes. About the upper lakes and farther to the North and West the lodge was of the style of the prairie tipi and covered with bark or skins. Along the Atlantic coast the villages were more compactly built, and sometimes strongly fortified with palisades, from which construction they were often called forts or castles. The temporary summer encampments were light coverings of bark on a framework of poles.

Character.—The Algonquian tribes were, perhaps, equal to the Iroquoian in bravery, intelligence, and physical powers, but seem to have lacked their constancy of purpose and solidity of character. Their failure in concerted action, however, was doubtless due in part to the great diversity of languages and the wide extent of their territory, as compared with the Iroquois, who, by reason of their narrower limits and mutually intelligible dialects, were better able to keep up a compact organization. Many individual Algonquian tribes, as the Pequots and Powhatans, displayed indomitable resolution in defending their homes, stubbornly contesting every foot of ground until they were practically exterminated.

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JAMES MOONEY.

Algonquin, al-gon'kwīn: a post-township of McHenry co., Ill. (for location of county, see map of Illinois, ref. 1-F). It contains the villages of Algonquin, Cary, and Crystal Lake. The first is noted as a milk-shipping station, also for its fine water-power and flouring-mills and its mineral spring. Crystal Lake is a railroad junction and a fine summer resort; the lake of the same name is a beautiful sheet of water, from which ice is harvested for the Chicago market. Pop. (1880) 2,321; (1890) 2,512; (1900) 3,048.

Algorism, or **Algorithm** [viā mediæval Lat. from Arab. *al-Khowārazmī*, name of the Arabic mathematician through whose works the Arabic notation became known in Europe. The form *algorilm* is due to a false association with the Gr. *ἀριθμος*, number]: the art of computing in reference to some particular subject, or in some particular way, as the *algorilm* of numbers, of surds, etc.; generally any system of notation by means of algebraic symbols.

Alguazil', or **Alguacil'** [Span. from Arab. *al-wazīr*; *al*, the + *wazīr*, vizier, minister; from *wazara*, carry on]: the name given in Spain to an inferior officer appointed to execute the law, corresponding to a constable, bailiff, or policeman.

Al-Hak'em-Ibn-At'tâ (called **Al-Moken'na**, -**Mokanna**, or -**Mukanna**, i. e. the veiled one): an impostor who in 774 A. D. announced himself as a prophet and lawgiver in Khorassan. Having been attacked by the troops of the Caliph Mahdi in 780, he set fire to his castle and consumed himself to ashes. His story is the subject of Moore's *Veiled Prophet of Khorassan*.

Alha'ma de Grana'da (i. e. the bath of Granada): bathing-resort of great popularity; near Granada and Malaga, Spain (see map of Spain, ref. 19-E). The spring is about 8 inches in diameter, and furnishes warm (110° F.) magnesian waters, abounding in sulphuretted hydrogen. The season is from April to October; the climate healthy and mild; the diseases benefited are those of the mucous membranes and skin, nervous debility, rheumatism, and sluggish sores. The baths were much frequented by the Saracens, and the Caliph of Granada is said to have received in some years as much as 500,000 ducats of revenue from these baths. Pop. 8,000.

Alham'bra [from Arab. *al*, the + *hamrā*, red, sc. house]: famous palace and citadel of the Moorish Kings of Granada; built 1248-1314 in a suburb of the city of Granada. It is surrounded by beautiful gardens and groves of aromatic trees. The interior of the palace is exceedingly gorgeous, and richly decorated with painted and glazed tiles, and plaster ornaments in relief, richly painted and gilded. Among the portions now standing are the Court of the Lions and the Court of the Fish-pond. The former is named from a fountain in its center supported by twelve lions, and surrounded by a gallery resting on columns and arches which are admirably light and elegant. This place capitulated to the Spaniards in 1491, and was entered in triumph by Ferdinand and Isabella in 1492. See Irving, *The Alhambra* (1832).

A'li, or **A'li-Ibn-A'bi-Tâ'lib** (surnamed **THE LION OF GOD**): Arabian caliph; a cousin-german of the prophet

Mohammed; b. at Mecca about 602 A. D. He married Fâtimah, a daughter of Mohammed, whose doctrines he adopted and enforced with great ardor and courage. Mohammed died in 632, but it was not till 656 that Ali became caliph, he having been preceded in this office by Abu Bekr, Omâr, and Othman. His troubled rule of less than five years was ended at Kufa by the dagger of the assassin in 661. Ali was a brave and high-minded man, but lacked many of the qualities essential for the successful government of a large empire. He is said to have been the author of many maxims and proverbs. A collection of sentences bearing his name was published in an English translation (Lond. 1832), and the original by H. L. Fleischer (Leipzig, 1837); a new edition of his *Divan* (lyrical poems) was published at Boulâk, near Cairo, in 1840. See **SUITES**. Revised by J. R. JEWETT.

Alibamu Indians: See **MUSKHOGEAN INDIANS**.

Ali-Bey, al'i-bâ: chief of the Mamelukes; b. in Abkhasia in 1728. He was taken to Egypt at an early age, and raised himself from a servile condition by his ability; became Bey of the Mamelukes; and in 1757 Bey of Egypt; and succeeded in becoming independent of Turkey. He attempted to restore the ancient Egyptian empire, and had almost conquered Syria, when his chief general, his adopted son, was bribed by the Turks, and drove him from Egypt. He succeeded in getting up another army, but after a few victories was again defeated and captured, and died a few days after, Apr., 1773.

Alibert, JEAN LOUIS: French medical writer; b. in Aveyron, May 12, 1775. He became first physician-in-ordinary to Louis XVIII., 1818. He wrote, besides other able works, a *Description of the Diseases of the Skin* (1806-27), which is commended for its style and other merits. D. in Paris, Feb. 6, 1837.

Al'ibi [Lat., elsewhere]: in law, the absence of a person accused of crime from the place where the offense is charged to have been committed. If established, it is a defense to the accusation.

Alicante, al-i-kan'tâ: province in the southeastern part of Spain; bounded N. by Valencia, E. by the Mediterranean, S. and W. by Murcia. Area, 2,098 sq. miles. The country consists partly of fertile plains and partly sterile mountains. Pop. (1887) 432,335.

Alicante (anc. *Lucen'tum*): fortified city and seaport of Spain, the capital of the above province; is on the Mediterranean Sea; lat. 38° 20' N., lon. 0° 26' W. (see map of Spain, ref. 18-I). It is well built, with high and substantial stone houses, and contains several hospitals, one college, and a theater. Wine, grain, soda, oil, oranges, etc., are exported from this place, which is the chief seaport of Valencia. Pop. (1877) 34,926; (1887) 39,638.

Alica'ta: See **LICATA**.

A'lien [from Lat. *alie'nus*, belonging to another (place or person)]: by English law a person born out of the allegiance of the king. In the U. S. one born out of the jurisdiction of the U. S., who has not been naturalized or made a citizen under their laws. By the common law the children of public ministers born abroad are citizens, for their fathers owe allegiance to no foreign power. By the laws of Congress, children born abroad are citizens of the U. S. if their fathers were citizens of the U. S. and had resided in the U. S. (See **CITIZEN**.) It has been claimed that, independent of this statute, such children are citizens of the U. S. (The arguments against this view are stated with great cogency and learning by Horace Binney in an article upon *The Alienage of the United States*.) Aliens are subject to certain disabilities affecting their exercise of political rights. After naturalization they are ineligible to the office of President and Vice-President of the U. S. The principal disability affecting aliens concerns the acquisition of the title to real estate. There are two general modes of acquisition—by purchase and by descent. An alien may acquire title by purchase (including conveyance and devise) in the absence of statutes to the contrary, and can hold it subject to a proceeding by the State termed "office found." This is in substance an inquiry through an authorized officer into the fact of alienage; and if that be found, the land is adjudged to belong to the State. An alien can convey no better title to a citizen than he himself possesses. This defect in the title can be cured by a private act of the State Legislature. In the case of descent no title at all passes to the alien, and no inquest of office is necessary. A citizen brother can inherit from a brother, though their father be an alien, owing to the

common-law rule that inheritances never ascend, and it is accordingly not necessary to trace title through the alien father. This disability is wholly removed in a number of the U. S., and modified in others. Where the disability is not removed, legislation is almost universal in favor of resident aliens, allowing them, if they intend to become citizens, to acquire land for a limited period, and to dispose of it and to transmit it to heirs. Aliens are capable of acquiring, holding, and transmitting personal property in the same manner as citizens, and may freely resort to courts of justice to maintain and protect their rights. Under the laws of Congress they are not, however, entitled to take out a copy-right. Aliens have been distinguished in time of war into friends and enemies. An alien enemy can not make a contract with a citizen. It is illegal in its inception, and can not be enforced even after peace. Nor can such an alien prosecute actions of any kind while the war lasts, though, if there be no illegality in the claim, the right to sue revives in time of peace. An alien becomes a citizen through naturalization. The difficulties growing out of this subject have led to the negotiation of various treaties between the U. S. and foreign powers. See NATURALIZATION. T. W. DWIGHT.

Aligarh, al'-i-gūr: district, fort, and city of the Meerut division, Northwestern Provinces, British India; lying between the Ganges and Jumna (see map of N. India, ref. 5-E). It has an area of 1,955 sq. miles, with a population of over 1,000,000. The fort is in lat. 27° 56' N., lon. 78° 8' E., on the railway from Calcutta to Delhi. It was captured from the Mahrattas in 1806, and has since been much strengthened and improved. A short distance S. of the fort is the city, called Aligarh by foreigners, Koel by natives. Pop. (1891) 60,560.

Alimentary Canal: the cavity in the body of an animal in which food enters to be digested before it is conveyed by the nutritive vessels into the system. In some animals it is a simple cavity, with only one opening; in others it is a proper canal, with an outlet or anus distinct from the inlet or mouth, and is a continuous passage of variable dimensions from the mouth to the anus. The principal portions of the alimentary canal of mammalia are the œsophagus, a duct or tube leading from the mouth to the stomach; the more expanded cavity of the stomach; the small intestines, which are long and convoluted; and the large intestines. The canal is lined throughout its whole length with mucous membrane. Its entire length in man is about 30 feet.

Alimony [Lat. *alimonia*, nutriment, from *alere*, nourish]: in law, an allowance granted by a court to a wife from the husband's estate, either during a litigation between them or at its termination. Originally it was only granted in suits for separation, but now by statute it is usual to make the allowance in proceedings for divorce dissolving the bonds of matrimony. In England the ecclesiastical court had jurisdiction of this subject until 1857, when it was vested in a court of divorce. In this country the jurisdiction is conferred in general on courts of equity. Alimony is of two sorts—*pendente lite* and permanent. (1) The object of the first is to enable the wife to carry on a litigation with her husband, or to sustain herself during its pendency. It is immaterial whether the proceedings be instituted by or against her. Should the wife have sufficient means of her own, no allowance of this kind will be made. The amount rests in the sound discretion of the court, and is subject to increase or diminution. (2) *Permanent Alimony*.—This is a periodical allowance given from the husband's estate as the result of the litigation in the wife's favor. No allowance is made when the proceedings terminate unfavorably to her. The amount varies with the husband's wealth and position, and is commonly from one-third to one-half of his income. It is subject from time to time to variation by the action of the court, depending upon the circumstances of the case. The court has ample power to make its decree effectual, and may have recourse to the writ of *ne exeat* to prevent the husband's withdrawal from the State without proper security for its payment. Should the husband depart to another State, the parties might become "citizens of different States," within the view of the U. S. Constitution; so that she could enforce her claim to alimony in the Federal courts. The ordinary rule that the domicile of the wife follows that of the husband would not be applicable to this case, even though the case were one of judicial separation rather than of total divorce. T. W. DWIGHT.

Alisma'ceæ [from the Gr. *άλισμα*, name of a water-plant]: a natural order of endogenous plants, natives of temperate

climates. They are herbaceous, and usually grow in swamps or shallow waters. Among the genera of this order are *Alisma* and *Sagittaria* (arrowhead).

Alison, ARCHIBALD: Scottish writer; b. in Edinburgh, Nov. 13, 1757, and educated at Oxford. He took orders in the Church of England in 1778, and became curate of Kenley, in Shropshire, in 1790. In 1800 he removed to Edinburgh, where he preached for many years. His chief works are *Essays on the Nature and Principles of Taste* (1784), and two volumes of sermons (1814). D. in Edinburgh, May 17, 1839.

Alison, Sir ARCHIBALD, Bart., D. C. L.: son of the preceding; b. at Kenley, in Shropshire, England, Dec. 29, 1792. He graduated in the University of Edinburgh, studied law, and was called to the bar in 1814. In 1832 he published his *Principles of Criminal Law*, a work of standard authority. His chief work is a *History of Europe during the French Revolution* (10 vols. 8vo., 1833-42), which comes down to 1815, and has had a great popularity. "Its merits," says the *Edinburgh Review* for Oct., 1842, "are minuteness and honesty—qualities which may well excuse a faulty style, gross political prejudices, and a fondness for exaggerated and frothy declamation." He wrote a continuation of this history to the year 1852, and a *Life of John, Duke of Marlborough* (1847). In politics he was ultra-Conservative. D. in Glasgow, May 23, 1867.

Alison, Sir ARCHIBALD, Jr., Bart.: son of Sir Archibald, the eminent historian; b. at Edinburgh, Jan. 21, 1826; educated in the universities of Glasgow and Edinburgh; entered the army; served in the Crimea and in India, where he was military secretary to Lord Clyde; lost an arm at Lucknow; and distinguished himself as brigadier-general, second in command of the Ashantee expedition of 1873-74. He succeeded to the baronetcy 1867, and became deputy adjutant-general in Ireland, Oct., 1874. He distinguished himself in the war of 1882 in Egypt, and became lieutenant-general in November of that year. After Arabi's surrender, General Alison commanded the British army of occupation in Egypt.

Alizarin [from Arab *al*, the + *azārah*, juice, extract; *alizeri* is the commercial name of madder in the Levant]: the coloring-matter of madder (*Rubia tinctorum*). Alizarin was discovered in 1824 by Robiquet and Colin, by treating madder with strong sulphuric acid, producing a black mass, which they called *charbon de garance*. On heating this, it yielded a sublimate of alizarin crystals.

Alizarin is largely sold to the calico-printers in the form of a yellowish brown paste, under the name of "madder extract"; also in the form of a dry powder. It may be crystallized from solution in red prisms or by sublimation in yellow needles.

It is soluble in caustic alkalies and alkaline carbonates, forming a violet solution, from which it is precipitated by acids. Alkaline solutions of alizarin form, with soluble lime and baryta salts, precipitates of a beautiful purple color; with alumina salts, a red; with iron salts, a purple precipitate. If a piece of cotton cloth which has been printed with the common alumina and iron mordants is placed in water holding a little alizarin in suspension, it will be found on heating the whole that the cotton will become permanently dyed in shades of red and purple. Alizarin is a feeble acid, forming, as above shown, soluble salts with the alkaline metals, and insoluble colored salts with most other metals. Turkey-red, madder-pink, and the various shades of purple and chocolate on calico, are compounds of alizarin with metallic bases.

Artificial Alizarin.—One of the greatest triumphs of modern chemistry was the production by Graebe and Liebermann in 1869 of artificial alizarin.

By passing the vapor of alizarin from madder over heated zinc dust they obtained the compound anthracene, C₁₄H₁₀. Further investigation showed that alizarin is more directly related to anthraquinone, a compound of the composition C₁₄H₈O₂, which is formed by oxidizing anthracene. When anthraquinone is treated with bromine it is converted into dibrom-anthraquinone, C₁₄H₆Br₂O₂, and this when melted with caustic potash, KOH, is converted into the potassium salt of alizarin, from which the acid was precipitated by hydrochloric acid as a yellow powder identical with the alizarin derived from madder. The practical importance of this discovery attracted to it the attention of numerous chemists, and simpler processes, avoiding the use of the expensive bromine, were soon devised. An abundant supply

of anthracene is obtained from the refuse coal-tar of gas-works, and in a few months anthracene, which had never been seen except as a chemical curiosity, became a regular article of commerce. See ANTHRACENE.

The process now employed for making alizarin consists in converting the anthraquinone into a mono-sulpho acid and fusing the soda salt of this with caustic soda, with a small addition of potassic chlorate. In executing this process it is found that two di-sulpho acids are formed in large quantities, which yield with soda two new isomeric coloring-matters of great importance, $C_{14}H_8O_5$: flavo-purpurine from the *a* acid, which produces yellowish reds, and anthra or iso purpurine from the *b* acid, which produces pure fiery reds. Alizarin produces bluish reds. By separating the mono and the two di sulpho acids, each may be made to yield its own coloring-matter on fusion with soda, or by operating upon various mixtures of them dyestuffs producing the greatest variety of shades may be obtained.

The following new dyestuffs have been prepared from alizarin:

Alizarin carmine, which is the sodium salt of mono-sulpho alizarin and the two purpurines. It is used on wool as a substitute for cochineal.

Alizarin orange is nitro-alizarin.

Alizarin blue is produced by heating nitro-alizarin with glycerin and sulphuric acid.

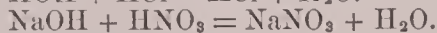
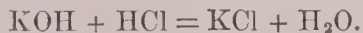
Alizarin blue S. is a compound of the blue with acid sulphite of sodium.

The annual consumption of madder in dyeing and calico-printing exceeded \$10,000,000. Large tracts in Holland, Alsace, Italy, and the Levant were devoted to its culture. It not only supplied dyestuffs, but in Alsace it yielded a large proportion of the alcohol of commerce; the root containing sugar, which was extracted and subjected to fermentation.

The brilliant discovery of Graebe and Liebermann has effected a very serious change in the agricultural system of people as remote from each other as the shores of the North Sea and Asia Minor. Theoretically, 1 lb. of alizarin would require 0.60 lb. anthracene, which would be obtained from 30 lb. of coal-tar, requiring 660 lb. of coal. In practice, the yield is less than half this amount. For further details, consult *Die Farbstoffe*, von P. Schützenberger, uebersetzt von Dr. H. Schroeder (Berlin, 1873); *The History of Alizarin*, by W. H. Perkin (I. Soc. Arts, 1879); *Die Chemie des Steinkohlentheers*, von G. Schultz (Braunschweig, 2 Auf., 1886); *Dictionary of Applied Chemistry*, T. E. Thorpe (Lond., vol. i., 1890).

C. F. CHANDLER. Revised by IRA REMSEN.

Alkali [from Arab. *al*, the + *qalī*, calcined ashes of the plant glass-wort (*Salicornia*), from *qalay*, fry]: one of an important class of bases which combine with acids to form salts, turn vegetable yellows to brown, and vegetable blues to green, and act upon oil or fat to form soap. The proper alkalies are potash, soda, lithia, cæsia, rubidia, and ammonia, which are extremely caustic. Potash is called vegetable alkali, soda is called mineral alkali, and ammonia, volatile alkali. Lime, magnesia, baryta, and strontia, having some properties of alkalies, are called *alkaline earths*. The alkalies and alkaline earths are metallic oxides, except AMMONIA (*q. v.*). When an alkali and an acid combine, they are said to neutralize each other; they really produce metallic salts:



See ACID.

Alkali Flat: See PLAYA.

Alkalim'eter [from *alkali* + Gr. μέτρον, a measure]: an instrument used to ascertain the proportion of pure potassium or sodium carbonate in a commercial sample of those articles, and to test the strength and purity of soda-ash, potash, etc. It consists of a graduated glass tube divided into 100 degrees (numbering from the top), and filled with diluted sulphuric acid, poured into a given quantity of the solution of the alkali until it is neutralized. If this process empties the tube to the eightieth degree, it shows that the article contains 80 per cent. of pure alkali. This process is called alkalimetry. The same instrument is also used to test the strength of acids, by filling the tube with a solution of alkali and reversing the process. See the article ANALYSIS, VOLUMETRIC.

Alkalimetry: See ALKALIMETER and ANALYSIS, VOLUMETRIC.

Alkaloids [from *alkali* + ending *-oid*, from Gr. εἶδος, form, shape]: compounds of vegetable origin, generally of complex composition and capable of producing marked effects upon animals. They all contain nitrogen, and all have certain properties in common with ammonia, more especially the power of combining directly with acids to form salts. They belong to the general class of organic bases. On account of their poisonous and medicinal properties, they have long attracted the attention of chemists. They are extracted from the plants by treating with dilute acids, and, from the solutions thus obtained, they are precipitated by ammonia. Among the most important alkaloids are: Aconitine, from *Aconitum napellus*; atropine, hyoscyne, and belladonnine, from *atropa*; quinine and cinchonine, from *cinchona*; cocaine, from *coca-leaves*; caffeine, from *coffee-berries*; coniine, from *conium*; nicotine, from *Nicotiana tabacum*; morphine and narcotine, from *opium*; strychnine and brucine, from *Strychnos*; and veratrine, from *veratrum*. It sometimes becomes a matter of importance to determine whether alkaloids are present or not, as, for example, in cases of suspected poisoning. Chemists can now determine this with absolute certainty. I. R.

Alkanet [from Span. *alcana*, from Arab. *al-hennā*, the shrub henna]: a herbaceous plant found in Europe belonging to the genus *Anchusa* and family *Boraginaceæ*. They have five stamens. Some of the species are cultivated for the beauty of the flowers. The root of the *Anchusa tinctoria* affords a resinous red coloring-matter, and is used to color pomades, lip-salves, hair-oils, etc.

Al-Kindi, or **Alchindus**: a very prolific Arabian writer on medicine and philosophy; b. at Bassorah; flourished in the middle of the ninth century. Several of his works, translated into Latin, were much read during the Middle Ages; the most celebrated was *De Theoria Magicarum Artium*.

Alkmaar': an old and important town of Holland; province of North Holland; 20 miles N. N. W. of Amsterdam, and 5 miles from the ocean (see map of Holland and Belgium, ref. 4-E). It is well built, and is traversed by several canals, by which it carries on an active trade in butter and cheese. It is said to be the greatest mart for cheese in the world. Here are manufactures of soap, leather, sail-cloth, etc. This town was defended with success against the Spaniards in a long siege which began in 1573. Pop. (1879) 13,304; (1890) 15,833.

Alkmaar, HENDRIK, van: a Low German poet who wrote about 1475-1491. He was the translator of a very popular satiric poem entitled *Reinke de Vos* (Reynard the Fox), which he published in Low German at Lübeck in 1498. See REYNARD THE FOX.

Alkoran: See KORAN.

Al'lah: the Arabic name of the Supreme Being, the only true God, as distinguished from the deities worshiped by idolaters.

Al'lahabad' (i. e. the city of God): a division (district and city) of the Northwestern Provinces, British India; on the Ganges and Jumna, between Benares and Oudh (see map of N. India, ref. 7-F). The division contains 13,746 sq. miles. Pop. (1891) 5,942,900. Allahabad district is the territory around the junction of the Ganges and Jumna, and contains 2,833 sq. miles. The city is at the junction of these rivers, and is the capital of the Northwestern Provinces. Lat. 25° 26' N., lon. 81° 55' E. It is one of the most noted resorts of Hindu pilgrimage, and owes its sanctity to its being at the confluence of three sacred rivers—the two above mentioned and the Saraswati. The latter, however, does not now reach the city, being lost in the sands 400 miles to the N. W.; but the Hindus assert that the junction occurs underground. A great annual fair is held at Allahabad. The most conspicuous feature of the city is a fort, which rises directly from the banks of the confluent rivers, and completely commands the navigation of both streams. Within it are the remains of a splendid palace erected by the Emperor Akbar, and his favorite residence. Next in interest is a great mosque, once occupied by the English, but afterward returned to the Mohammedans, who have since refused to use it as a place of worship because of its desecration.

The city was taken by the British in 1765 from the Vezir of Oudh, and assigned to the titular Emperor of Delhi. When he joined the Mahrattas it was transferred to the Nawab of Oudh, but was finally ceded to the British in 1801.

It is growing rapidly in commerce and in population, and is now a railway center. The population was 72,098 in 1853, 144,464 in 1872, and 176,870 in 1891.

MARK W. HARRINGTON.

Allan, DAVID: a Scottish painter of domestic and humorous subjects; called the "Scottish Hogarth"; b. at Alloa, Feb. 13, 1744. He studied and worked for many years in Rome, whither he went in 1764. Among his works are *The Origin of Painting*, which represents a Corinthian maiden drawing her lover's profile on the wall, and illustrations of Allan Ramsay's *Gentle Shepherd*. D. in Edinburgh, Aug. 6, 1796.

Allan, GEORGE WILLIAM, D. C. L., F. R. G. S.: Canadian Senator; b. in Toronto, Jan. 9, 1822; educated at Upper Canada College; admitted to the bar in 1846; represented York county in the Conservative interest in the Legislative Council of Canada, 1858-67; became a member of the Senate in May of the latter year, and appointed Speaker of that body March 17, 1888. He is Chancellor of the University of Trinity College; president of the Ontario Society of Artists, and of the Historical Society of Ontario; chief commissioner of the Canada Company; president of the Western Canada Loan and Savings Company; and is prominently connected with other institutions—learned, industrial, etc. He is a lieutenant-colonel of militia, and was at one time mayor of Toronto.

NEIL MACDONALD.

Allan, Sir HUGH: Canadian ship-owner; b. at Saltcoats, Scotland, Sept. 29, 1810. After completing his school education he was for some time employed as a clerk, and in 1824 removed to Canada. He served in the rebellion of 1837, and attained the rank of captain. In 1838 he became a partner in the firm of Edmonston & Allan, who in 1853 began the construction of iron screw steamships. From this the Allan line of steamships has developed. He was knighted in 1871. Sir Hugh attained some prominence in Canadian politics in consequence of his connection with the Canadian Pacific Railway scandal. He died in Edinburgh, Dec. 8, 1882.

NEIL MACDONALD.

Allan, Sir WILLIAM: a Scotch portrait and figure painter; b. in Edinburgh in 1782; elected a Royal Academician, 1835; and was president of the Royal Scottish Academy, 1838-50. D. in Edinburgh, Feb. 23, 1850.

WILLIAM A. COFFIN.

Allan-Kardee', HIPPOLYTE LÉON DENIZARD: b. at Lyons, Oct. 3, 1803; was the representative of the spiritualistic movement in France, and wrote *Le Livre des Esprits* (1857); *Le Livre des Médiams*; and *L'Imitation de l'Évangile selon le Spiritualisme* (1864). He also founded the *Revue spirite* (1858). D. in Paris Apr. 1, 1869.

Allantois, a-lan'tō-is [false sing. of quasi-plur. *allantoi'des* = Gr. *ἀλλαντοειδής*, sing. sausage-shaped, *ἀλλās*, sausage + *ειδος*, shape]: a thin membranous sac developed during incubation in the eggs of birds and reptiles, and in the embryo of viviparous animals during gestation. For its development and uses, see EMBRYOLOGY.

Alla'tius, LEO [Latinized form of Leone Allacci]: b. of Greek parents in the island of Chios in 1586. He was taken when nine years old to Calabria in Italy, and thence in 1600 to Rome to complete his studies; was employed in 1622 by Pope Gregory XV. to superintend the transfer to Rome and the incorporation in the Vatican of the Heidelberg library, which had been given to the pontiff by the Elector of Bavaria; was appointed by Pope Alexander VII. in 1661 librarian of the Vatican, which office he held till his death in 1669. Leo was a prolific writer; his works were partly editions and elucidations of the classic and ecclesiastic writers and notices of authors, and partly treatises on the history and doctrines of the Roman Church and on the differences between the Eastern and Western churches. Though the son of Greek parents, he was an extreme partisan of the Roman Church. A complete list of his productions (fifty enumerated by Fabricius) is added to his *Exercitatio de Mensura Temporum Antiquorum* (Cologne, 1645), and is also given by Fabricius in his *Bibliotheca Græca*, vol. xi. 437, sqq., ed. Harles. See Creuzer, *Zur Gesch. der Class. Philologie*. H. DRISLER.

Allatoona: on railroad, Bartow co., Ga. (for location of county, see map of Georgia, ref. 2-F); 40 miles N. W. of Atlanta. Gen. J. E. Johnston, when pursued by Gen. Sherman, made a stand in the strong position of Allatoona Pass, in May, 1864, until his flank was turned. General Corse defended this place with success against the assault of a superior force in Oct., 1864, while Gen. Sherman, from the top of Kennesaw Mountain, signaled that he should hold out to the last.

This incident furnished the theme for Ira D. Sankey's famous religious song, "Hold the Fort, for I am Coming."

Al'legan: railroad junction; capital of Allegan co., Mich. (for location of county, see map of Michigan, ref. 7-II); on the Kalamazoo river; has electric lights, the Holly water-works, foundries, car-works, and other manufactories using water and steam-power; an academy; and the library of the Allegan Literary and Library Association. Pop. (1880) 2,305; (1890) 2,669; (1900) 2,667.

EDITOR OF "JOURNAL."

Allegha'ny: a river which rises in Potter co., Pa., makes a short circuit in New York, and returns into the former State. Flowing afterward in a S. S. W. direction through the hilly oil-regions, it unites with the Monongahela at Pittsburg, forming the Ohio. It is navigable for small steamboats 150 miles or more above Pittsburg, is over 400 miles long, and its waters are remarkably clear and pure. Among the principal towns on its banks are Warren, Franklin, and Kittanning.

Alleghany Mountains, or Alleghanies: the Appalachian system of mountains. (See APPALACHIAN MOUNTAINS.) In a more limited sense the name is applied to parallel ranges which traverse Pennsylvania, Maryland, and Virginia W. of the great valley. The general direction of these ridges is nearly N. E. and S. W., and their mean height about 2,500 feet. These ridges are remarkable for the parallelism of their direction and the uniformity of their outline and altitude, and inclose several beautiful and fertile valleys. The rocks of the Alleghanies are shales, sandstones, and limestones of Silurian, Devonian, and carboniferous age, and include in the upper series the most important store of coal in the Eastern States.

Alleghany Springs: Montgomery co., Va. (for location of county, see map of Virginia, ref. 7-D); 3 miles from Shawsville, on the Norfolk and Western R. R., and 77 miles S. W. of Lynchburg; a popular resort for invalids and others. The springs are highly saline, and produce laxative, tonic, or alterative effects, according to the method of use. They are especially recommended for dyspeptics. Eight miles distant are the sublime Puncheon Run Falls.

Allegheny: city; Allegheny co., Pa. (for location of county, see map of Pennsylvania, ref. 5-A); separated from Pittsburg by the Allegheny river, here crossed by nine fine bridges. For map, see PITTSBURG.

Allegheny is the terminus of the West Pennsylvania R. R., the Pittsburg and Western R. R., and is on the Pittsburg, Fort Wayne and Chicago R. R. and the Cleveland and Pittsburg R. R. The city covers an area of 5,925 acres; the ground is hilly, the elevation above low-water mark ranging from 20 to 671 feet; it has a river-front on the Ohio river of 19,000 feet and on the Allegheny river of 14,500 feet; 76 miles of paved streets, 40 miles of sewers, 86 miles of water-pipes, and many miles of gas-pipe for conveying natural gas, which is used as fuel.

The town of Allegheny was laid out in 1788, created a borough in 1828, and incorporated as a city in 1840.

The municipal government is similar to that of Pittsburg, both cities being in the second class. It is composed of a recorder, auditor, controller, treasurer (the last three chosen by councils), with city councils in two branches, styled respectively select and common. These are elected by the people. The recorder appoints the administrative officials to take charge of the police, health, and fire departments, assessments and public works. The total assessed valuation of the city of Allegheny for purposes of taxation is \$82,582,800, on which a revenue is collected, for all purposes, of \$1,268,158; the bonded indebtedness of the city is \$5,535,470, with a sinking fund of \$1,171,143.

The city contains extensive iron and steel rolling-mills, locomotive-works, cotton and woolen mills, foundries, machine-shops, tanneries, flour-mills, salt-works, white-lead works, etc. According to the census of 1890 the number of manufactories was 616, with a capital of \$14,441,916, employing on the average 9,210 persons, who receive during the year \$5,020,188, the total value of the product for the year being \$19,297,003.

The Western University of Pennsylvania, 3 theological seminaries, numerous benevolent and reformatory institutions, and the Western Penitentiary are located in Allegheny. It has 24 ward schools with 340 teachers, and 20,500 pupils in attendance. The high school, 22 teachers and 570 pupils. Besides the public schools there is a large number of

others, including the parochial schools of the Roman Catholic Church.

The Western University and Allegheny Observatory are located on a high hill in the northern part of the city. There are two free public libraries—one founded by Col. James Anderson and maintained by the Board of School Controllers, for use of teachers, pupils of the public schools, and citizens of Allegheny; the other founded by Andrew Carnegie. The city has two parks, containing 315 acres.

Allegheny holds the same relation commercially and socially to Pittsburg as Brooklyn does to New York, and may justly be termed a city of churches, including, as it does, eighty churches of all religious denominations, as well as many benevolent and eleemosynary institutions, among which may be mentioned the Allegheny Orphan Asylum, Home of the Friendless, etc. Pop. (1890) 105,287; (1901) 129,896.

JOHN B. KENNEDY.

Allegheny College: organized at Meadville, Pa., by citizens of the village, in 1815. Its first president was Rev. Timothy Alden, D. D., a Presbyterian. Incorporated in 1817, it came under the control of the Methodist Church in 1833. The three buildings of the college are pleasantly located and well equipped; the library numbers 12,500 volumes; and the productive endowment is \$160,000. Three courses lead to the degree of A. B., and one to that of C. E. In 1900 there were 17 professors and tutors, 326 students in the college, and 116 in the preparatory school. Nearly a fifth of the students are ladies. The president is (1901) William H. Crawford, D. D., and the college is under the joint control of the Pittsburg, Erie, East Ohio, and West Virginia conferences of the M. E. Church. C. H. THURBER.

Alle'giance [Eng. prefix *a-* + M. Eng. *ligeance*, a derivative of *lige* = Mod. Eng. *liege*, faithful; Fr. *allégeance* is adopted from Eng.]: in law, the tie or obligation which binds a citizen or subject to a state. The common law distinguishes between natural and local allegiance. The former is that which a citizen owes to the state of which he is a member; the latter is due from a person who is not bound by the rules of natural allegiance, but who is temporarily subject to the laws of the state by which the allegiance is claimed. Under this theory a foreigner temporarily residing in a country is subject to its laws. Under such circumstances, should he conspire to overturn the government he may be guilty of treason. When he departs his allegiance is at an end. Natural allegiance, on the other hand, can only be shaken off by a formal act on the part of the citizen; this is called naturalization, following emigration. Should he abandon the country to which he belongs, and engage in war on the part of a foreign state against it, he might in strictness, if taken prisoner before naturalization, be treated as a traitor. Such a treatment would, under some circumstances, be extremely harsh, as where the state had encouraged emigration, and the consequent assumption by an emigrant of relations naturally leading to a duty to take sides in a controversy with an adopted country. The doctrines of allegiance are of feudal origin, and it has been found difficult to reconcile them with the requirements of modern times. The U. S. in their legislation upon naturalization have proceeded upon the theory that a citizen of a foreign country might, at his will, shake off his allegiance and become a citizen here. The European nations formerly denied that there was any such rule of public law, Great Britain until 1870 even maintaining a right to the indelible allegiance of her subjects. But now, through a series of treaties negotiated about twenty years ago with Great Britain and many of the continental states, a complete transfer of allegiance in favor of the U. S. on the part of these subjects is permitted. Allegiance to one state remains until superseded by the acquisition of a new allegiance to another. See NATURALIZATION.

T. W. DWIGHT.

Revised by T. S. WOOLSEY.

Allegret'to [Ital.; a diminutive of *allegro*, brisk]: in music a movement or time quicker than *andante*, but not so quick as *allegro*.

Alle'gri, ANTONIO: See CORREGGIO.

Alle'gri, GREGORIO: Italian composer of sacred music; b. in Rome about 1580. He was a singer in the pope's chapel, and a pupil of Nanini. His masterpiece is the *Miserere*, which is annually performed in the pontifical chapel during Passion Week. D. in Rome, Feb. 18, 1652.

Alle'gro [Ital. brisk < Lat. *a'lacer*]: in music, one of the principal degrees of movement; a term which signifies that

the piece to which it is prefixed is to be performed in a brisk and lively manner. The word is sometimes used as a substantive, and a name of an entire musical composition.

Al'lein, or **Al'leine**, JOSEPH: an English Nonconformist minister and writer; b. at Devizes in 1634; educated at Oxford. He was ejected from a curacy at Taunton in 1662, after which he was persecuted by imprisonment in Herester jail, and was fined for preaching. His death was hastened by ill treatment, and he died Nov. 17, 1668. Among his works is an *Alarm to the Unconverted* (1672), which is highly esteemed. See his life by Stanford (1861).

Allen, ALEXANDER VIETS GRISWOLD, D. D.: professor in the Episcopal Theological School, Cambridge, Mass.; b. at Otis, Berkshire co., Mass., May 4, 1841; graduated at Kenyon College, Gambier, O., 1862, and at Andover Theological Seminary 1865; was rector of St. John's, Lawrence, 1865-67, when he was appointed to the chair of ecclesiastical history at the Cambridge school. Besides review articles and other minor publications he has issued *The Continuity of Christian Thought, a Study of Modern Theology in the Light of its History*, the Bohlen lectures for 1883, and a life of *Jonathan Edwards* (1889).

W. S. P.

Allen, CHARLES, LL. D.: jurist; b. at Worcester, Mass., Aug. 9, 1797; admitted to the bar in 1818: a judge of various State courts of Massachusetts between 1842 and 1859, and Chief Justice of the Massachusetts Superior Court (1859-67). From 1849 to 1853 he was a Free-Soil member of Congress. He was a delegate to the Peace Congress of 1861. D. at Worcester, Mass., Aug. 6, 1869.

Allen, ELISHA HUNT: b. at New Salem, Mass., Jan. 28, 1804; graduated at Williams College; was admitted to the bar; removed to Brattleboro, Vt., and in 1830 to Bangor, Me.; member of Maine Legislature, 1836-41 and 1846; in 1838 was Speaker; member of Congress from Maine, 1841-43; removed to Boston in 1847, and was elected to the Massachusetts Legislature in 1849; U. S. consul at Honolulu, 1852-56, then became Hawaiian Minister of Finance, and from 1857 was Chief Justice and Chancellor of Sandwich islands, holding that office twenty years, during which period he was several times minister plenipotentiary of Sandwich islands to the U. S. He was resident minister of Sandwich islands at Washington from 1876 till his death, at Washington, D. C., Jan. 1, 1883.

Allen, ELIZABETH (*Akers*): poet; known as "Florence Percy"; b. at Strong, Me., Oct. 9, 1832. Her maiden name was Elizabeth Chase; her first husband was the sculptor Akers, and she afterward became the wife of E. M. Allen, of New York. She published in 1866 a volume of poems, and in 1886 *The Silver Bridge and other Poems*, and has contributed much to periodical literature. Her most popular poem is the song *Rock Me to Sleep, Mother*.

Allen, ETHAN: general: b. at Litchfield, Conn., Jan. 10, 1737. He became an owner of iron-works at Salisbury, Conn., and in 1766 removed to Vermont, where he became a leader in the popular resistance to the claims of New York. The province of New York declared Allen an outlaw, and offered £150 for his arrest. On the outbreak of the Revolution, Allen heartily joined the movement, and on the 10th of May, 1775, he surprised and captured the fort at Ticonderoga, summoning its astonished commander to surrender "in the name of the great Jehovah and the Continental Congress." This capture gave the army a valuable supply of artillery and stores. He had but eighty-three men under him, among whom was Benedict Arnold. On Sept. 25, 1775, he attacked Montreal with a small force, but was captured and sent to England as a prisoner. He was treated with great cruelty, and was not exchanged till 1778. The British authorities tried in vain to bribe him to induce the Vermonters to join their cause, but he skillfully contrived by his negotiations to keep the British troops out of Vermont. He published pamphlets against the New York domination, a narrative of his captivity (1799); a *Vindication of Vermont* (1779); and *Allen's Theology, or the Oracles of Reason* (1784), an attack upon the Christian religion. He professed to believe in the transmigration of souls. D. near Burlington, Vt., Feb. 12, 1789. See his life by Hugh Moore (1834), by H. W. de Puy (1853), and by H. Hall (1892).

Allen, FREDERICK DE FOREST, Ph. D.: classical scholar; b. at Oberlin, O., 1844; graduated at Oberlin College, 1863; studied at University of Leipzig; professor in University of Tennessee, Knoxville, Tenn., 1866-68 and 1870-73; tutor at Harvard, 1873-74; professor in University of Cincinnati,

1874-79; professor at Yale, 1879-80; Professor of Classical Philology, Harvard University, 1880; author of an edition of the *Medea* of Euripides, 1876; *Remnants of Early Latin*, 1880; *Greek Versification in Inscriptions*, 1888. D. Aug. 5, 1897.

Allen, GRANT: See the Appendix.

Allen, HARRISON, M. D.: surgeon; b. in Philadelphia, Pa., Apr. 17, 1841; M. D., University of Pennsylvania, 1861; assistant surgeon U. S. army, 1862-65; Professor of Comparative Anatomy, University of Pennsylvania, 1865-78, and later of Physiology. In the same year he was elected Professor of Anatomy and Surgery in the Philadelphia Dental College, and in 1870 surgeon to the Philadelphia Hospital. Author of *Outlines of Comparative Anatomy* (1867); *System of Human Anatomy* (1880). D. Nov. 14, 1897.

Allen, HEMAN, LL. D.: b. at Poultney, Vt., Feb. 23, 1779; graduated at Dartmouth, 1795; became a lawyer; was chief justice of a Vermont State court (1811-14); member of Congress (1817-18); U. S. minister to Chili (1823-28); and held various other important positions. He was a nephew of Ethan Allen. D. at Highgate, Vt., April 9, 1852.

Allen, HENRY: an enthusiast; b. at Newport, R. I., June 14, 1748; founder of the "Allenites." He maintained that Adam and Eve before the fall had no corporeal bodies, and denied the resurrection of the body. He preached in Nova Scotia, and published some hymns and religious treatises. D. at Northampton, N. H., Feb. 2, 1784.

Allen, HORATIO: civil engineer; b. at Schenectady, N. Y., in 1802; graduated at Columbia College in 1823, and at once engaged in civil engineering. In 1828 he went to Great Britain to purchase locomotives for the Delaware and Hudson Canal Co., and on Aug. 9, 1829, he operated at Honesdale, Pa., "the Stourbridge Lion," the first locomotive ever run in America. Soon after he was appointed chief engineer of the South Carolina R. R., on which the first continuous 100 miles of track ever built was opened. Later he became connected with the Croton aqueduct as principal assistant engineer, and had particular charge of the Forty-second Street reservoir in New York city, and of High Bridge over the Harlem river. He was president of the New York and Erie R. R. on its first formation, and during 1872 and 1873 was president of the American Society of Civil Engineers. He died Dec. 31, 1889. See RAILWAYS.

Allen, IRA: general; a younger brother of Ethan Allen; b. in Cornwall, Conn., May 1, 1751. Emigrating in 1772 to Vermont, he became a prominent and public-spirited citizen. While he was colonel of militia, his regiment did good service at the battle of Bennington. He bore a prominent part in settling the early difficulties of Vermont with the neighboring States. In 1795 he went to France to purchase arms for his State, but was taken on the voyage home, carried to England, and there sustained with success an eight-years' lawsuit on the charge of attempting to supply the Irish with arms. For a time he was imprisoned in France. He wrote a *Natural and Political History of Vermont* (1798), and other works. D. in Philadelphia, Jan. 4, 1814.

Allen, JEROME, Ph. D.: b. at Westminster West, Vt., July 17, 1830; educated in Amherst College; principal of Maquoketa (Ia.) Academy, 1853-55; Professor of Natural Sciences in Alexander College, Dubuque, 1855-59; principal of Bowen Collegiate Institute, Hopkinton, 1859-67; superintendent of schools, Monticello, 1867-71; Professor of Natural Sciences in the State Normal School, Geneseo, N. Y., 1874; president of the State Normal School at St. Cloud, Ia., 1885; Professor of Pedagogy, University of New York; dean of the School of Pedagogy, 1889; author of *A Handbook of Experimental Chemistry for Laboratory Use*; *Methods for Teachers in Grammar*; *Manual of Map-drawing*; *Mind Studies for Young Teachers*; *Temperament in Education*. D. in Brooklyn, N. Y., May 26, 1894. C. H. T.

Allen, JOEL ASAPH: b. at Springfield, Mass., July 19, 1838; entered the Lawrence Scientific School at Cambridge, Mass., as a special student in zoölogy (1862); from 1865-69 was a member of various scientific expeditions to Brazil, the Rocky Mountains, and Florida, the scientific results being given in a series of papers on the birds and mammals of the different regions. In 1873 he was appointed chief of a scientific party to accompany the Northern Pacific R. R. surveying expedition, and a *Report of the Natural History of the region traversed* was published in the Proc. Bost. Soc. Nat. Hist.; elected (1870) assistant in ornithology at the Museum of Compara-

tive Zoölogy in Cambridge; author of *Monographs of North American Rodentia* (with Elliott Coues, 1877); *History of North American Pinnipeds* (1880). He has edited the *Bulletin of the Nttal Ornithological Club* (.876-80), and became editor of *The Auk*. RALPH S. TARR.

Allen, JOSEPH HENRY, D. D.: Unitarian scholar and preacher; b. at Northboro, Mass., Aug. 21, 1821; educated at home and at Harvard University; settled as minister at Jamaica Plain (Roxbury), Mass., 1843-47, Washington, D. C., 1847-50, Bangor, Me., 1850-57; taught a boys' school and preached in his native town, 1857-67; removed to Cambridge, taught, and edited the Allen and Greenough series of Latin classics (16 vols.), 1867-77; lectured on ecclesiastical history in Harvard University, 1875-82; editor of the *Unitarian Review*, 1887-91; author of *Ten Discourses on Orthodoxy* (1849; 2d ed. 1889); *Memorial of H. Withington* (1849); *Manual of Devotions* (1852); *Hebrew Men and Times* (1861; 2d ed. 1879); *Christian History in its Three Great Periods* (1883, 3 vols.); *Outline of Christian History* (1884); *Our Liberal Movement in Theology* (1889); *Positive Religion: Essays, Fragments, and Hints* (1891); senior editor of the *History of Unitarianism*. D. in Cambridge, Mass., Mar. 29, 1898. JOHN W. CHADWICK.

Allen, PAUL: journalist; b. at Providence, R. I., Feb. 15, 1775; graduated at Brown University in 1796; studied law and removed to Philadelphia, where he engaged in journalism, serving as editor and as correspondent to various journals. He published a volume of poems (1801); *Lewis and Clark's Travels* (1814); *Life of Alexander I.* (1818), etc. His *History of the Revolution* (1819) was written by John Neal and others. He was for a time insane. D. at Baltimore (where he was an editor of the *Morning Chronicle*), Aug. 18, 1826.

Allen, PHILIP: b. in Providence, R. I., Sept. 1, 1785; graduated at Rhode Island College (now Brown University) in 1803. He was an extensive cotton-manufacturer, and built the first Watt steam-engine ever made in Providence; was Governor of Rhode Island (1851-53), and U. S. Senator (1853-59). D. in Providence, Dec. 16, 1865.

Allen, RICHARD: first bishop of the African Methodist Episcopal Church in the U. S. He was originally a preacher in the Methodist Episcopal Church, and was ordained deacon by Bishop Asbury in 1799. He was elected bishop of the African Methodist Episcopal Church in 1816. D. in Philadelphia, Mar. 26, 1831.

Allen, RICHARD L.: b. in Hampden co., Mass., Oct., 1803. Was a merchant in Buffalo, N. Y., in 1834, residing later at Allenwood, his farm, on the Niagara river. With his brother, A. B. Allen, he established the *American Agriculturist* in the city of New York, in 1842, which became a very successful paper. He was the author of the *American Farm-book* and the *Diseases of Domestic Animals* (1845). D. at Stockholm, Sweden, Sept. 22, 1869.

Allen, STEPHEN, D. D.: divine and educator of the Methodist Episcopal Church; b. in Maine in 1810; graduated at Bowdoin College in 1835; entered the ministry in the Maine Conference in 1839; and devoted much of his life to education in his native State, particularly as principal of Maine Wesleyan Seminary. D. July 3, 1888.

Allen, THOMAS: animal and landscape painter; b. in St. Louis, Mo., 1849; pupil of the Düsseldorf Academy; associate member National Academy of Design; member of the Society of American Artists (1880). Two of his best works are *Maplehurst at Noon*, a herd of Jersey cattle at rest under the trees, and a landscape of an effect at early evening called *O'er all the Hilltops is Rest*. Studio in Boston. W. A. C.

Allen, WILLIAM, F. R. S.: English chemist and philanthropist; b. in London, Aug. 29, 1770; was a friend of Sir H. Davy. In conjunction with W. H. Pepys he made researches on respiration, etc. He devoted much time to benevolent enterprises, and as an eminent minister of the Society of Friends traveled in France, Germany, and Russia. He had interviews with the Emperor Alexander in 1814 and 1822, first in England, next in Vienna. In 1825 he founded two manual-labor schools at Lindfield in Sussex, where he died Dec. 30, 1843.

Allen, WILLIAM, D. D.: b. at Pittsfield, Mass., Jan. 2, 1784; graduated at Harvard in 1802; was licensed to preach in 1804; in 1810 succeeded his father as pastor in Pittsfield; was chosen president of Dartmouth University in 1817, and

was president of Bowdoin College from 1820 to 1839. His last days were spent at Northampton, Mass., where he died July 16, 1868. He published numerous volumes, both of prose and of poetry. His best known work is an *American Biographical and Historical Dictionary* (1809; 3d ed. 1857).

Allen, WILLIAM: cardinal; b. in Lancashire, England, 1532; a zealous defender of the Roman Catholic faith in the latter half of the sixteenth century; founded the English College at Douay, in France, 1568; was made cardinal in 1587. D. at Rome, Oct. 16, 1594. Author of a number of polemical and apologetic works. See Gillow's *Bibliographical Dictionary of English Catholics* (Lond. 1885).

JOHN J. KEANE.

Allen, WILLIAM FRANCIS: historian and essayist; b. at Northborough, Mass., Sept. 5, 1830; graduated at Harvard 1851; studied at Berlin, Göttingen, and Rome 1854-56; Professor of Ancient Languages at Antioch College, O., 1866-67; Professor of Latin and History in the University of Wisconsin 1867-89. He published numerous works on classical and historical subjects, evincing varied, broad, and exact scholarship. The list of his publications given in his collected *Monographs and Essays* covers thirty 12mo pp. D. Dec. 9, 1889.

C. K. ADAMS.

Allen, WILLIAM HENRY, M. D., LL. D.: b. at Readfield, Me., Mar. 27, 1808; educated at Bowdoin College, Me., 1833; was Professor of Latin and Greek in the Cazenovia Methodist Seminary, N. Y., from 1833 to 1835; Professor of Chemistry and Natural Philosophy in Dickinson College, Carlisle, Pa., from 1836 to 1846; Professor of Philosophy and English Literature at the same institution from 1846 to the close of 1849; president of Girard College, Philadelphia, from 1850 to 1863; president of the Agricultural College of Pennsylvania during 1865 and 1866, and was reappointed president of Girard College in 1867. In 1872 he was elected president of the American Bible Society. He was author of *A Manual of Devotion for Girard College Orphans*, and of numerous and able addresses, reviews, etc. D. Aug. 29, 1882.

Allen, WILLIAM SULLIVANT VANDERBILT: a figure painter who was one of the first of American artists to adopt the methods of the "impressionists" in painting; b. in New York, Oct. 8, 1860. He is well known, also, as an illustrator, and is a talented draughtsman in pen and ink. Pupil of Gérôme and Puvis de Chavannes, Paris, and of Claude Monet at Givernay, France. Member of the Society of American Artists (1887); third-class medal, Paris Exposition (1889). Studio in New York.

W. A. C.

Allen'de: the name of two towns in Mexico. (1) SAN MIGUEL DE ALLENDE, or simply *Allende*, is in the state of Guanajuato, a few miles E. of the city of the same name, on the Mexican National R. R., 34 miles N. of Celaya (see map of Mexico, ref. 6-G). It is a pretty town, situated on the declivity of a high hill, and has well-paved streets and a college. Pop. 15,000. (2) EL VALLE DE ALLENDE, in Southern Chihuahua, S. E. of Parral and W. of the Mexican Central R. R. It is said to contain 12,000 inhabitants.

Allende, JUAN RAFAEL: Chilean poet and dramatist; b. in Santiago in 1850; began writing for the press in 1869. In 1875 he published studies in local customs in the journal called *El Padre Bobos*. In 1884 he founded the paper *El Padre Padillo*, which has made him famous. In 1872 his first piece was given in a theater, being entitled *El Qué Dirán*. He has since written several successful comedies. During the war between Chili and Peru he published six volumes of verse, entitled *Poesías del Pequén*. The Chilean Minister of War had 10,000 copies of these popular and intensely patriotic poems printed for the use of the army.

A. R. MARSH.

Allentown: city; an important railroad center; capital of Lehigh co., Pa. (for location, see map of Pennsylvania, ref. 5-I); on the right bank of the Lehigh river, 60 miles N. by W. of Philadelphia. The town was first incorporated as Northampton in 1811. In 1836 the name was changed to Allentown by act of the Legislature. There are many blast furnaces at this place, large rolling-mills, foundries, and machine-shops, tanneries, shoe-manufactories, tube-works, woolen-mills, fire-brick works, etc. According to the census of 1890 there were 376 manufacturing establishments, representing 74 different industries, with an aggregate capital of \$6,479,860, and employing 5,805 persons. The wages paid during the year amounted to \$2,302,638; and the total value of the products to \$8,826,273. There is a fine court-house, and a prison costing \$250,000. It is the seat of Muhlenberg

College, and other institutions of learning. Pop. (1870) 13,884; (1880) 18,063; (1890) 25,228, including suburbs: (1900) 35,416. FRANK J. SHERER, CITY EDITOR OF "CHRONICLE."

Alleppi', or Aleppi': the chief port of the native state of Travancore; on the west coast of the southern extremity of Hindustan; lat. 9° 20' N., lon. 76° 25' E. (see map of S. India, ref. 7-D). A canal connects it with a large coast lake called the Backwater. There is a large trade in teak, cardamoms, and pepper. The name of this town is very variously spelled, including such forms as Alipee, Aulapolay, and Alipalli. Pop. about 30,000.

Al'ler: a river of Germany, an affluent of the Weser, rises near Magdeburg and flows northwestward. It is about 150 miles long.

All Fools' Day: See APRIL FOOL'S DAY.

All-Hal'lows [*hallows*, plural of *hallow*: O. Eng. *hālga*, saint]: the old English name for All Saints' Day (the 1st of November).

Alli'ance: city and railroad junction: Stark co., O. (for location of county, see map of Ohio, ref. 4-I); has many extensive manufactories of horseshoes, reapers, pumps, terracotta ware, steam-hammers, tin-presses, besides rolling-mills, white-lead works, etc. It has excellent public schools, a college, and good libraries. Pop. (1880) 4,636; (1890) 7,607; (1900) 8,974.

EDITOR OF "REVIEW."

Alliance, Evangelical: See EVANGELICAL ALLIANCE.

Alliance, Holy: See HOLY ALLIANCE.

Alliance Israélite Universelle: a league established in Paris in 1860 by a number of distinguished Israelites for the protection of their co-religionists against the oppressions which crushed them, and for their social elevation. It has spread all over the world wherever Jews are found, and has been of great service. Local committees are formed which keep up communication with the central committee in Paris. By the munificence of Baron Hirsch, who in 1873 put one million francs at its disposal, and by other donations and contributions, the Alliance supports trade schools in Turkey, in Palestine (one for agriculture at Jaffa), and in Africa. The girls are taught in self-supporting arts and vocations.

S. M. J.

Alliance of the Reformed Churches THROUGHOUT THE WORLD HOLDING THE PRESBYTERIAN SYSTEM (popularly called the PRESBYTERIAN ALLIANCE): a voluntary organization for the promotion of brotherly feeling and co-operation among the members of the widely scattered religious bodies bearing different names but agreeing in Reformed theology and Presbyterian form of government. The alliance owes its origin to the advocacy of the Rev. Dr. James McCosh, ex-president of the College of New Jersey, who in 1862 first called attention to the need for one. Other persons made suggestions on the subject, prominent among whom was the Rev. Dr. W. G. Blaikie, professor in New (Free Church) College, Edinburgh, whose articles on the subject powerfully influenced the Scotch Presbyterians. But in reality the project was a revival of a scheme as old as Presbyterianism itself, for we find that Calvin in his letter to Cranmer in 1552, replying to an invitation to attend a conference at London for the promotion of unity in doctrine, suggests that the Reformed churches should be brought into one. So, later, the authors of the *Second Book of Discipline*, in Scotland, and also Théodore Beza in 1561. But the times were not favorable for this, any more than for the wider union proposed by Henry of Navarre in 1583. The union in 1820 between the Burgher and Anti-Burgher churches, making the United Secession Church, and other events of similar nature, set Presbyterians thinking on the desirability of more intimate relations with those who agreed with them in theology and polity. The General Assembly of the Irish Presbyterian Church and of the Presbyterian Church of the U. S. (North) resolved in 1873 to open up correspondence "with other churches holding by the Westminster Confession of Faith, with a view of bringing about an œcumenical council of such churches, to consider subjects of common interest to all, and especially to promote harmony of action in the mission fields at home and abroad." Advantage was taken of the meetings of the Evangelical Alliance in New York city that autumn to convene a gathering of Presbyterian (including Reformed) ministers and elders. Other conferences were held in different countries, and finally the movement took shape in the conference held in London, July 21 and 22, 1875, which settled on a constitution and arranged for the first General Council,

which convened in Edinburgh, July 3-10, 1877. The invitation given by the London conference was accepted by almost every Presbyterian organization through its highest court, and delegates were appointed. The roll of the first council showed that there were actually present 249 delegates, representing 40 different communions. The platform on which they met was thus expressed in their constitution: "Any church organized on Presbyterian principles, which holds the supreme authority of the Scriptures of the Old and New Testaments in matters of faith and morals, and whose creed is in harmony with the consensus of the Reformed churches, shall be eligible for admission into the alliance." The council is made up of delegates, both ministerial and lay in equal number, regularly commissioned by their respective communions; considers questions of general interest to the Presbyterian community, but is expressly forbidden to "interfere with the existing creed or constitution of any Church in the alliance, or with its internal order or external relations."

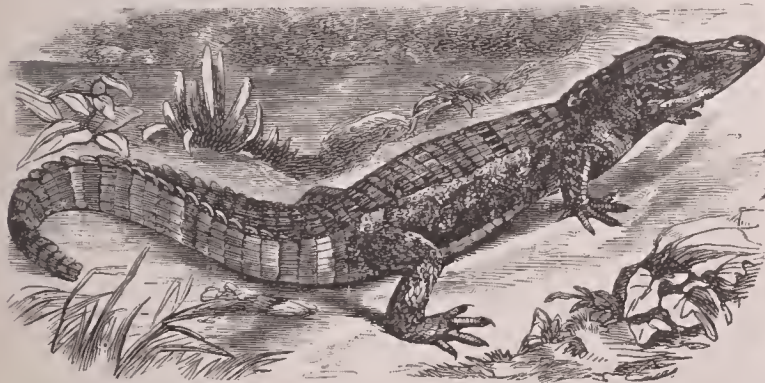
The second General Council was held in Philadelphia, Sept. 23-Oct. 2, 1880, and was attended by 220 delegates, representing 28 different communions; the third in Belfast, June 24-July 3, 1884, with 238 delegates from 35 communions; the fourth in London, July 3-12, 1888, with 275 delegates from 44 communions; the fifth in Toronto, Sept. 21-30, 1892, with 279 delegates from 25 communions; the sixth in Glasgow, Scotland, June 17, 1896; and the seventh in Washington, D. C., Sept. 27, 1899. On the roll of the council there are altogether 61 different bodies, but as many of them are in the mission field they can not be regularly represented. The papers and proceedings of these different councils have been published, and are on sale in London at the office of the general secretary of the alliance, Rev. Dr. G. D. Matthews. They contain much valuable matter. The alliance has been of great service in cementing union among the Reformed Churches.

Allibone, SAMUEL AUSTIN, LL. D.: author and librarian; b. in Philadelphia, Apr. 17, 1816. His principal work is a *Critical Dictionary of English Literature and Authors* (1859-70); also a *Dictionary of Poetical Quotations* (1872), etc. Became librarian of Lenox Library, New York, in 1880; resigned in 1888. D. at Lucerne, Switzerland, Sept. 2, 1889. A continuation of his *Dictionary of English Literature and Authors*, prepared by J. Foster Kirk, was published in 1891.

Allier, aäl'lée-ā': a river of France; the most important affluent of the Loire. It rises in the south of France, near the source of the Loire, flows nearly N., and enters that river at Nevers. Its entire length is about 260 miles.

Allier: a department of France; bounded N. by Cher and Nièvre, E. by Saône-et-Loire, S. by Puy-de-Dôme, and W. by Creuse and Cher. Area, 2,822 sq. miles. It is intersected by the Allier, and bounded on the N. E. by the Loire. The soil is fertile. The chief productions are wine, grain, timber, cattle, horses, and sheep. Iron, coal, and marble are found here. It comprises four arrondissements. Chief town, Moulins. Pop. (1881) 416,579; (1891) 424,382; (1896) 424,378.

Alligator [corruption of Span. *al lagarto*, the lizard < Lat. *lacerta* (*lacarta*)]: a genus of American saurian reptiles



Alligator.

(nearly allied to the crocodile) which abound in the rivers and swamps of the Southern U. S. They have broader heads, more numerous teeth, and more obtuse snouts than crocodiles. Similar reptiles are called caymans in South America. They all hibernate in the winter or dry season, when they bury themselves in the mud. The alligator is about 12 feet long, including the tail, which is a powerful weapon for defense. It is a fierce and voracious animal, and sometimes attacks and kills men in the water, but it can not turn quickly on land. During the heat of the day it is often seen basking in the sun on the dry ground. Its back and sides are defended

by hard mailed plates. The alligator is an oviparous animal, its eggs being small, but numerous. The parent deposits them in the sand of the river-side, scratching a hole with her paws, and placing the eggs in a regular layer therein. She then covers these with sand, grass, mud, etc., and deposits another layer on top of them, and so on until she has laid from fifty to sixty eggs. These are hatched by the heat of the sun and the decaying vegetable matter. The name alligator is also frequently applied to the mugger of India. The common alligator of the Southern States is the *Alligator mississippiensis*. Among the so-called alligators of Florida a true crocodile (*Crocodylus americanus*) also occurs. See CROCODILE. Revised by DAVID S. JORDAN.

Alligator Pear: See AVOCADO PEAR.

Allingham, WILLIAM: Anglo-Irish poet, journalist, and playwright; b. at Ballyshannon in 1828. He was at one time editor of *Fraser's Magazine*, and was intimately associated with the Pre-Raphaelites. He published many volumes of poetry, original and selected, including *Day and Night Songs* (1854); *The Music-Master* (1855); *Laurence Bloomfield in Ireland* (1864); *Evil May-Day: a Play* (1882); *Irish Songs and Poems* (1887). His poems were illustrated by D. G. Rossetti, Kate Greenaway, and other eminent designers. His most popular pieces are *Mary Donnelly* and *The Fairies* (1883). D. in London, Nov. 20, 1889. HENRY A. BEERS.

Allio'li, JOSEPH FRANZ: German Catholic theologian; b. at Sulzbach, Aug. 10, 1793. He became Professor of Theology at Munich in 1826, resigned in 1835, and became canon soon after at Ratisbon. His German translation of the Bible (6th ed. 1839-45) was approved by the pope, and had a very wide circulation. He also published a *Manual of Biblical Antiquities* (1841). D. at Augsburg, May 22, 1873.

Allison, JOHN: b. Aug. 5, 1812, at Beaver, Beaver co., Pa., where he was a hatter; took a leading part in the Whig party; was elected to the State Legislature in 1846, 1847, and 1849; served in Congress 1852-54 and 1855-57; was a member of the convention of Pittsburg which instituted the Republican party (1856), and in 1860 he headed the State delegation in the convention at Chicago which nominated Lincoln; served as major and paymaster in the army during the civil war, and register of the U. S. treasury from Apr. 1, 1869, till his death, at Washington, D. C., Mar. 23, 1878.

Allison, WILLIAM B.: b. at Perry, O., Mar. 2, 1829; educated at Western Reserve College, O., studied law and practiced in Ohio until his removal to Iowa in 1857, where he served on the Governor's staff and aided in organizing volunteers at the commencement of the civil war of 1861-65; was representative in Thirty-eighth, Thirty-ninth, Fortieth, and Forty-first Congresses; was elected to U. S. Senate as a Republican, and has held that office since Mar. 4, 1873. He was a delegate from the U. S. to the International Monetary Congress at Brussels, Dec., 1892.

Allium [Lat., etymology unknown]: a genus of herbaceous plants of the natural order *Liliaceae*, natives of the temperate and cold regions of the northern hemisphere, including the garlic, onion, leek, and chive. They have mostly bulbous roots, umbellate flowers, narrow and fistulose leaves, and a peculiar smell and taste called *alliaceous*.

All-mouth: See ANGLER.

All'oa: a seaport and market-town of Scotland, in the county of Clackmannan, on the left (N.) bank of the Forth, and at the head of its frith; 28 miles W. N. W. of Edinburgh (see map of Scotland, ref. 11-G). It has a good harbor and an active trade. Glass, ale, whisky, woolen goods, and leather are manufactured here, and coal is an important article of export. Steamboats ply daily between Alloa and Edinburgh. Pop. 11,638.

Allocu'tion [Lat. *allocu'tio*, from *ad*, to + *loqui*, speak]: a formal address, as by a general-in-chief to his soldiers; in ecclesiastical usage, a speech which the pope addresses to the college of cardinals on some political or ecclesiastical subject. The pope often resorts to this method to define his position or explain his policy. At the opening of the Lambeth Conference of 1888 the Archbishop of Canterbury, Dr. Benson, delivered an "allocation" to the Anglican bishops assembled from all parts of the world, from the patriarchal chair of St. Augustine, Canterbury's first archbishop.

Allo'dium, or Allo'dial Ten'ure [med. Lat. *allo'dium*, from Ger. **alōd*, entire ownership, *all*, entire + *ōd*, property, O. H. G. *ōt*, O. E. *eād*]: in feudal law, freehold estate, land held by an individual in his own absolute right, and free

from feudal tenure or obligation. There is no allodial land or property in England, the laws of which declare that the king is the original proprietor and lord paramount of all the land in the kingdom.

Allon, HENRY, D. D.: Congregationalist; b. at Welton, near Hull, England, Oct. 13, 1818; graduated at Cheshunt College, 1843; minister of Union chapel, Islington, London, from 1844 to his death, Apr. 16, 1892. He was editor of the *British Quarterly Review* for twenty-two years, from 1865. He compiled a popular hymn-book, *The Congregationalist Psalmist*. He published *The Life of James Sherman* (1863) and a volume of sermons (1876); and edited *Binney's Sermons* (1875), with a preliminary memoir. Dr. Allon was one of the ablest and most influential leaders of the Congregationalists in England, and was highly respected beyond the limits of this religious body. GEORGE P. FISHER.

Allo'pathy [from Gr. ἄλλος, other + πάθος, suffering]: a supposed theory of medicine, according to which remedies are used whose effects are opposite to the symptoms of the diseases treated. The term allopathy was formed after that of homœopathy, and both terms were introduced by Hahnemann. The two terms are contrasted, the one teaching that medicines must produce a *similar affection* to the disease itself, the other a *different affection*. The idea of this method of medication is at least as old as Hippocrates, who used the expression, "τὰ ἐναντία τῶν ἐναντίων ἐστὶν ἰήματα"—"opposites are remedies of opposites." It has been contrasted in modern times especially with the maxim of Hahnemann, "*similia similibus curantur*," or "like cures like," which is the fundamental principle of homœopathy—an idea which is also advanced by Hippocrates. It is altogether an error to designate the prevalent and ancient science and practice of medicine as allopathy. The teachers and adherents of this science insist that its scope legitimately embraces all positive truth concerning disease and its treatment; no more to be narrowed down to an exclusive principle such as that of allopathy, than astronomy can be made synonymous with the nebular theory, or zoölogy with the theory of development.

Allori, ALESSANDRO: Italian painter; b. in Florence, May 31, 1535; d. there Sept. 22, 1607; excelled in the science of anatomy. Among his masterpieces are *The Last Judgment* and *Christ Disputing with the Doctors*. His son Christofano (b. 1577, d. 1621) is celebrated for his portraits.

Allotta'va, or abbrev. 8^{va}: in music, a direction to play an octave higher or lower, according as the phrase may be placed above or below the notes in question.

Allotropy, or **Allotropism** [Gr. ἄλλοτροπία, diversity; ἄλλος, other + τροπος, turn, guise]: in chemistry, the diversity of form and properties which some elements exhibit in certain circumstances, as when exposed to a great heat or to an electric discharge. (See ISOMERISM.) Many chemists believe that every element is capable of existing under several allotropic modifications. Among the substances which afford examples of allotropy are sulphur, phosphorus, oxygen, and carbon. If the solid and brittle sulphur be heated to 480° F., and then poured into water, it ceases to be brittle and becomes very elastic. Sulphur in its ordinary state is slightly soluble in turpentine and some fixed oils, but in its elastic condition it becomes insoluble in those oils. Phosphorus affords a remarkable illustration of the same principle. In ordinary circumstances, when freshly prepared, it is a pale yellow solid, resembling wax. In this form it is extremely combustible, requiring to be kept under water to avoid taking fire spontaneously. But if this same substance be excluded from air and kept several days at a temperature of about 450° F., it becomes red, and ceases to be readily combustible, so that it need not be kept under water to prevent its taking fire. Oxygen, which in its common state has no odor, may by an electric discharge through a glass tube or bottle containing air be transformed into ozone, which has a peculiar odor and other new properties. (See OZONE.) The diamond and graphite are allotropic forms of carbon.

Revised by IRA REMSEN.

Alloway Kirk: an old ruined church in the parish of Ayr, near the mouth of the river Doon, Scotland; the scene of Burns's poem *Tam o' Shanter*. A monument has been erected here to the memory of Burns, who was born near the kirk.

Alloy [modif. under influence of Fr. *aloi* of older *alay* < O. Fr. *alay*, from Lat. *attigare*, combine]: a mixture or compound of two or more metals fused together; sometimes a compound of precious metal with a metal of less value; thus, in coinage, the term alloy is applied to a

baser metal mixed with gold or silver in order to make it harder. Chemists apply this term to all combinations obtained by fusing metals together; thus, brass is an alloy of copper and zinc; bronze is an alloy of copper and tin; pewter is an alloy of tin and lead. In many cases the metals do not unite in definite or invariable proportions. The density—or, in other words, the specific gravity—of an alloy is sometimes greater and sometimes less than the mean of its components. Most alloys have greater cohesion than either of the metals of which they are composed, so that a bar of an alloy will bear a greater longitudinal strain than a bar of either metal. British gold coin contains 11 parts of pure gold and 1 of copper; the law of the U. S. requires that in 1,000 parts of coin there must be 900 parts of gold; and the intent of the law is that the alloy shall be of copper only; but, as in parting silver from native gold it has been heretofore impossible to separate the whole, except at an expense too great to be economical, it has been permitted to allow the residual silver to be counted as part of the alloy, provided the proportion of silver be *not greater* than one-half. The more effectual processes introduced of late years into the U. S. assay offices have made it possible to make the parting nearly complete; and it is now provided that the silver shall not exceed *one-tenth* part of the whole alloy. A compound of mercury with another metal is an *amalgam*.

Revised by IRA REMSEN.

All Saints' Day, or **All-Hallows**: a festival of the Roman Catholic, Anglican, Lutheran, and the various Oriental churches, observed on the 1st of November, in honor of the saints in general. The Greeks keep their feast of All Saints on the Sunday after Whit Sunday.

All Souls' Day: a festival of the Roman Catholic Church observed on the 2d of November, when the prayers of the living, offered at the Eucharist, are publicly offered for the faithful departed.

Allspice: pimento, or Jamaica pepper, the dried berry of the *Eugenia pimenta*, which is a native of the West Indies. It is called allspice because it is supposed to combine the flavor of several spices.

Allston, ROBERT FRANCIS WITHERS: soldier and Governor; b. in All Saints' parish, S. C., Apr. 21, 1801; graduated at West Point in 1821; served as lieutenant of artillery on topographical duty till he resigned, Feb. 1, 1822, to become a rice-planter on the Great Pedee river; surveyor-general of South Carolina 1823-27, member of the House of Representatives of South Carolina 1828-32, of the Senate 1832-56, presiding 1847-56, deputy adjutant-general of South Carolina 1831-38, and Governor of South Carolina 1856-58. He was much interested in agriculture and public education, and wrote valuable memoirs upon both subjects. D. April 7, 1864, on his plantation near Georgetown, S. C.

GEORGE W. CULLUM.

Allston, WASHINGTON: painter of historical and religious compositions and of portraits; b. at Waccamaw, S. C., where his father was a planter, Nov. 5, 1779, and d. at Cambridgeport, Mass., July 9, 1843. He became acquainted with Edward Malbone, a miniature painter, while at school in Newport, R. I., and after graduating at Harvard College in the class of 1800 he went to Charleston, S. C., and began to paint, making use of such small opportunities for study as the place afforded. In 1801 he went to London with Malbone and entered the schools of the Royal Academy, and in 1804 he went to Paris to study in the Louvre and soon afterward to Rome, where he spent about four years. He returned to the U. S. in 1809, but shortly returned to London, where in 1812 he won a prize of 200 guineas from the British Institution with a picture entitled *The Dead Man Restored to Life by the Touch of Etisha's Bones*. It was afterward purchased by the Pennsylvania Academy of Fine Arts, and is now in its permanent collection at Philadelphia. Allston's fame grew rapidly in succeeding years, and he was elected an associate of the Royal Academy, London, in 1818. He took a studio in Boston the same year, and began work on his *Elijah* and a large composition, *Belshazzar's Feast*, which, however, he never finished. A sketch of the picture is in the Boston Athenæum. A portrait of Benjamin West is also in the Athenæum Gallery, and a portrait of Coleridge is in the National Portrait Gallery in London. In the gallery of the Fine Arts School of Yale University one of his important pictures may be seen, painted in Boston during the time he passed there from 1818 to 1830. He went to Cambridgeport to live in 1830 and

spent the rest of his life there, devoting himself to literature and painting, but working irregularly and producing little. Allston was a man of refined sensibility and poetic temperament, and was loved and esteemed by his friends and fellow-artists. His reputation as an artist is greater than his achievement in painting warrants on the whole, and in his work there is not much to entitle him to a high rank. His best quality was a good sense of color. His portraits, in spite of only moderate technical skill, are refined, and impress with a sense of personality that is often lacking in better work. Being one of the first in the U. S. to take up the study of the fine arts seriously and devote his life to the profession of painting, he will always remain an interesting and important figure in the history of our art. WILLIAM A. COFFIN.

Allu'vion [viâ Fr. from Lat. *allu'vio*, a washing against; *ad*, to + *lu'ere*, wash]: the soil imperceptibly formed by the constant washing of the waters along the banks of a river or the sea. (See ACCRETION.) It differs from "avulsion," as the latter is not gradual, but sudden and perceptible.

Allu'vium [Lat. neut. of adjec. *allu'vius*, washed against; *ad*, to + *lu'ere*, wash]: gravel, sand, and other matter washed down by rivers and floods, and spread over land that is not permanently submerged. Such deposits often accumulate at the mouths of large rivers and form deltas. (See DELTA.) Streams which issue from mountain gorges upon an adjacent plain usually accumulate alluvium about the mouths of the gorges in sloping plains known as alluvial fans or alluvial cones.

Al'lyn, ROBERT, D. D.: clergyman; educator in the Methodist Episcopal Church; b. at Ledyard, Conn., Jan. 25, 1817; graduated in 1841 at the Wesleyan University, Conn.; mathematical teacher in Wilbraham Academy, Mass., in 1841-43; joined the New England Conference 1842; was elected principal at Wilbraham 1845; principal of the Providence Conference Academy 1848; Commissioner of Public Instruction for Rhode Island 1854; served three terms in the Rhode Island Legislature; appointed Professor of Ancient Languages in Ohio University at Athens 1857; president of the Wesleyan Female College, Cincinnati, O., 1859, and president of McKendree College, Ill., 1863-73. D. Jan. 7, 1894.

Al'ma: a small river of Russia, in the Crimea, flows W. and enters the sea about 20 miles N. of Sevastopol. On its banks the allied armies of England, France, and Turkey defeated the Russians on Sept. 20, 1854. The British forces consisted of 25,000 men and 60 guns, commanded by Lord Raglan. The French had 30,000 men and 68 guns, and also 7,000 Turkish infantry, the French and Turkish forces being all under the command of Marshal St. Arnaud. The Russians had 36,000 men and 122 guns under Prince Menschikoff, and were strongly posted on the left bank of the river, on the heights.

Alma: city (founded in 1865); capital of Wabaunsee co., Kan. (for location of county, see map of Kansas, ref. 5-1); 35 miles W. of Topeka, the State capital; on two railroads; has good water-power and fine stone quarries, a flouring-mill, a creamery, graded public schools, a Lutheran school, 5 churches, and 3 weekly newspapers. Pop. (1880) 300; (1890) 1,125; (1900) 966. EDITOR OF "NEWS."

Alma: town in northeastern part of Gratiot co., Mich. (for location of county, see map of Michigan, ref. 6-1); on Pine river, 32 miles W. of Saginaw, and on the Detroit, Lansing and Northern and Toledo, Ann Arbor and North Michigan R. Rs. A branch of D., L. and N. connects Alma with Ithaca, the county seat, 9 miles south. It is the seat of Alma College (Presbyterian), and has an excellent public school of twelve departments. There are six churches. The leading manufactures are lumber and shingles, hoops, sashes, doors, and blinds, furnishings for buildings, tables, flour, excelsior, barrels, machinery, and woolen goods. Pop. (1880) 456; (1890) 1,655; (1900) 2,047.

EDITOR OF "RECORD."

Alma: city; county seat of Buffalo co., Wis. (for location of county, see map of Wisconsin, ref. 5-B); on the Mississippi river, 60 miles N. of La Crosse, and within 4 miles of the celebrated Beef Slough Booms. It has manufactures of lumber, bricks, wagons, flour, etc., and is surrounded by good farming country. It has a high school with seven departments, and four churches. Pop. (1880) 1,244; (1890) 1,428; (1900) 1,201. EDITOR OF "JOURNAL."

Al'mack's: a suite of assembly-rooms in King Street, St. James, London, was formerly celebrated as a fashionable place of resort for the aristocracy. Annual balls were given

in these rooms, the managers of which were ladies of high rank, who conducted them with great exclusiveness. These rooms were built in 1765 by a person named Almack, an anagram of McCall, his original name. The desire for admission to balls and parties at Almack's was so eager that it is said that votes in Parliament were bought by tickets offered to wives and daughters of members.

Almaden', or **Almaden' del Azo'gue** (i. e. the mines of quicksilver): a town of Spain, in the province of Ciudad Real, 50 miles S. W. of Ciudad Real (see map of Spain, ref. 17-E). Here are mines of quicksilver (cinnabar), which are said to be the richest and most ancient in the world, producing annually about 2,000,000 lb. They were worked by the ancient Spaniards, and afterward by the Romans. Almaden has a practical school of mines and three hospitals. The mines were rented in the sixteenth century by the Fuggers, the famous bankers of Antwerp, and in 1843 the Rothschilds obtained the contract from the Spanish Government. Pop. 8,645.

Almaden': township of Santa Clara co., Cal. (for location of county, see map of California, ref. 8-C); has mines of mercury and mineral springs. Pop. (1870) 1,647; (1880) 2,418; (1890) 1,932; (1900) 1,599.

Almaden Quicksilver Mines (Santa Clara co., Cal.): named after those of Almaden in Spain, the latter being the most important in the known world. The Santa Clara mines are the New Almaden, Providence, Enriquita, and Guadalupe. The first mentioned is 14 miles from San José and 65 miles S. of San Francisco, in a region remarkable for its picturesque scenery. The ore (cinnabar) has from time immemorial been known to the Indians, who used it for making vermilion paint. Some Mexicans having bribed them to disclose the profound secret of its place, a company was formed in 1846, which began to work the mine. The presence of this deposit has been of incalculable benefit to the Pacific coast, since enormous quantities are employed in gold and silver mining. The metallic mercury is separated from the ore by a simple process of distillation. The total production of the California mines from July, 1850, to Jan. 1, 1899, was 967,796 flasks of 76½ lb. each. The maximum was reached in 1865 with 47,194 flasks, the product in 1898 being 5,875 flasks. Revised by C. KIRCHHOFF.

Al'magest [viâ O. Fr. from Arab. *al-majisti*; *al*, the + Gr. *μεγίστη*, fem. greatest (sc. *σύνταξις*): a name given by the Arabs to Ptolemy's celebrated work on astronomy, in which the laws of the celestial motions were developed on the supposition that the earth was the center of the universe. It was the standard work from the time it was written, about A. D. 150, until Copernicus showed that the earth revolves around the sun.

Almagro, al'maa'grō: city of Spain; province of Ciudad Real; 14 miles S. E. of Ciudad Real (see map of Spain, ref. 17-F). It is well built, has a town-hall, two hospitals, and one Latin school. Large quantities of fine black and coarse white lace are made here; also brandy, soap, and earthenware. Pop. 14,000.

Almagro, DIEGO, de: a Spanish soldier of fortune; one of the conquerors of Peru; a founding named after the city in which he was found in 1475. At an early age he went to America, where he is said to have enriched himself by plunder. Pizarro, Almagro, and Luque in 1525 united in an enterprise to conquer Peru, in which they were successful. (See PIZARRO, FRANCISCO.) In 1535 Almagro invaded Chili and gained some victories over the natives, but his progress was hindered by the enmity and perfidy of Pizarro. He returned from Chili in 1536, and took Cuzco, which Pizarro claimed as part of his possessions. In April, 1538, Almagro was defeated in battle and taken prisoner by Pizarro, who put him to death.

Almagro, DIEGO, de: son of the preceding; b. about 1520. He became the leader of a party which was hostile to Pizarro, whom they assassinated in 1541. He then took the title of captain-general of Peru, but he was defeated in battle by the royal army under Vaca de Castro, and was executed in 1542.

Alma'li: a large town of Asiatic Turkey; in the S. part of Anatolia; on the river Myra; 25 miles from the Mediterranean (see map of Turkey, ref. 6-E). It is beautifully situated in a valley, contains several factories and mills, and has a prosperous trade. The appearance of the town is uncommonly picturesque. Pop. variously estimated from 8,000 to 25,000.

Al'ma Ma'ter (Lat., fostering or propitious mother): a name used to express the relationship of a university to its "foster-children" (alumni) who have been educated in it.

Almanac [from a Spanish-Arab. *al-manākh* of uncertain origin]: an annual publication designed to give information respecting times, seasons, the motions and positions of the heavenly bodies, and other celestial phenomena. Frequently, also, the times of high and low tides are added, especially in the case of almanacs intended for use in seaports or on ship-board.

The familiar household almanac is calculated and compiled from a large Government publication, issued in different countries under different names. In the U. S. this publication is known as the *American Ephemeris and Nautical Almanac*; in the United Kingdom as the *Nautical Almanac and Astronomical Ephemeris*, the familiar name of the publication in both countries being simply the *Nautical Almanac*. See EPHEMERIS.

Among the most widely known almanacs of the present time is the *Almanach de Gotha*, which was first published in German in 1763. It is also published in French. It contains the official lists of statistics of all nations, with much political information.

The first American almanac was that of William Pierce, published at Cambridge, Mass., in 1639. In 1733 Franklin first published his celebrated *Poor Richard's Almanac*. The *American Almanac* appeared from 1830 to 1861, and a new publication under the same title, edited by A. R. Spofford, from 1878 to 1889. Over 100 almanacs are published in the U. S., embracing very many subjects—religious, political, agricultural, etc. S. NEWCOMB.

Almanach de Gotha: See GOTHA ALMANAC.

Almandine: See GARNET.

Alman'sa, or **Alman'za**: a town of Spain; province of Albacete; 52 miles by rail E. of Albacete (see map of Spain, ref. 17-H). It has manufactures of linen and cotton fabrics, brandy, leather, and soap. Near this town the French, under the Duke of Berwick, defeated the British and Spanish armies, April 25, 1707. Pop. 7,900.

Al-Mansoor', ABOO JAAFAR: the second caliph of the family of the Abbassides; b. in 712. He ruled from 754-775; persecuted the Christians in Syria and Egypt; founded Bagdad; and promoted arts and sciences.

Alma-Tadema, LAURENZ, al-ma-tad'e-ma: figure painter, principally of Greek and Roman subjects; b. at Dronryp, Friesland, Jan. 8, 1836. Pupil of the Antwerp Academy and of Baron Leys. Has resided for many years in London, and was elected a member of the Royal Academy in 1879. Has received many honors at the principal exhibitions on the Continent and in Great Britain, and is a member of the academies of Amsterdam, Munich, Berlin, Madrid, Stockholm, and Vienna. Officer of the Legion of Honor, 1878; first-class medal, Paris Exposition, 1878; medal of honor, Paris Exposition, 1889. His work is remarkable for archaeological correctness and for technical qualities of a high order. Some of his principal pictures are: *Roman Dance* (1866); *Vintage Festival* (1870); *Sculpture Gallery* (1874); *Picture Gallery* (1874); *The Four Seasons* (1877); *Bacchante* (1877); *In the Tepidarium* (1881); *Anthony and Cleopatra* (1883); and *The Women of Amphissa* (1888). Some excellent examples of his work are owned in the U. S. Studio in London. WILLIAM A. COFFIN.

Al'meh, or **Al'mah**, written also **Almé** (plu. **Awâlim**): a professional female singer of Egypt. The singers are hired to perform in the harems of the rich. The common dancing-girls are a different and less respectable class, and are called Ghawazis (*q. v.*).

Almei'da: a fortified town of Portugal; in Beira; on the Coa, 95 miles N. E. of Coimbra (see map of Spain, ref. 14-C). It is an important stronghold. Here Lord Wellington defeated the French General Massena, Aug. 5, 1811. Pop. 10,125.

Almeida: a town of Brazil; province of Espirito Santo; is on the ocean, about 20 miles N. of Victoria (see map of South America, ref. 6-H). It was founded by the Jesuits in 1580. Pop. about 4,000.

Almeida, DON FRANCISCO, de: a famous Portuguese commander and Viceroy of India; b. in Lisbon about 1450. He was a son of the Count of Abrantes. Having gained distinction in wars against the Moors, he was appointed Viceroy of India in 1505. He built several forts on the Indian coast,

and extended the dominion of Portugal by his conquests. In 1507 Albuquerque was sent to India with a commission to supersede Almeida, but the latter refused to resign. He gained a decisive victory over the Egyptian fleet near Diu in 1508, and resigned his office about the end of that year. As he was returning to Portugal, he was killed by some Kaffirs near the Cape of Good Hope, Mar. 1, 1510.

Almeida-Garrett, JOÃO BAPTISTA, de: a Portuguese poet and politician; b. at Oporto, Feb. 4, 1799; Minister of Public Instruction, 1820-23; was compelled to leave the country in 1823, and again in 1828. In 1832 he landed in Portugal with Dom Pedro, was minister to Belgium in 1834, and member of the Cortes after the revolution of September, 1836. He was raised to the peerage in 1852, and died at Lisbon, Dec. 9, 1854. Inspired by the romantic movement with which he became acquainted during his exile in France since 1823, he was the first to collect the ballads and other forms of the national poetry of the Portuguese people, recognizing in them and in the national traditions the only organic basis upon which to build up a truly national literature, free from the influences of French classicism. Though his efforts to create a modern Portuguese drama were not successful, it is on them that his claim to a place beside Gil Vicente and Camoëns, the two other great poets of Portugal, chiefly rests. The most important of his works are the *Romanceiro* (3 vols.), a collection of Portuguese ballads; the historical novel, *O Arco de Sant' Anna*; the satirical poem, *Dona Brauca*; the epic-lyrical compositions, *Camoëns* and *Adozinha*, and especially the dramas *Auto de Gil Vicente*, *Filippa de Vilhena*, *O Alfageme de Santarem*, and *Frei Luiz de Sousa*. Valuable information in regard to Garrett's life is contained in Francisco Gomes de Amorim's work, *Almeida-Garrett, Memorias biographicas* (1881). HENRY A. LANG.

Almeri'a: a province of Spain; forms the E. part of the former kingdom of Granada. It is bounded N. by Murcia, E. and S. by the Mediterranean, and W. by Granada. Area, 3,302 sq. miles. It contains rich mines of silver and lead. Grain, silk, and wine are the chief productions. Pop. (1887) 339,383.

Almeria: city and port of Spain; on the Mediterranean; 104 miles E. of Málaga; the capital of a province of the same name (see map of Spain, ref. 19-G). Under the reign of the Moorish kings it was one of the richest and most important towns in the kingdom of Granada. It has a safe harbor, defended by two forts, and a fine cathedral. Wine, silk, cochineal, and other articles are exported from this port. It is pretty well built, the architecture of many of the houses still showing its Moorish origin, and has some fine squares. Pop. (1877) 40,323; (1887) 37,241.

Almodo'var, ILDEFONSO DIAZ DE RIBERA, Count: b. in 1777 at Granada; educated at the Military Academy of Segovia, and fought with distinction in the war against the French. By the reactionary Government of Ferdinand VII. he was suspected of liberalism and confined in the dungeons of the Inquisition, but was liberated by the revolution of 1820. In 1823, however, he was compelled to flee to France, and did not return until after the death of Ferdinand, when he at once took rank as one of the leaders of the Liberal party. In the cabinets of Mendizabal, Calatrava, and Espartero he was Minister of War, but retired in 1843 from public life. D. at Valencia, Jan. 26, 1846.

Almohades, al'mō-hadz [Arabie *Al-Mowahidoon*, i. e. the unitarians, or advocates of the unity of God, as taught in its original purity by Mohammed]: a Mohammedan dynasty that reigned in Spain and Northern Africa from 1129 to 1269. It was founded by Abu-Abdillah Mohammed, surnamed AL-MAHDI, "the director." The Almohades were the conquerors and successors of the Almoravides. The first Almohade who took the title of sultan was Abd-el-Mumen.

Almonacid': a town of Spain; province of Toledo; on the Tagus (see map of Spain, ref. 16-F). Here the French under King Joseph defeated the Spaniards under Vanegas on Aug. 11, 1809.

Almond (*Prunus communis*): a fruit closely allied to the peach, and supposed by some to have given rise to the peach through cultivation and selection. It has been in cultivation from time immemorial, and is thought to be native to the Mediterranean basin and Western Asia. The fruit is characterized by a more or less hard and inedible flesh, the marketable product being the pit or stone, the meat or kernel of which is the edible portion. There are a score of varieties, most of which fall readily into one of two groups—the sweet

kernels and the bitter kernels. The thickness and consistence of the shell vary in each group, so that the common terms "soft shell" and "hard shell" express no definite distinctions. The almonds of the shops belong to the sweet kernel group, and the best of them are thin-shelled varieties. Bitter varieties yield the "oil of bitter almonds," and they are used for medicinal and confectionery purposes. Almond leaves are rich in prussic acid. The almond is extensively cultivated in Southern Europe, and lately it is being grown largely in California, where several varieties have originated peculiarly well adapted to certain localities. Several varieties are hardy as far N. as New York and Detroit, but the popular market sorts rarely succeed N. of 38° or 40°. Almonds are cultivated in the same manner as peaches. They are budded upon almond, peach, plum, or apricot, these stocks being named in the order of preference. The fruits are shaken from the tree as soon as the outer flesh is burst open. The hulling is done in this country by simple hand or power machines. When thoroughly dry the stones are bleached with sulphur fumes to improve their appearance.

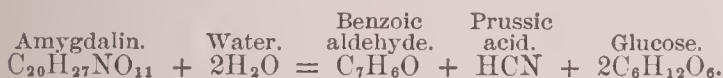
Flowering or dwarf almonds are bushy plants belonging to the species *Prunus triloba* and *P. nana*. They are propagated by budding upon plum or peach; also by root-cuttings, division, and rarely by cuttings of the branches.

L. H. BAILEY.

Almond'bury: a large village, township, and parish of England, in the West Riding of Yorkshire (see map of England, ref. 7-H). The village is on the Calder, 36 miles S. W. of York, and has cotton and woolen mills. Pop. about 16,000.

Almon'de (sometimes *Alemonda*), PHILIPPUS, van: a Dutch admiral; b. at Briel, Dec. 29, 1646. He was the second in command under De Ruyter when the latter was killed in 1676, and contributed to the victory which Van Tromp gained over the Swedes in 1677. He accompanied William of Orange to England in 1688, and commanded the Dutch fleet which, aided by the English, defeated the French at La Hogue in 1692. D. near Leyden, Jan. 11, 1711.

Almonds, OIL OF: a fixed oil, of a light-yellow color and odorless, obtained by pressure from almonds, both sweet and bitter. It consists chiefly of olein; is soluble in 25 parts of alcohol. It is used in medicine, having a mild laxative property. It is sometimes given to new-born infants, mixed with sirup of roses. One hundred pounds of almonds yield about 50 lb. of oil. Bitter almonds, macerated with cold water and distilled, yield a volatile oil known as the "oil of bitter almonds," or benzoic aldehyde. This does not pre-exist in the almonds, but is produced, together with hydrocyanic or prussic acid, from the glucoside amygdalin under the influence of the ferment emulsin:



It is a colorless, limpid oil, smelling of bitter almonds. When freed from prussic acid it is not poisonous. It oxidizes to benzoic acid, $\text{C}_7\text{H}_6\text{O}_2$. It is regarded as the aldehyde of benzoic acid. It is also produced by the action of manganese dioxide and sulphuric acid on albumen, fibrin, casein, and gelatin. It has been used to a considerable extent for flavoring confectionery and for scenting soap. For the former purpose the prussic acid which it usually contains makes it dangerous. For the latter purpose it has been entirely superseded by the much cheaper nitrobenzene or essence of mirbane ($\text{C}_6\text{H}_5\text{NO}_2$), also called artificial oil of bitter almonds, which possesses the same odor.

Revised by IRA REMSEN.

Al'moner [O. Fr. *almosnier*, from Lat. *elemosynarius*, adjec. from Gr. *ἐλεημοσύνη*, pity]: an officer whose duty is to distribute alms for a king or other person of rank, or for a monastery. The grand almoner of France was a functionary of high rank, and usually a cardinal. This office was abolished during the revolution. In England there is a lord high almoner, who distributes the bounty of the queen twice a year, and whose duties are defined in the constitutions of the royal chapels. All monasteries by the ancient canons were to spend not less than a tenth part of their income in giving alms to the poor. All bishops were required to keep almoners.

Almonte: town in Lanark co., Ontario, Canada (for location, see map of Ontario, ref. 2-H); situated in an agricultural region, on Canadian Pacific Railway, 35 miles S. W. of Ottawa; has good water-power, and manufactures woolen and knit goods. Pop. (1881) 2,684; (1891) 3,071.

Almon'te, DON JUAN NEPOMUCENO: a Mexican general and statesman of Indian descent; b. at Valladolid, Mexico, in 1804; was attached to the embassy in London in 1824 and 1832, Minister of War under Bustamente, and in 1841 minister plenipotentiary at Washington. He distinguished himself in the war against the U. S., was sent to Washington in 1853, and in 1857 to Paris. He went to Mexico with the French expedition in 1862, and was declared President in Juarez's place, but was not able to gain recognition. He entered the capital with the French army June 10, 1863, and was made President of the Government Junta; was sent to Paris as minister extraordinary 1866, and remained there after the fall of Maximilian till his death, Mar. 22, 1869.

Revised by S. M. JACKSON.

Almoravides, al-mō-ra-vids [a corruption of the Arabic *Almorabitun*, signifying those bound or devoted to the service of God]: the name of a Moslem or Arabian dynasty that reigned in Northern Africa and Spain. It was founded by Abdallah-Ibn-Yaseen about 1050, and continued until 1145, when it was succeeded by the Almohades.

Almquist, alm'kvist, CARL JONAS LUDVIG: Swedish writer of the Romantic school; b. at Stockholm, Nov. 28, 1793. After an eccentric attempt to establish a community of the old Scandinavian pattern, he devoted himself to literature, producing books of all sorts—poems, plays, school-books, tales, and romances. In 1851 he fled from Sweden to America, under suspicion of an attempt at murder. He afterward returned to Europe and lived some years under a false name (C. Westermann) in Bremen, where he died Sept. 26, 1866. His most important work is *Törnrosens Bok* (Book of the Thorn-Rose, 17 parts in two series, 1832-51), a collection of miscellanies in prose and verse, among which may be mentioned the short stories *Araminta May* and *Skällnora Quarn*; the semi-dramatic sketch *Colombine*; the dramas *Marjam* and *Isidoros of Tadmor*; and the epic *Arturs Jagt*. Of his long romances, *Amalia Hillner* and *Gabriele Mimanso* are perhaps the best. G. L. KITTEDGE.

Almshouses: See PAUPERISM.

Almucan'tar [from the Arabic *al-muqantarāh*, a horizontal circle on the celestial sphere; from *al*, the + *muqantarāh*, a sun-dial; from *qantarāh*, an arch]: a small circle, immediately around the zenith, or a larger one at any altitude, the largest of all being the great circle of the horizon.

The term has also been applied by Mr. S. C. Chandler to an instrument of his invention, for the very accurate measurement of equal altitudes. It consists essentially of a telescope mounted upon a stand which floats in quicksilver. The eyepiece of the telescope is supplied with one or more horizontal spider-lines. If the stand of the telescope be made to turn as it floats, the axis on which it turns will be truly vertical; and the line of sight of the telescope will therefore describe an almucantar. Thus the equal altitudes of two or more heavenly bodies at given moments can be determined with this instrument with, perhaps, greater precision than any other. But its use requires great care and skill on the part of the observer. An elaborate series of observations and investigations with it will be found in one of the volumes of *Annals of the Harvard College Observatory*. S. NEWCOMB.

Almy, JOHN JAY: See the Appendix.

Alnwick, an'nik: a market-town of England; county of Northumberland; on the river Alne; 32 miles N. of Newcastle (see map of England, ref. 3-H). It is well built of stone, and has a town-hall, a theater, a mechanics' institute, etc. There are remains of the old wall which formerly surrounded the town. Pop. about 8,000.

Alnwick Castle: seat of the Duke of Northumberland; N. W. of the town of Alnwick; one of the most magnificent baronial castles in England. It is supposed to be twelve hundred years old or more, and has belonged to the Percy family since the reign of Edward II. In 1830 it was repaired at a cost of £200,000. Malcolm III., King of Scotland, while besieging this castle in 1093, was killed, with his eldest son, by the Earl of Northumberland. William the Lion of Scotland, having laid siege to it in 1174, was defeated and made prisoner.

Al'oë: a genus of endogenous plants of the order *Liliaceæ*, natives of Africa and other warm regions, and chiefly valuable for their medicinal properties. The drug called aloes is obtained from several species, among which the *Aloe socotrina*, found in the island of Socotra, affords the best quality. See ALOES.

Aloe, American: See AGAVE.

Al'oes: a stimulating, purgative drug having a bitter taste, is the inspissated juice or extract obtained from the leaves of several species of the aloe. It is imported from Bombay, Socotra, the Cape of Good Hope, the West Indies, etc. "Cape aloes" is obtained from the *Al'oe spica'ta*; "Socotrine aloes," from the *Al'oe socotri'na*; and "Barbadoes aloes," from the *Al'oe vulga'ris*. Aloes is much used combined with other cathartics; from its stimulating effect upon the lower bowel it is unsuitable for those suffering from piles. Heated with nitric acid, aloes yields chrysamic acid. See Wood and Bache's *Dispensatory*.

Aloes Wood, or **Agila**, or **Eagle Wood**: the inner part of the trunk of the *Aquila'ria ova'ta* and the *Aquila'ria agal'lochum*, trees which are natives of tropical Asia. It is supposed to be the lign-aloes of the Bible. Aloes wood contains a fragrant resinous substance, which emits a pleasant odor when burned, and is highly prized as a medicine by the Orientals.

Al'ogi: a sect of religionists opposed to the Montanists; formed about 160 A. D. They were styled Alogi, a name of double meaning, signifying their rejection of writings in which the Logos is mentioned, and also that they were without reason.

Aloi'adae (i. e. sons of Aloens): in Greek mythology, Otus and Ephialtes, two giants of extraordinary strength who attempted to storm Olympus, and were condemned to suffer in Tartarus.

Alom'pra: the founder of the last dynasty of Burma, which came to an end early in 1886, when Upper Burma became a province of British India. Alompra was born about 1700. He revolted against the King of Pegu in 1753, was victorious in several battles, and became master of Burma, in which he founded Rangoon. D. May 15, 1760.

Alopecia: See BALDNESS.

Alo'ra: a city of Spain; in the province of Málaga; 17 miles N. W. of Málaga (see map of Spain, ref. 20-E). Soap and oil are manufactured here. A winter resort with mineral waters. Pop. 10,014.

Alosa: See SHAD.

A'lost, or **Aalst**: an ancient town of Belgium, in East Flanders, on the navigable river Dender, midway between Ghent and Brussels (see map of Holland and Belgium, ref. 9-D). It contains the church of St.-Martin, one of the largest and finest in Belgium, a town-hall, a college, and an academy of design. Here are cotton-mills, copper-foundries, distilleries, and manufactures of lace, leather, etc. Alost has an active trade, and exports hops, corn, and oil. It was formerly the capital of Austrian or imperial Flanders. Pop. (1896) 28,137.

Aloysius, SAINT, OF GONZAGA: See GONZAGA.

Alpa'ca: the *Auche'nia pa'cos*; supposed by many zoölogists to be only a domesticated variety of the *guanaco*, a

eated or semi-domesticated state on the high Andes of Peru and Bolivia. It is rather smaller than the llama, and is not used as a beast of burden, being valued only for its wool. The latter varies in color, and is remarkable for its length, fineness, silken texture, and a luster almost metallic. It is longer and straighter than that of sheep. The most extensive manufactures of alpaca cloth are in Great Britain, which imports annually about 3,000,000 lb. of this wool. A great part, however, of the so-called alpaca goods of commerce are made of the wool of the Cotswold, Leicester, and other long-wooled breeds of sheep.

Alp-Arslan' (i. e. strong lion), written also **Alp-Arselan**: a famous Persian sultan of the Seljukian dynasty; b. in Turkestan in 1029. He ascended the throne in 1063, embraced Islamism, and became sole monarch of Persia from the river Tigris to the Oxus. Under the direction of his wise vizier, Nizâm-ul-Mulk, who was one of the most noted statesmen in early Mohammedan history, and ably assisted him in consolidating his empire and subduing contending factions, Persia enjoyed great prosperity, many colleges were founded, justice was well administered, and learning was promoted. In 1071 Alp-Arslan defeated and took prisoner Romanus Diogenes, Emperor of Constantinople, whom he treated with great generosity and kindness. Alp-Arslan was assassinated Dec. 15, 1072.

Alpe'na: city; capital of Alpena co., Mich. (for location of county, see map of Michigan, ref. 4-J): at the head of Thunder Bay. It manufactures about 200,000,000 feet of lumber yearly, and large quantities of shingles and lath. Contains large hemlock-extract factory, a sulphite fibre works, and spool factory, has an excellent harbor, and is situated about 210 miles N. by W. from Detroit on Lake Huron. It has a high school costing \$40,000; another school costing \$12,000; 7 miles paved streets, electric lights, water-works, telephone exchange, etc. Pop. in 1880, 6,153; in 1890, 11,283; (1900) 11,802. H. C. HAMILL, PUBLISHER OF "PIONEER."

Alpes, Basses: See BASSES-ALPES.

Alpes, Hautes: See HAUTES-ALPES.

Alpes-Maritimes, alp-ma-rêe-teem' [i. e. the Maritime Alps]: a department forming the S. E. extremity of France, bordering on Italy. It is bounded N. and E. by Italy, S. by the Mediterranean, W. by Var and Basses-Alpes. Area, 1,482 sq. miles. It is drained by the river Var. The surface is diversified by mountains and fertile valleys. The mild climate along the coast makes it a favorite winter resort for invalids. This department includes the county of Nice, which was ceded by Italy to France in 1860; also the arrondissement of Grasse, detached from the department of Var. It is partly covered with forests of valuable timber. Among its staple products are grapes, olives, oranges, lemons, figs, silk, and flowers for perfumes. The chief towns are Grasse, Antibes, Cannes, and Nice, which is the capital. It is divided into three arrondissements. Pop. (1881) 226,621; (1891) 258,571; (1896) 265,155.

Al'pha and O'mega: the names of the first and last letters of the Greek alphabet, Α. Ω. These words occur in the book of Revelation as a title of the Lord Jesus Christ. The two letters were used by the early Christians as symbols of faith, and were sometimes marked on coins, tombs, ornaments, etc.

Alphabet: this term, formed from the names of the first two Greek letters, *alpha*, *beta*, after the manner of our *a-bee-see'*, and originally applicable to the series of letters by which the Greek language is written, has been extended in application to any such complete set of symbols for the sounds of a language. The modern European alphabets are all ultimately derived from the Greek. The Russian and those of other Slavic countries where the Greek Orthodox Church is dominant are modifications of the Cyrillic alphabet, which is based upon the Greek writing of the ninth century A. D. Our own alphabet is essentially the Roman form of the Greek. The letter J is a late differentiation of I, and W represents the attempt, in the earlier use of the Latin alphabet among Germanic peoples, to indicate the Germanic consonantal *u* (= *w*) by doubling the Roman symbol V, which had assumed, since the third century A. D., the value of a spirant. The symbol &, often appended to our alphabet, is, as well as + (*plus*), a conventionalized degradation of Latin *et* (ε), "and."

The form of the Greek alphabet from which the Roman is derived is that form of the Eubœan which was introduced into Italy by the colonists from Chalcis. The alpha-



Alpaca.

ruminant animal nearly allied to the llama, and belonging to the family *Camelidæ*; occurs in large flocks in a domesti-

bet which we commonly know as Greek is essentially the Ionic. It had its home in the Ionic cities of the Asiatic coast, and from there gradually spread over all Greece, becoming the standard at Athens in 403 B. C., and in Greece generally during the following century. It differed from the Chalcidian in the following points (see table): 1. *Gamma* (3) was angular, not rounded. 2. *So delta*, which was rounded in the Roman source. 3. *Eta* (8) had assumed the value

Order.	Hebrew name.	Moab.	Chalcid.	Ionic.
1.	Aleph	Ⲁ	A	A
2.	Bêth	ⲁ	B	B
3.	Gimel	Ⲃ	C	Γ
4.	Daleth	ⲃ	Δ D	Δ
5.	Hê	Ⲅ	E	E
6.	Vâu	ⲅ	Ⲇ	<i>lacking</i>
7.	Zayin	Ⲇ	I	I
8.	Cheth	ⲇ	Ⲉ H	H (e)
9.	Teth	Ⲉ	ⲉ	⊗
10.	Yôd	ⲉ	I	I
11.	Kaph	Ⲋ	K	K
12.	Lamed	ⲋ	L	Λ
13.	Mêm	Ⲍ	M	M
14.	Nûn	ⲍ	N	N
15.	Samekh	Ⲏ	(ⲏ)	Ξ
16.	Ayin	ⲏ	O	O
17.	Pê	Ⲑ	ⲑ	ⲑ
18.	Tsâdê	ⲑ	(Ⲓ)	(ⲓ)
19.	Q'ôph	Ⲓ	ⲓ	<i>lacking</i>
20.	Rêsh	ⲓ	P R	P
21.	Shin	Ⲕ	ⲕ S	Ξ
22.	Tau	ⲕ	T	T
Non-Phœnician.				Y
				X
				ϕ
				ψ
				Ω

of open *e* in Ionic, where in the dialect the sound *h* was lacking, but Chalcidian, and consequently the Roman, re-

tained it in its older value. 4. *F* was not in use. 5. *Lambda* had its angle at the top. 6. *Koppa* (19) was lost, though preserved in Chalcidian (cf. our Q). 7. *Rho* lacked its queue. 8. *Sigma* was angular, and generally composed of four lines. 9. The letter *X* had the value *ch*, not *ks*, as in Chalcidian. 10. A special symbol for open *o* had been developed (*omega*).

In Roman usage the alphabet suffered the following modifications: (1) C, the Greek *gamma*, was commonly used for both sounds *k* and *g* until by the addition of a diacritical mark G was invented, and put in place of the disused *zeta* (ζ). (2) K was little used. (3) F assumed the value *f* instead of *v*. (4) In the Augustan age *upsilon* (pronounced *ū*) and *zeta* were introduced from the Greek alphabet, primarily to assist in writing Greek words, and were placed at the end of the alphabet. Hence our *y* and *z*. (5) The three aspirates ⊕ ⊙ ⊕ disappear except as numerals; thus ⊕ "1000" survives as CIO, which through influence of *milite* becomes M, and D as one-half of it denotes "500."

All the Greek alphabets are based upon the Phœnician alphabet of twenty-two letters, to which a twenty-third (Y) was directly added. From this series of twenty-three letters all the various systems may be derived. The form of the parent alphabet may be regarded as almost identical with the writing of the Moabite stone (c. 890 B. C.), which is reproduced in the table above. See GREEK LANGUAGE.

The adoption of the Phœnician alphabet by the Greeks occasioned the following changes: (1) As the Phœnician alphabet lacked vowel signs, Nos. 1, 5, 10, and 16, which were otherwise useless, were given the values of *a*, *e*, *i*, *o*, and a variety of No. 6 supplied a symbol for *u*. (2) The four sibilants, Nos. 7, 15, 18, 21, were reduced to two, *zeta* and either *san* (M) or *sigma* (ς). (3) All the alphabets except those of Thera, Melos, and Crete add the symbols ϕ (*ph*) and χ (in some *kh*, in others *ks*).

The order of the letters, as may be inferred from various indications, notably the acrostic Psalms (119, 145), etc., the ancient "*abecedaria*" or written lists of letters, as that of Formello (see Kirchoff, *Studien zur griech. Alphab.* 4 134), and the use of the letters as numerals, is old, and is most rigidly preserved. The original grounds for this arrangement are not entirely clear; it was partly due to likeness of sounds, thus the three sonants *b*, *g*, *d*, and the liquids *t*, *m*, *n*, and partly, doubtless, to the names of the letters; thus Nos. 16, 17, 19, 20 refer to the head or its parts, *ayin*, "eye"; *Pê*, "mouth"; *Q'ôph*, "back of head"; *Rêsh*, "head."

The Greek names of the letters are meaningless echoes of their Semitic originals, which were themselves, however, suggestive of some resemblance in the shape of the letters. Thus *alpha* from *aleph*, "ox" (cf. our *elephant*), because of the resemblance of the letter (ϑ) to the head of an ox; so *gamma* = *gimet*, "camel" (English *camel* is of Semitic origin), probably from the suggestion of a camel's hump (Δ). Kirchoff, *Studien zur Geschichte des griech. Alphabets* (4th edit., 1887); Taylor, *The Alphabet* (2 vols., 1883); Hinrichs, *Mütter's Handbuch d. Alterthumsw.*, i. 331 ff.; Roberts, *Introduction to Greek Epigraphy* (1887); Schlottman, *Riehm's Bibelwörterb.*, ii. 1416 ff. s. v. *Schrift*. See also WRITING.

BENJAMIN IDE WHEELER.

Alphand, al-foñ, JEAN CHARLES ADOLPHE: civil engineer; director of the improvements of Paris, the Expositions of 1867, 1878, and 1889; b. at Grenoble, Oct. 26, 1817; entered the Polytechnic School in 1835 and the School of Ponts et Chaussées in 1837. Graduating in 1843 with the appointment of engineer, he was posted at Bordeaux, where in addition to his duties as engineer he was a member of the municipal council, and of the general council of the canton. In 1854 Baron Haussmann, prefect of the Seine, who had known Alphand when he himself was prefect of Bordeaux, called him to Paris, appointing him chief engineer of the improvements of the city. In 1871 President Thiers appointed him Director of Works of Paris, which included the supervision of all architectural matters. In 1878 he became Director of Water-supply and Drainage, thereupon centralizing in his own person all the technical services of Paris. In the Exposition of 1867 he was in charge of the works of the Champ de Mars, a member of the executive committee of the Exposition of 1878, and director of the works of that of 1889. He was appointed chief engineer of Ponts et Chaussées in 1857, and inspector-general of the first class in 1875. During the war of 1870-71 he was colonel of a corps of engineers, in charge of the continuous line of defense surrounding the city. Chevalier of the Legion of Honor since 1852, and officer since 1862, the

insignia of grand officer were sent to him at the new Hôtel de Ville by the President of the republic on the 13th of July, 1882. Modern Paris is said to owe its existence to Baron Haussmann, but it was Alphand who organized the means by which they were carried out. When the official life of the great prefect terminated with the fall of the empire the work begun by him was continued, and Alphand, having held aloof from politics, maintained his position, and became himself its controlling spirit, not only in the design and execution of the works, but in providing means for carrying them on. He died in harness of an attack of paralysis on the 6th of Dec., 1891, in the seventy-fifth year of his age.

WILLIAM R. HUTTON.

Alphe'us, or **Alphei'us**: the modern Roupbia, a celebrated river of Greece, in the Morea. It rises in the S. E. part of Arcadia, on the frontier of Laconia, flows westward through Arcadia and Elis by Olympia, and empties into the Ionian Sea after a course of about 100 miles. The Alpheus, like some other rivers in Arcadia, disappears more than once in the cavernous limestone mountains, and appears again after flowing some distance underground. In the commencement of its course it is now called the *Saranda*. Below Pegæ, the Alpheus receives the Helisson, and below Heræa the Ladon, after which it is called the Roupbia. In the upper part of its course the Alpheus is generally called the *River of Karitena*. Below the Ladon the Alpheus receives the Erymanthus. A temple and grove of Artemis Alpheionia were at the mouth of the Alpheus, which river is wide and shallow from the Pass of Lavdha to the sea.

Alpheus: in classic mythology, a river-god and a son of Oceanus. According to the poetical legend, he loved the nymph Arethusa, who fled from him to the island of Ortygia, and was transformed into a fountain. Alpheus pursued her under the sea and was united to the fountain.

Alphonso: See ALFONSO.

Alpine Club: a society for the promotion of Alpine discovery; formed in Great Britain in 1858. Three members of this club, Mr. Hudson, Lord Francis Douglas, and Mr. Hadow, perished with their guide in the descent of the Matterhorn in July, 1865. Other Alpine clubs were formed in Austria, Switzerland, Italy, and Germany. In 1873 an Alpine Club was formed in the U. S.

Alpine Plants: those plants which grow at considerable elevations (a mile or so) upon mountains. Primarily, the term was applied to the plants on the Alps, but, inasmuch as the vegetation of all high mountains resembles that of the Alps, the term has come to have a broader significance. It has been observed, also, that as we go N. (in the northern hemisphere) and S. (in the southern hemisphere) the vegetation is Alpine in character at lower and lower levels, so that finally it occurs upon the surface but little above sea-level. The botanist finds many plants in Labrador and other far northerly parts of Canada which occur on the mountains of the U. S. A notable example of this is the *Diapensia lapponica*, which is abundant in Labrador, occurring also on the White Mountains of New England.

Among the more remarkable Alpine plants is the EDELWEISS (*q. v.*) of the higher regions of the Alps. Little less interesting are the gentians, of which many species occur in the Alps (*Gentiana nivalis*, *G. brachyphylla*, *G. bavarica*, *G. excisa*, *G. acaulis*) and in the Rocky Mountains (*G. barbellata*, *G. prostrata*, *G. frigida*, *G. parryi*), while some are common to both regions (*G. amarella*, *G. tenella*). The low catchfly (*Silene acaulis*) occurs on the Alps and the Rocky Mountains, and the same is true of species of forget-me-not (*Myosotis alpestris*), saxifrage (*Saxifraga oppositifolia*, *S. aizoides*), knot-grass (*Polygonum bistorta*), etc.

The woody plants growing at high altitudes are greatly reduced in size—e. g. the Alpine species of willows (*Salix ovata*, *S. retusa*, *S. reticulata*, etc.), which trail upon the ground, and bear small or even minute leaves. At great elevations trees of various kinds are sometimes reduced to mere shrubs. The flowers of Alpine plants are remarkable for the brightness of their colors.

CHARLES E. BESSEY.

Alpi'nus, or **Alpini**, PROSPER, M. D.: a celebrated Italian botanist; b. at Marostica, in the Venetian state, Nov. 23, 1553. Having passed several years in Egypt, he published in Latin a work on *The Plants of Egypt* (1591), and obtained a chair of botany at Padua in 1593. He made important contributions to the science of botany. Among his works is one on *Exotic Plants*. D. at Padua, Feb. 5, 1617.

Alps [Lat. *Alpes*, Fr. *Alpes*, Ger. *Alpen*, etymology uncertain]: the most remarkable system of mountains in Europe as regards both extent and elevation. They may be said to extend from the Mediterranean between Marseilles and Nice irregularly eastward to near 18° E. lon. and 45° 30' N. lat. They form a crescent-shaped chain, and stretching across the country cover a part of France, the greater part of Switzerland, and a considerable portion of Northern Italy and Austria. They culminate in Mont Blanc, and form the watershed or dividing line between the rivers that flow into the Mediterranean and those which discharge their waters into the German Ocean and Black Sea. Several important rivers of Europe take their rise in Alpine valleys: the largest are the Rhine and the Rhône. This system of mountains is included between the parallels of 44° and 48° N. lat. and 6° 40' and 18° E. lon., and covers an area of about 95,700 sq. miles. It is estimated that the Alps, with their various windings, have an extent from W. to E. of about 700 miles, and a breadth varying from 50 to 200 miles. The bases of the northern and the southern sides are encircled by an extensive series of lakes, those on the former side being from 1,200 to 1,500 and those on the latter from 600 to 700 feet above the level of the sea, while in the interior some are found at an elevation of 6,000 feet. The average height of the central chain is 10,000 feet, being in the region of perpetual snow, while several hundred peaks rise above it to 12,000 and 15,000 feet. From these snowy heights descend the destructive avalanches. In the numerous valleys of these lofty regions are collected the immense quantities of snow which form the long streams of ice called glaciers. (See GLACIERS.) The Alps are generally divided into three parts which are distinguished as the East, the West, and the Middle Alps: I. WEST ALPS.—The principal ranges included within these are: 1. The Maritime Alps, commencing not far from Genoa, extend westerly along the coast of the Mediterranean to near Barcelonette in France, and attain in their highest part an elevation of nearly 10,000 feet. 2. The Cottian Alps, culminating in Monte Viso, 12,600 feet high. 3. The Graian Alps, forming the boundary between Savoy and Piedmont, and rising in Mont Iseran to an elevation of 13,272 feet, and in Mont Cenis to 11,785 feet. II. MIDDLE ALPS. *Central Chain*.—1. The Pennine Alps between the plains of Lombardy and the valley of the Rhône. Their most lofty peaks are: Mont Blanc, 15,781 feet high, and Monte Rosa, 15,217 feet high. 2. The Helvetian Alps, extending from the Pass of the Simplon along St. Gothard (10,000 feet) to the Pass of Splügen. 3. The Rætian Alps, between the Inn, the Adda, and the Upper Adige. *Northern Chain*.—1. Bernese Alps, between the Rhône and the Aar. The highest summits are Finsteraarhorn, 14,026 feet; Jungfran, 13,672 feet; and Schreckhorn, 13,393 feet high. *Southern Chain*.—1. Oertler Alps, between the Adda and the Adige, the highest peak being Oertlerspitze, 12,823 feet high. 2. The Tridentine Alps, between the Adige and the Piave. III. EAST ALPS.—The principal chains of these are: 1. The Noric Alps, highest summit Gross-Glockner, 12,957 feet high. 2. The Carnic Alps. 3. The Julian Alps. 4. The Dinaric Alps. Generally speaking, the Alps are lowest where the system is broadest, and highest where the system is narrowest.

The passes over the Alps are called in French, *cols*. They are about sixteen in number, and now most of them can safely be traveled over by carriages. One of the most noteworthy is the Great St. Bernard, connecting the valley of the Rhône with Piedmont. It was crossed by Napoleon in 1800. Its highest summit is about 8,170 feet. The Little St. Bernard connects Geneva, Savoy, and Piedmont. This is the pass by which some suppose Hannibal to have crossed into Italy. Its highest point is about 7,190 feet above the level of the sea, and is now but little used. The Splügen Pass, connecting the sources of the Rhine with the Adda, was used by the Romans in their intercourse with the countries bordering on the Danube and the Rhine, by the Germans in the Middle Ages, as well as by modern tourists. In some places bridges, terraces, and long galleries are constructed of stone to afford protection against the avalanche and whirlwinds. The latter are not only destructive in themselves, but frequently set the former in motion. The Alps, with the exception of Switzerland, are rich in minerals, and offer one of the finest fields in the world for the geologist. It has been shown that the highest central mass, the primary Alps, consists chiefly of the crystalline rocks, gneiss and mica-slate, with a small proportion of granite. Representatives of the carboniferous and Jurassic formation appear among the Central Alps. In the Pennine, Graian,

and Rhaetian Alps are found large masses of serpentine. Quartz-porphry is found in the N. of Piedmont and in the upper valley of the Adige; and in the E. of Piedmont on the N. and S. sides of the chief range extensive deposits of clay-slate and grauwacke, mixed with transition limestone, occur. Precious stones are found in considerable numbers. Among these is the well-known rock crystal of St. Gothard. Most of the mining and smelting is done in the eastern part of the Alps; gold and silver are found in Tyrol, Salzburg, and Carinthia; copper exists in the French Alps, in Tyrol, and in Styria. The amount of iron and lead extracted from the mines of Carinthia and Styria is about 745,000 cwt. per annum. Large quantities of quicksilver are extracted from the mines in Carniola. Salt exists in almost every part. Coal is found in abundance in Switzerland and Savoy, and hot springs are numerous. Many animals inhabit the Alps. Among them are the chamois, the ibex, marmots, wolves, bears, lynxes, wild cats, and various species of birds. Of the domestic animals goats and oxen abound, but horses, sheep, dogs, etc., are found in small numbers. Fish are found in some of the lakes at an elevation of 6,000 feet. The inhabitants of the Alps are industrious and simple hearted, but the spirit and manners of the neighboring plains have penetrated the larger valleys; the true Alpine life has passed away, and the simplicity and characteristic industry of the Alpine farms are now preserved only in the higher valleys.

A. GUYOT.

Alpujarras, al-pōo-char'as: a mountain region or range of Spain; in Granada between the Sierra Nevada and the Mediterranean. The direction of the range is nearly parallel to the seacoast. The highest peaks rise to the altitude of about 7,000 feet. Rich pastures abound on the slopes and in the valleys of the northern side of the range.

Alrau'neu, or **Alru'næ**: a name given by the ancient Germans to certain prophetic women who were employed in sacrificing victims, and were supposed to have magical or supernatural skill. Also applied to small images carved out of mandrake roots, and exhibiting a rude imitation of the human form. These were venerated or superstitiously prized by the Germans and other northern nations.

Alsace, al-saās' [Ger. *Elsass*, i. e. the country of the "Sassen" (settlers) on the Ill; Lat. *Alsatia*]: a part of the German empire, but for centuries a bone of contention between France and Germany, the French always trying to push their eastern frontier to the Rhine as the natural boundary line, and the Germans to prevent them: bounded E. by the Rhine, S. by Switzerland, and W. by the Vosges Mountains, which separate it from France. Area, 3,236 sq. miles. It was ceded to France by the Emperor of Austria in 1648, and became a province of that country. After the division of France into departments, about 1790, it formed the departments of Haut Rhin and Bas Rhin (upper and lower Rhine), which in 1866 contained a population of 1,119,255. Chief towns, Strassburg, Colmar, and Mülhausen. After the German armies had defeated and captured Napoleon III. in 1870, Bismarck and his king insisted on the annexation of Alsace to Germany as one of the conditions of peace. The French therefore continued to fight for it, but at last they were compelled to cede it (with the exception of the fortress Belfort and its *rayon*) by the treaty of May 10, 1871. Pop. (1890) 1,093,114. Revised by C. K. ADAMS.

-Alsace-Lorraine, al-saās' lor-rān' (Ger. *Elsass-Lothringen*): a new division of Germany formed of those portions of Alsace and Lorraine which in 1871 were ceded by France to Germany. It has not been annexed to any particular German state, but it is a Reichsland (imperial land), immediately subject to the emperor. Area, 5,668 sq. miles. It is divided into three districts (Bezirke)—Ober-Elsass, Unter-Elsass, and Lothringen. The first corresponds to the former French department of Haut Rhin, the second to the former French department of Bas Rhin, while the third contains all the territory which has been ceded of the French departments of Moselle, Meurthe, and Vosges. The districts have been subdivided into circles (Kreise), which in extent do not correspond with the former French arrondissements. Ober-Elsass contains six, Unter-Elsass eight, and Lothringen eight circles. Pop. (1890) 1,603,506.

It is estimated that of the population 1,393,000 are of German origin and 210,000 of French origin. Of the latter, 180,000 belong to Lothringen, and 15,000 to Ober-Elsass and Unter-Elsass each. Over 77 per cent. of the population profess the Roman Catholic religion, which in Elsass-Lothringen is more predominant than in any other German

state; Bavaria, the next in order, numbering less than 71 per cent. of Catholics. The legislative functions are exercised by the German Reichstag, in which Elsass-Lothringen is represented by fifteen members. At the head of the administration is the Statthalter, Prince Hohenlohe-Schillingsfürst, appointed by the emperor. The revenue and expenditure for the year ending March 31, 1892, were each estimated at 49,990,732 marks. The public debt is equivalent to 25,799,400 marks. At the time when the country was ceded to Germany 770 km. (1 km. = 0.62 English miles) of railroads were in operation, which, with a few exceptions, belonged to the Société des Chemins de Fer de l'Est, from which the German empire bought them for 325,000,000 francs. In 1891 there were 824 miles of railway, of which all but eleven belonged to the state. The navigable rivers are the Rhine, Ill, Moder, Saar, and Moselle. The soil is fertile and rich in mines of iron, copper, and coal. The chief productions of the soil are grain, wine, beet-root, tobacco, madder, and linseed. Mülhausen (Mulhouse) is the seat of important manufactures of cotton prints, muslins, flowered silk stuffs, linen damasks, etc. Capital, Strassburg. Revised by C. K. ADAMS.

Alsa'tia: a name formerly given to Whitefriars, London, which was used as a sanctuary by criminals in the early part of the seventeenth century. This privilege, owing to disgraceful abuses of it, was abolished by an act passed in 1697. See WHITEFRIARS.

Al Se'gno (Ital. to the sign): in music, a notice to a performer that he must return and commence again that part of the movement to which the sign :S: is prefixed.

Al'sen: an island belonging to the Prussian province of Schleswig-Holstein, in the Baltic, near the coast of Schleswig; 18 miles long, and has an area of 124 sq. miles (see map of German Empire, 1-E). It is remarkable for its picturesque and beautiful scenery, is very fertile, and produces excellent apples. Christian II. of Denmark, who was deposed in 1523, was imprisoned here for nearly seventeen years. Pop. 24,000.

Al Sirat' (literally the road or passage): a bridge as narrow as the edge of a razor, supposed by the Mohammedans to extend from this world over hell to paradise.

Alsop, RICHARD: poet and scholar; b. at Middletown, Conn., Jan. 23, 1761; was versed in Greek, Latin, French, and other languages. In conjunction with Theodore Dwight and others, he edited the *Echo*, a satirical publication, the first number of which was issued at Hartford in 1791. He published a *Monody on the Death of Washington* (1800), and translated from the Spanish Molina's *Natural and Civil History of Chili*. D. at Flatbush, L. I., N. Y., Aug. 20, 1815.

Alstrœme'ria: a genus of plants of the family *Amaryllidaceæ*, natives of Peru and Chili. Several species of this genus have beautiful flowers, and are cultivated in gardens. The tubers of the *Alstrœmeria salsilla* are cultivated for food in the West Indies.

Al'strömer, or **Alstrœmer**, KLAUDIUS or KLAS: Swedish naturalist; b. at Alingsås, Aug. 9, 1736. He was a pupil of Linnaeus, who named in his honor a genus of plants, *Alstrœmeria*. He traveled in Spain and other countries, and published a *Discourse on the Breeding of Fine-wooled Sheep* (1770). D. Mar. 5, 1796.

Altai, aāl-tī': a group of mountains in Central Asia; between Jungaria (Northwest Mongolia) and West Siberia, extending from the T'ien Shan to the Yenisei river, consisting of a series of parallel ranges running nearly E. and W. The principal individual ranges, beginning at the S., are the Alatan, the Tarhagatai, the little Altai, and the Altai proper, the latter continued eastward into Mongolia under the name of the Tannu-ola Mountains. The great Siberian rivers, the Obi, Irtish, and Yenisei, rise on the northern side of these mountains, and, although not very lofty, they are said to be very picturesque. They are rich in mineral products, especially gold, silver, copper, and iron. The area covered by perpetual snow is considerable, and there are many glaciers, which, however, rarely extend beyond the snow-line. M. W. H.

Altamaha': a river of Georgia, formed by the union of the Oconee and Ocmulgee in the central part of the State. Flowing southeastward through sandy plains, it enters the Atlantic 12 miles below Darien, after a course of about 140 miles. It is navigable for vessels of 30 tons.

Altamont: Effingham co., Ill. (for location of county, see map of Illinois, ref. 8-F); at foot of the Mound (old Government signal station); the highest point between Terre Haute and St. Louis; 88 miles from either place; at the crossing of O. and M. and Van lines, and terminus of Wabash and C. and N. O. R. Rs.; was laid out in 1870; is a grain and fruit shipping point; has 5 schools, 7 churches, 10 different factories, 2 flouring-mills, 2 elevators, 4 hotels, creamery, etc. Pop. (1880) 650; (1890) 1,044; (1900) 1,335.

EDITOR OF "NEWS."

Altamu'ra: a handsome cathedral town of Southern Italy; province of Bari; at the foot of the Apennines; 33 miles S. W. of Bari (see map of Italy, ref. 7-G). It is defended by a castle, and has a fine cathedral. It was formerly the seat of a university. Here is the site of the ancient *Lupatia*. Pop. 20,841.

Alt'ar: an elevated place or table on which sacrifice is offered. The first altar mentioned in history was built by Noah immediately after the Flood. Altars were sometimes erected as memorials of some great event by the religious personages of sacred history. The ancient Greeks and Romans used a great number of altars, each of which was dedicated to some particular deity. They were constructed of different materials and in various forms. In the Christian Church the term "altar" is applied to the table-like construction, whether of wood, stone, or marble, upon which the Eucharist is offered. There are wooden altars existing in the churches of St. John Lateran, "the mother of churches," and St. Praxedes at Rome. Pope St. Sixtus II. is said to have erected the first stone altar, A. D. 257. St. Wolstan is believed to have introduced stone altars into England, where before, as in the Eastern Church, they were generally of wood. Of old, as in the Greek Church now, there was but one altar in a church; the addition of others being comparatively of late introduction. In the first Prayer-Book of King Edward VI. the altar was called "God's board." The words "holy table" appear in the place of "altar" in the Prayer-Books of the English and American churches. In fact, in these Prayer-Books the word "altar" is not found at all. It occurs, indeed, in the American "Office of Institution of Ministers into Parishes or Churches," where it includes the whole sanctuary. The Lutheran Church retains the altar. An altar was a sanctuary both among the Jews and the heathen for those who fled to it for refuge.

Revised by W. S. PERRY.

Altaz'imuth: the name given by Prof. Airy, late astronomer-royal of England, to an instrument formerly known as the "altitude and azimuth instrument." Its purpose is to determine both the altitude and the azimuth (*q. v.*) of a heavenly body, and therefore the exact position of the body relative to the horizon, and to a N. and S. line, at any required moment. It consists essentially of a telescope turning upon a horizontal axis, like a meridian circle, having attached to it a vertical, graduated circle. But the base of the instrument, instead of being fixed, turns upon a vertical axis. There is also a horizontal circle, by which the azimuth of the instrument, as it turns on this vertical axis, can be determined. Both circles being read, the horizontal circle shows the azimuth of the body on which the telescope is pointed, and the vertical circle shows its altitude, or zenith distance. It was constructed by Sir George Airy for the purpose of observing the position of the moon when it could not be seen on the meridian. The instrument is not, however, of extensive use in astronomy, since the work of both making and reducing the observations is extremely laborious, and the results not so accurate as those made with an instrument fixed in the meridian.

S. NEWCOMB.

Alt'dorf (i. e. old village), or **Alt'torf:** a town of Bavaria; on the river Schwarzbach; 13 miles E. S. E. of Nuremberg; had a university from 1623 to 1809 (see map of German Empire, ref. 6-E). Pop. 3,106.

Altdorf (Switzerland): See ALTORF.

Alt'dorfer, ALBRECHT: German painter and engraver; a pupil of Albert Dürer; b. at Altdorf, in Bavaria, in 1480. A painting of the victory of Alexander over Darius, now in the Pinakothek at Munich, is called his masterpiece. He left many engravings on copper and on wood. Died at Regensburg, 1538.

Alt'enburg, SAXE, GERMAN DUCHY OF: See SAXE-ALTENBURG.

Altenburg (i. e. old castle): a city of Germany; capital of Saxe-Altenburg; 24 miles by rail S. S. E. of Leip-

zig (see map of German Empire, ref. 5-F). It is the seat of the higher courts, and contains seven churches, one theater, and several hospitals. Linen goods, brandy, porcelain, and optical instruments are made here. Pop. (1880) 26,241; (1890) 31,439.

Altenes'sen (i. e. old Essen): a suburb of Essen, Rhenish Prussia, 2 miles distant (see map of German Empire, ref. 4-C). It has large iron-works, with coal mines near by. Pop. 17,350.

Altengaard: a seaport-town of Norway; capital of the province of Finmark; on the Alten, at the head of a fiord; 53 miles S. of Hammerfest (see map of Norway and Sweden, ref. 2-II).

Alten Oet'ting (i. e. old Oetting), or **Alt'ötting:** a small town of Bavaria; near the river Inn; 42 miles S. W. of Passau (see map of German Empire, ref. 7-G). It is visited by great numbers of Roman Catholic pilgrims, who are attracted thither by an image of the Virgin Mary, called the "Black Virgin." Several German emperors held their court here in the Middle Ages. Pop. 3,202.

Alt'enstein: a castle in Saxe-Meiningen, Germany, near the watering-place Liebenstein (see map of German Empire, ref. 5-E). Near this castle is the beech-tree where Luther was captured and taken to the Wartburg on May 4, 1521.

Altenstein, KARL, Baron von: a Prussian minister of state; b. at Anspach, Oct. 7, 1770. In 1815 he rendered important services to Germany by the recovery of works of art and literature which the French had removed to Paris. He was appointed Minister of Public Instruction and Worship in 1817, and held that office till Dec., 1838. D. in Berlin, May 14, 1840.

Al'teratives [from the Lat. *altera're*, change]: drugs which so act upon the system as to induce healthy action. The same drugs in large doses may act as decided irritants or poisons, as mercury, iodine, and arsenic.

Al'ter E'go (i. e. my other self): a term used in the former kingdom of Naples to signify the king's deputy, who was authorized to perform the functions of royalty during the compulsory absence of the king.

Alternate Currents (in electricity): When the electro-motive force in any electric circuit undergoes periodic changes of direction and intensity, the current generated by this fluctuating electro-motive force is an "alternate current." The simplest and most important case is that of the current generated by the uniform revolution of a ring or coil in a uniform magnetic field. Here the fluctuations of electro-motive force are given by the equation,

$$e = E \sin \frac{2\pi t}{T},$$

where e is the electro-motive force at any time t ; E is a constant depending upon the size of the coil, the strength of the field, and the rate of revolution; while T is the time of one complete revolution of the coil. These are the conditions existing, with a more or less close approximation, in every properly constructed alternating current dynamo. Under these conditions the electro-motive force follows the law of sines, disappearing every half-revolution of the coil, and reaching maximum values, opposite as to direction, at instants midway between the times of disappearance. The character of the fluctuation is shown graphically in Fig. 1.

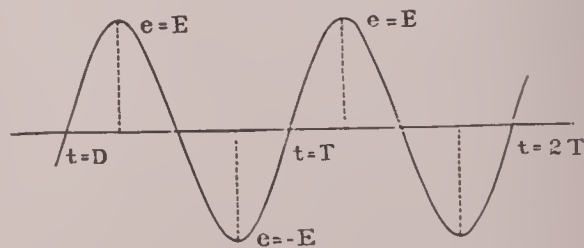


FIG. 1.—Curve of sines, showing the usual law of fluctuation in an alternate current circuit.

Now, in any circuit (see ELECTRICITY) the current and electro-motive force tend to rise and fall together, and where there is an alternating electro-motive force the current will undergo the same number of reversals per second, although not always following precisely the same law of change as does the electro-motive force. Owing, moreover, to the presence of induced currents in the circuit, which always impede the rise and retard the fall of current strength, the

curve of current fluctuation (except in certain cases where inductance is absent) will lag behind the curve of electro-motive force, as to time.

Fig. 2 shows curves of electro-motive force and current

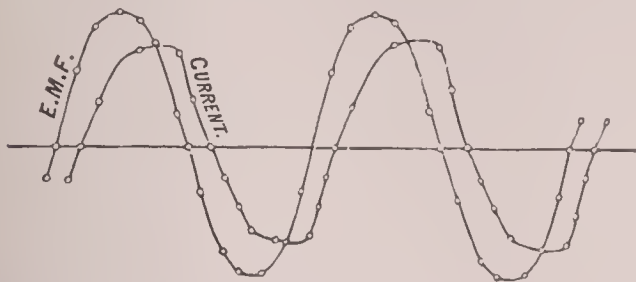


FIG. 2.—Curves of alternating E. M. F. and current, from measurements by Messrs. Humphrey and Powell.

from actual measurements, by Messrs. Humphrey and Powell. See *Trans. Am. Inst. of Elec. Engineers*, vol. vi.

The curve of current in this illustration lags through a very considerable angle, and it differs in a striking manner from the curve of electro-motive force.

The great importance which alternating currents have attained is due to their remarkable inductive action. In every piece of metal near an alternating current circuit, alternating currents of similar type are induced. By means of modifications of the ordinary induction coil (see TRANSFORMER), actuated by alternate currents, it has been found possible to transfer electrical energy from one closed circuit to another without serious loss. The electro-motive force can at the same time be raised or lowered through almost infinite range, a matter of the utmost importance in the application of electricity. By raising the electro-motive force, for instance, to 20,000 volts, or even to 30,000 volts, it becomes possible to transfer hundreds of horse-power hundreds of miles, over conductors no larger than an ordinary telegraph wire. By reducing the electro-motive force, on the other hand, to small values, enormous currents are obtained and such processes as welding and smelting by electricity become practicable. See ELECTRIC WELDING. See also DYNAMO ELECTRIC MACHINE and ELECTRO-MAGNETIC INDUCTION, under INDUCTION. For a complete analysis of alternate-current phenomena, see Fleming, *Alternate Current Transformers* (2 vols., Lond.). E. L. NICHOLS.

Alternator (in applied electricity): a machine for the generation of alternate currents. See DYNAMO.

Alternation of Generations: a term used in biology to designate the course of development peculiar to certain groups of animals and plants, in which at least two generations of individuals are necessary to complete the life of the species, one reproducing sexually, the other asexually. In such a case one animal produces an egg—the sexual product. This develops into an individual unlike the parent, incapable of producing eggs, and reproducing only by division or budding—the asexual method. The progeny thus formed develop again into the sexual generation, which produces eggs. These alternating generations frequently differ from each other greatly in appearance and structure, and have often been classed in different groups before their relation to each other has been recognized. Sometimes the sexual, sometimes the asexual, generation is the longer-lived and more conspicuous.

Among the hydroids the egg develops into a polyp—a cup-shaped animal attached by the closed end. A much-repeated process of budding now occurs, the individuals thus produced cohering to form a finely branched colony, moss-like or tree-like in appearance, and frequently mistaken for a seaweed. Most of the polyps thus asexually formed remain sterile, but certain ones detach themselves, develop into small, free-swimming medusæ which greatly resemble the larger jellyfishes, finally form and distribute the eggs, and thus complete the cycle. DAVID S. JORDAN.

Alternation of Generations (in plants): In the moss-worts (*Bryophytes*) the thallus, or leafy plant, bears sexual organs; after fertilization of the egg-cell, a new plant-body is produced, in which are eventually developed the spores; from the latter may be produced the thallus, or leafy plant, again, and so on. We have here two generations which alternate with one another, viz. (1) the sexual generation (*gametophyte*), and (2) the asexual generation (*sporophyte*). In the fern-worts (*Pteridophytes*), the thallus (prothallium) bears sexual organs; after fertilization of the egg-cell a new plant-

body is produced, consisting of root, stem, and leaves, the latter eventually producing spores. The two generations are here very sharply defined: (1) the prothallium (sexual generation, or gametophyte), and (2) the leafy plant (asexual generation, or sporophyte). In flowering plants (*Anthophytes*) the gametophytes are much reduced, and are developed within the ovule and stamen of the sporophyte. In *Gymnosperms* an actual prothallium develops, and this in turn produces sexual cells. In *Angiosperms* the prothallium is more reduced, being represented by the endosperm in the ovule and the vegetative nucleus in the pollen cell. The leafy plant in *Anthophytes* is the sporophyte or asexual generation, while the gametophyte is almost suppressed.

CHARLES E. BESSEY.

Althæ'a [from Gr. *ἀλθαία*, marshmallow]: a genus of plants of the family *Malvaceæ*, natives of Europe and naturalized in the U. S. It includes the hollyhock (*Althæ'a rosea*) and marshmallow (*Althæ'a officinalis*), which is used in medicine as a demulcent or emollient. *Althæa*, or shrubby *althæa*, is also a common name of the *Hibiscus syriacus*.

Althen, EHAN or JEAN: a Persian who gained distinction by introducing Turkey madder into France; b. in 1711; taken captive by the Arabs in his youth, and sold as a slave in Smyrna, whence he escaped to France with seeds of madder, 1761. He made successful experiments in the cultivation of that plant, which was afterward extensively cultivated and became very profitable. D. in 1774.

Althorp, LORD: See SPENCER.

Altin' Nor, or **Altyn' Nor** (i. e. sea of gold), or **Teletskoi**: a lake of Siberia, in the S. part, is about 320 miles S. of Tomsk, and is traversed by one of the head-streams of the Obi. It is about 48 miles long and 8 miles in average width, but its size fluctuates much with the season.

Al'titude [Lat. *altitudo*, from *altus*, high]: a synonym for height. In astronomy, it signifies the apparent height of a star or other body above the horizon—that is, the angle which a line from an observer to the star makes with the plane of the horizon. This altitude is expressed in degrees, the greatest possible altitude being ninety degrees. It is measured in observatories by means of a telescope attached to a graduated circle, which is fixed vertically. The altitude of a triangle is measured by a straight line drawn from the vertex perpendicular to the base; that of a cone or pyramid by a straight line drawn from the vertex perpendicular to the plane of the base.

Al'tmühl: a river of Bavaria; rises near the village of Hornau, flows S. E. and E. and enters the Danube at Kelheim, after a course of 100 miles. The Ludwigs Canal connects this river with the Regnitz, and opens communication between the Danube and the Rhine.

Al'to [Ital. high, i. e. the highest male voice]: in music, the part immediately below the treble, and the deepest and lowest kind of musical voice in females and boys. As the word alto signifies *high*, the apparent discrepancy of this musical usage may be explained as follows: The voice-part referred to was originally sung by a species of high tenor, now apparently becoming extinct in the whole world. Therefore this male voice *was singing high*. The word "alto" has been retained, but the fact remains that the female or boy altos sing in their lower range to produce sounds of the pitch required. DUDLEY BUCK.

Al'ton, RICHARD, Count of: b. in Ireland in 1732; became a general in the Austrian service, and commanded in the Low Countries at the commencement of the rebellion in 1789. He was obliged to evacuate Brussels, and died in 1790 during his retreat toward Vienna.

Alton: city and important railroad center and port of entry in Madison co., Ill. (for location of county, see map of Illinois, ref. 8-D); on Mississippi river; 21 miles above St. Louis and 5 miles above the mouth of the Missouri. It stands on a high limestone bluff, and is magnificently picturesque. It has important manufactures. Large quantities of grain, hay, fruit, stone, lime, and flour are exported. It has a female seminary and a large Roman Catholic cathedral; an excellent system of public schools, a large number of factories, foundries, glass-works, public library, opera-house, electric lights, etc. The Burlington R. R. is bridging the Mississippi at Alton, and the city is connected by electric railroad with Upper Alton, 2 miles distant. Upper Alton is the seat of Shurtleff College. Pop. (1880) 8,975; (1890) 10,294; (1900) 14,210. EDITOR OF "SENTINEL DEMOCRAT."

Alto Amazonas: See AMAZONAS.

Al'tona: the most populous and important city of the Prussian province of Schleswig-Holstein; on the right bank of the Elbe; immediately adjoining Hamburg (see map of German Empire, ref. 2-E). It is connected by railroad with Kiel, and has an extensive trade by the Elbe. Many of the merchants of Hamburg reside in Altona, which contains an observatory, a gymnasium, and a library of 12,000 volumes or more. Here are important manufactures of tobacco, soap, chemicals, leather, ropes, etc. Altona is a free port, accessible to large vessels. Pop. (1885) 104,719; (1895) 148,944.

Altoona: city, 1,180 feet above sea-level; on Pennsylvania R. R., in Blair co., Pa. (for location of county, see map of Pennsylvania, ref. 5-D); 237 miles W. of Philadelphia, and 117 E. of Pittsburg, at the E. base of the Alleghany Mountains, which the railroad here crosses. It contains the extensive machine-shops of the Pennsylvania R. R., in which locomotives and cars are manufactured, and in which over 5,000 men are employed; large individual car-works, several extensive planing-mills, one large rolling-mill, partly in the city, extensive water-works, costing over \$300,000, an electric street railway, and a mechanics' library, containing about 14,000 volumes. Pop. (1880) 19,710; (1890) 30,337; (1900) 38,973.

EDITOR OF "TRIBUNE."

Alto Orino'co (i. e. the Upper Orinoco): a territory of Venezuela: covering a very large area in the southwestern part of that country, and claimed in part by Brazil. It is bounded on the N. and N. E. by the state of Bolivar, on the S. E. by Brazilian Guiana, on the S. by the territory of Amazonas, and on the W. by Colombia. Area, 119,780 sq. miles. It is crossed by the Orinoco in a nearly N. and S. direction, and is well watered by it and its branches. Its surface consists in part of savannas, in part of heavily wooded tracts. Its population is very sparse, averaging about one to every 5 sq. miles.

M. W. II.

Alt'orf, or **Alt'dorf** (i. e. old village): a town of Switzerland; capital of the canton of Uri; near the S. extremity of the Lake of Lucerne, and at the foot of the Grunberg (see map of Switzerland, ref. 4-G). Here is an old tower said to mark the place where William Tell shot the apple off his son's head. Pop. 2,901.

Alto-rilievo, al-tō-reel-yā'vō: in sculpture, high relief; that is, such sculpture as consists of figures projecting boldly from the background, having half or more than half, their full roundness. In some cases the figures are almost entirely detached from the background. An excellent instance of this kind of work is found in the metopes of Doric temples, as of the Parthenon of Athens. Compare BAS-RELIEF and RELIEF.

RUSSELL STURGIS.

Altran'städt: a town of Saxony, at which Charles XII. of Sweden concluded a treaty with Augustus, Elector of Saxony, in 1706. A treaty was also signed here in 1714 between the Emperor Charles VI. of Germany and Louis XIV. of France.

Altrices, al-tri'ssez: those birds in which the young are hatched in an immature condition, and are reared in the nest and fed by the parents. The higher birds, as sparrows and thrushes, belong to this group, which is, however, no longer used in classification.

Al'tringham: a market-town of England; in Cheshire; on the Cheshire Midland R. R. and on Bowden Downs, 8 miles by rail S. W. of Manchester (see map of England, ref. 7-G). It has some cotton-factories and is a resort for invalids, because of the salubrity of the air. Pop. about 12,000.

Al'truism: a term applied by the French positivist Comte to denote the benevolent instincts of man as distinguished from *egoism*, or the selfish instincts. In the philosophy of Herbert Spencer, as set forth in the *Data of Ethics*, *altruism* is recognized as an essential element of all organized society. In modern political economy also the same instinct is sometimes presented and urged as an element that necessarily under certain conditions modifies the force of the strict utilitarian doctrines that were formerly considered as the sole basis of that science.

C. K. ADAMS.

Al'udel [from Arabic *al-uthāl*; from *al-*, the + *uthāl* or *ithāl*, pl. of *athla*, a utensil]: one of several pear-shaped glass or earthen vessels used as receivers in the distillation of certain substances, especially mercury and hydrochloric acid. They are generally arranged in the form of a chain on an inclined surface.

Al'um [O. Fr. *alum*, Lat. *alu'men*]: a double salt of great importance, the chemical name of which is aluminium-potas-

sium sulphate. It occurs in colorless octahedral crystals, having a sweet astringent taste. It is a powerful styptic, and is applied sometimes as a mild caustic. Its formula is $AlK(SO_4)_2 + 12H_2O$. Alum is largely manufactured, and is much used in preparing skins, as a mordant in calico-printing, and in glazing paper, and occasionally for the adulteration of bread.

Ammonia alum, $Al(NH_4)(SO_4)_2 + 12H_2O$, containing ammonium in place of potassium, has of late largely replaced potash alum in the arts, owing to the low cost of the ammoniac sulphate prepared from gas-liquor. The term alum is now applied to a class of isomorphous double sulphates resembling ordinary alum very closely. In these, in place of the element aluminium contained in ordinary alum, there may be iron, chromium, manganese, etc., and in place of the potassium there may be sodium, ammonium, lithium, calcium, rubidium, etc. Next to the alums above mentioned, the most common is chrome alum, $CrK(SO_4)_2 + 12H_2O$. Ammonio-ferric alum is used in medicine and the arts.

Revised by IRA REMSEN.

Al'umbagh: a fort in Oude; about 4 miles from Lucknow (see map of N. India, ref. 6-F); was originally a palace surrounded by a fine garden and a park. During the mutiny of 1857 it was used as a fort by the Sepoys, from whom it was taken by the British under Outram and Havelock. It was afterward defended with success by Sir James Outram and a garrison of 3,500 men against the Sepoys.

Alungir, or **Alamgir:** See AURUNGZEBE.

Alu'mina: the oxide of aluminium, the most abundant of all the earths, and the principal constituent of clay. In 100 lb. of alumina there are 52.94 of aluminium and 47.06 of oxygen. Its symbol is Al_2O_3 . In its common state this earth is a soft white powder, without taste, and in the crystalline form it occurs as sapphire and ruby, two of the hardest and most valuable of the precious stones. An impure alumina, which is found in the islands of the Grecian Archipelago, Asia Minor, and Chester, Mass., is the emery used as a polishing-powder for glass and metals, on account of its hardness. The clay of arable land is mostly produced by the disintegration of felspar, which is a compound of alumina, potash, and silica. Alumina has two properties which render it of great importance in the useful arts: one is that its silicate forms with water a plastic material adapted for pottery; the other is its strong affinity for coloring and extractive matter, by which it is useful as a mordant in printing calico and in dyeing.

Aluminium, or **Alu'minum** (chemical symbol Al; atomic weight 27.04): an element; one of the most widely distributed constituents of the earth, occurring in a number of forms of combination. Among the best known minerals which contain it are the *feldspars*, silicates of aluminium and potassium or sodium; *cryolite*, a fluoride of aluminium and sodium; *bauxite*, the oxide together with ferric oxide; *corundum*, *emery*, *sapphire*, and *ruby*, which are forms of the oxide, Al_2O_3 ; *topaz*, a silicate containing silicon fluoride; *garnets*, silicates containing iron, magnesia, lime, etc. It is, however, most abundant in the different varieties of clay in which it is present as silicate.

History.—Wöhler first isolated aluminium in 1827 by decomposing aluminium chloride by potassium, obtaining it in the form of a gray powder. Later, in 1845, he obtained small malleable globules, but it was not until 1854 that H. St. Claire Deville isolated aluminium in a state of almost perfect purity, and determined its properties. Using first potassium as the reducing agent, he produced it in the same year by electric decomposition, employing the galvanic battery. Bunsen having made the latter discovery simultaneously. Toward the middle of 1854 Deville turned to sodium as the reducing agent, and developed the method to such perfection that it changed but little until the perfection of modern dynamos gave the electrolytic process economic pre-eminence. Deville's experiments attracted the attention of Napoleon III., at whose expense industrial work began at Javel. Meanwhile, in 1855, C. and A. Tissier started works at Amfreville-la-mi-Voie, near Rouen. Deville installed a plant at Nanterre, which was subsequently removed to Salindres, finally getting into the hands of Pechiney & Co., who until recent years enjoyed the reputation not only of making the best, but also the largest amount of aluminium produced in the world. In 1856 Alfred Monnier made some aluminium at Camden, N. J., exhibiting the product at the Franklin Institute, Philadelphia. In England the first aluminium works were started at Battersea, near Lon-

don, and in 1860 Bell Bros. began its manufacture at Newcastle-on-Tyne, continuing operations until 1874. Until 1882 the French company at Salindres was the only concern making aluminium, progress until that time being confined to the cheapening of the cost of production by improvement in details of process and apparatus. The price, which was \$28 to \$32 per lb. in 1857, had declined to \$17 per lb. in 1860, and ranged from \$12 per lb. and upward, according to purity, from 1862-87. James Webster in 1882 developed a process for the cheaper production of alumina and its conversion into chloride, with which was coupled a method, invented in 1886 by H. Y. Castner, of New York, for the manufacture of sodium, which lowered the cost of sodium from \$1 per lb. to about 20 or 25 cents. He reduces sodium compounds by means of a carbide of iron. In 1888 a plant was started under the name of the Aluminium Co., Limited, at Oldbury, near Birmingham, England, with a capacity of 100,000 lb. of aluminium annually. Another innovation upon the Deville sodium process was that of the Alliance Aluminium Co., whose works at Wallsend-on-Tyne, England, were also started in 1888. The methods are those of Dr. Netto, who produced metallic sodium cheaply by allowing fused caustic soda to trickle over incandescent charcoal in a vertical retort. He employed the fluoride or the double fluoride of aluminium and sodium as the compound to be reduced instead of the chloride or the double chloride of aluminium. Promising as they were, the modern improvements of the Deville sodium process have given way to the electrolytic methods developed during the past few years as the result of the great advances made in dynamo-electric machinery. Since the experimental work done simultaneously in 1854 by Deville and Bunsen, a series of proposals to produce aluminium by electrolytic methods were made by Le Chatelier in 1861, Monckton in 1862, Gaudin in 1869, Kagenbusch in 1872, Berthaut in 1879, and Grätzel in 1883. Only the last named appears to have been tried on an industrial scale at the Aluminium und Magnesium Fabrik, at Hemelingen, near Bremen, Germany, where it has since been superseded by secret methods devised by Saarburger, the manager of the works, which in 1888 were reputed to be producing at the rate of 12,000 kgr. of the metal annually. In 1886 Dr. Ed. Kleiner brought forward a process for electrolyzing molten cryolite by passing a current between two carbon poles, which was put in operation in an experimental plant at the Hope Mills, Tyldesley, Lancashire. It was experimented with by the Société Métallurgique Suisse, at Neuhausen, near Schaffhausen on the Rhine, but was abandoned in favor of the Heroult process. In the U. S. the first claimant for the honor of having manufactured aluminium on a commercial scale was William Frishmuth, of Philadelphia, who, in 1884, professed to have produced the metal used in the manufacture of the aluminium cap of the Washington monument. An epoch in the aluminium industry was created by the invention in 1885, by E. H. and A. H. Cowles, of Cleveland, of the electric furnace and the process for manufacturing aluminium alloys. A plant was established at Lockport, N. Y., and subsequently at Stoke-on-Trent, England, while the subsequent rolling of the alloys into sheets, wire, and rods is carried out at the Aluminium Brass and Bronze Co., Bridgeport, Conn., organized in 1887. The most notable advance in the production of the pure metal was, however, made by the invention of Charles M. Hall, whose process was established on a manufacturing scale in 1888 by the Pittsburg Reduction Co. In 1891 the same concern built a larger works at Kensington, near Pittsburg, and a branch establishment at Patricroft, Lancashire, England, in 1890. The American Aluminium Co., of Milwaukee, Wis., was formed in 1887 to manufacture by the process of A. J. Rogers, a small experimental plant having been put up in 1888. In a tentative way there has been work also in this country at Bridgeport, Conn., and later at Boonton, N. J., with the Heroult process, which is being used for the manufacture of aluminium alloys on a large scale at Neuhausen, and at Froges, Isère, France. Bernard Bros., at Creil, Oise, France, use the Minet process, which consists in electrolyzing a mixture of sodium chloride with aluminium fluoride, or with the double fluoride of sodium and aluminium. They are putting on the market metal of good quality.

The Manufacture of Aluminium.—Beauxite and cryolite are the minerals most used as raw materials, corundum being so valuable for other purposes that it is not used as an aluminium ore. Clay or kaolin is not available, because the large amount of silica it contains is much more easily reduced than its alumina. Beauxite, $H^6Al^2O^6$, is a mineral

first found near Beaux, large deposits occurring in the departments of Var and Bouches-du-Rhône, France. Important beds have also been discovered at Wochein, Styria; at Freisstritz, Austria; at a number of points in Ireland, and in abundance in the South, in Tennessee, Virginia, North and South Carolina, Georgia, Alabama, and Arkansas. Cryolite ($Al^2F_1^6, 6NaF$) is mined in large quantities by the Pennsylvania Salt Co. at Ivigtuk, on the west coast of Greenland. The beauxite must be purified, to get rid of silica and iron. It is calcined at a low temperature with sufficient sodium carbonate to form sodium aluminate. The incinerated mass is ground and lixiviated in hot water, dissolving the sodium aluminate, and leaving the silica and iron compounds as a residue. From the sodium aluminate solution the alumina is precipitated with carbonic acid gas. From cryolite alumina is obtained by incinerating a finely ground mixture of cryolite with chalk and coke. From the soluble aluminate of soda formed the alumina is precipitated in the same manner. Upon the purity of the alumina thus obtained depends the quality of metal produced by the electrolytic methods now almost exclusively employed.

As described by A. E. Hunt, president of the Pittsburg Reduction Co., the Hall process consists in electrolyzing alumina dissolved in a fused mixture of fluorides of aluminium and sodium, or of fluorides of aluminium and potassium. The mixture of fluoride salts is placed in a row of carbon-lined iron tanks placed in series. The pots, together with their carbon linings and the reduced metal in the bottom of the pots, become the negative electrodes, or cathodes. The positive electrodes, or anodes, are a series of 3-inch diameter carbon cylinders attached to the copper conductors. The current of 5,000 ampères and 50 volts in one series, and of 2,000 ampères and 20 volts in the other series, is turned on, and the mixture is melted by the heat caused by the resistance offered to the current by the fluoride mixture. In less than two hours' time the mixture becomes fluid, and alumina is added. The electrolyte then becomes a much better conductor, the resistance goes down to a normal one of about 8 volts, and the operation of electrolysis commences. The heat is retained in the molten bath by a covering of finely powdered carbon, on top of which the alumina is placed. When the voltmeter attached to each pot shows a rising resistance, more heated ore from the surface of the pot is stirred in. The light metal accumulates in the bottom of the pot, and may be tapped off while the feeding is made continuous. Thus the pots are run for months at a time, the wasting carbons being replaced by fresh ones from time to time.

Properties.—Commercial aluminium is never chemically pure, and displays properties varying more or less from those of the pure metal. The impurities most frequently met with are combined and graphitoid silicon, iron, copper, sodium, and lead. The following table, compiled by A. E. Hunt, gives a series of analyses:

COMPOSITION OF VARIOUS COMMERCIAL ALUMINIUMS.

ALUMINIUM METAL MADE BY THE	Per cent. of aluminium.	Per cent. of combined silicon.	Per cent. of graphitoid silicon.	Per cent. of iron.	Per cent. of copper.	Per cent. of sodium.	Per cent. of lead.
Pittsburg Reduction Co.	95.00	1.50	1.35	2.00	0.07	0.04	0.03
Soc. Anonyme d'Aluminium..	95.00	0.90	1.00	3.00	0.05	0.01	0.04
Alliance Aluminium Co., Lim'd	95.00	0.90	0.75	3.25	0.02	0.07	0.01
Aluminium Co., Limited.....	95.00	0.85	0.75	3.00	0.10	0.30	nil.
Alumin.-Industrie-Aktien- Gesellschaft, of Neuhausen }	95.00	1.75	1.15	2.00	0.01	0.07	nil.
Pittsburg Reduction Co.....	94.15	1.02	0.54	2.80	1.49	.....	.....
Soc. Anonyme d'Aluminium..	97.00	1.55	1.25	0.13	0.03	0.02	0.02
Alliance Aluminium Co., Lim'd	97.00	0.90	0.82	1.20	0.04	0.01	0.03
Aluminium Co., Limited.....	97.00	0.95	0.53	1.45	0.01	0.05	0.01
Pittsburg Reduction Co.....	97.00	0.75	0.52	1.55	0.03	0.15	nil.
Soc. Anonyme d'Aluminium..	98.00	1.30	0.60	0.07	0.01	0.01	0.01
Alliance Aluminium Co., Lim'd	98.00	0.71	0.35	0.90	0.01	0.01	0.02
Aluminium Co., Limited.....	98.00	0.90	0.29	0.75	0.01	0.04	0.01
Pittsburg Reduction Co.....	98.00	0.90	0.23	0.80	0.02	0.05	nil.
Soc. Anonyme d'Aluminium..	98.52	0.42	0.72	0.05	0.06	nil.	0.04
Alliance Aluminium Co., Lim'd	99.00	0.80	0.15	0.03	0.01	nil.	0.01
Aluminium Co., Limited.....	99.00	0.35	0.13	0.50	nil.	0.01	0.01
Pittsburg Reduction Co.....	99.00	0.31	0.20	0.45	nil.	0.03	0.01
Alliance Aluminium Co., Lim'd	99.00	0.27	0.15	0.55	0.02	0.01	nil.
Pittsburg Reduction Co.....	99.20	0.41	0.34	0.05	nil.	nil.	nil.
Alliance Aluminium Co., Lim'd	99.14	0.23	0.17	0.46	nil.	nil.	nil.
Pittsburg Reduction Co.....	99.34	0.40	0.21	0.05	nil.	nil.	nil.

That even greater purity is attainable is shown by the fact that metal with 99.92 per cent. aluminium has been commercially made.

The most striking property of aluminium is its lightness, Deville having determined the specific gravity of the chemically pure metal as 2.60, while Mallet makes it 2.583. John W. Langley ascertained that an aluminium casting $\frac{3}{4}$ inch thick, the metal carrying 98.52 per cent. of aluminium, had a density of 2.587, while the same material, a $\frac{3}{8}$ -inch round rod, had a specific gravity of 2.703. Taking the specific gravity of aluminium as one, soft steel is nearly 2.95 times, copper 3.6 times, ordinary high brass 3.45 times, silver 4 times, lead 4.8 times, and gold 7.7 times as heavy. Many extravagant and erroneous claims have been based on the lightness of aluminium for its use as a structural material, coupled often with assertions relating to very low cost of production. Aluminium is not, section for section, comparatively a very strong metal. It is only about as strong under tensile strain, section for section, as cast iron, and has less than one-half the strength of wrought iron under ordinary conditions. Under compression the metal has a very low elastic limit, although its extreme ductility allows the metal to flow on itself so freely as to make it for special purposes a very safe metal to use in compression. Alfred E. Hunt, John W. Langley, and Charles M. Hall, in a paper read before the American Institute of Mining Engineers, vol. xiii., summarize its mechanical properties as follows:

AVERAGE TENSILE AND COMPRESSION TESTS OF COMMERCIAL ALUMINIUM.

		Pounds.
Elastic limit per square inch in tension,	Castings	6,500
" " " "	Sheet	12,000
" " " "	Wire	16,000-30,000
" " " "	Bars	14,000
Ultimate strength per square inch in tension,	Castings	15,000
" " " "	Sheet	24,000
" " " "	Wire	30,000-65,000
" " " "	Bars	28,000
		Per cent.
Percentage of reduction of area in tension,	Castings	15
" " " "	Sheet	35
" " " "	Wire	60
" " " "	Bars	40
		Pounds.
Elastic limit per square inch under compression in cylinders, with length twice the diameter		3,500
Ultimate strength per square inch under compression in cylinders, with length twice the diameter		12,000
The modulus of elasticity of cast aluminium is about 11,000,000.		
The modulus of elasticity of cold-drawn aluminium wire is about 19,000,000.		
The modulus of elasticity of aluminium sheets and bars is about 13,000,000.		

Under transverse stress aluminium is not a very rigid metal.

Pure aluminium is white with a decided bluish tint, which becomes much more marked upon exposure, when a thin film of white oxide on its surface prevents further tarnishing from the air, but seems to give by contrast to the metal as a background an enhanced bluish tint. The metal fuses at about 1,300° F., but becomes pasty at a temperature of about 1,000° F. The specific heat is 0.2143, and its coefficient of linear expansion is 0.000206 per degree centigrade. Placing the electrical conductivity of silver at 100, commercial aluminium has a conductivity of about 50. It exhibits no appreciable polarity. Annealed aluminium has a thermal conductivity of 38.87, and unannealed of 37.96, referred to silver at 100. It can be welded readily electrically. It has been successfully soldered by the use of pure zinc and Venetian turpentine. Pure aluminium, when properly treated, is a very malleable and ductile metal, being most malleable at between 200° and 300° F. Both malleability and ductility are greatly impaired by the presence of the two common impurities, silicon and iron. Aluminium can readily be rolled into sheets $\frac{1}{10000}$ of an inch thick, can be beaten into leaf nearly as thin as gold-leaf, and can be drawn into the finest wire. In working it must be frequently annealed, which is best accomplished at a temperature of about 800° F. By hardening the metal by rolling, forging, stamping, or drawing, it may be turned out very rigid, and is then suitable for many purposes for which the annealed metal would be too soft or too weak.

Aluminium can be readily cast in dry sand molds without fluxes. It should not be heated much above the melting-point. It flows readily, but shrinks more than brass, the shrinkage being about 2.26 per cent. of the length of the mold.

The metal is not acted upon by carbonic acid, carbonic oxide, or sulphuretted hydrogen. It withstands better than silver the action of organic secretions, and is therefore widely

used for surgical instruments and apparatus. It is less acted upon than tin, copper, or silver, by salt water, and by such solutions in vinegar as the metal is likely to be subjected to in culinary vessels. Hydrochloric acid is the natural solvent, and it is corroded rapidly by the caustic alkalis, chlorine, bromine, iodine, and fluorine.

Aluminium Alloys.—Tissier claims that silver is the metal most useful to improve aluminium, 5 per cent. of silver giving to it increased elasticity and hardness without injuring the malleability of the metal. The alloy is susceptible of a fine polish. While it is predicted that the alloys of silver and aluminium will have a large use in the arts in the future, the most valuable thus far manufactured on a large scale are those of aluminium and copper, the so-called *aluminium-bronzes*. They are alloys of copper containing from 2 to 12 per cent. of aluminium, which possess great strength and ductility, and resist corrosion well. The specific gravity is about 7.7 for 10 per cent. bronze, 8.25 for 5 per cent. bronze, copper being 8.90. The hardness lessens with the percentage of aluminium, while the color changes from a yellowish gold at 10 per cent. to a deep red gold at $2\frac{1}{2}$ per cent. of contained aluminium. The following tests of cast aluminium bronze and brass were made for the U. S. Navy Department by W. H. Harris, chief engineer U. S. N., on specimens 1.87 inches in diameter and 15 inches in length between reference marks:

	APPROXIMATE COMPOSITION.						
	Copper.	Aluminium.	Silicon.	Iron.	Tensile strength, lb. per sq. in.	Elastic limit, lb. per sq. in.	Elongation, per cent.
6½ per cent. cast aluminium-bronze	91.50	6.50	1.75	0.25	60,700	18,000	23.2
Do.....	91.50	6.50	1.75	0.25	67,600	24,000	21.62
Do.....	91.50	6.50	1.75	0.25	59,100	19,000	23.59
Do.....	93.00	6.50	0.50	....	53,000	19,000	6.2
Do.....	92.00	6.50	0.50	....	46,550	17,000	7.8
9 per cent. cast aluminium-bronze	88.50	9.33	1.66	0.50	66,000	27,000	3.8
Do.....	90.00	9.00	1.00	....	72,830	33,000	2.40
Do.....	88.50	9.33	1.66	0.50	69,930	33,000	1.33
Aluminium-brass, cast..	63.00	3.33	0.33	Zinc. 33.33	82,200	60,000	2.33
Do.....	63.00	3.33	0.33	33.33	70,400	70,000	0.4

In forged bars a 10 per cent. aluminium bronze can readily and uniformly be made with 100,000 lb. tensile strength per square inch, an elastic limit of 60,000 lb., and with at least 10 per cent. elongation in 8 inches. The 5 per cent. to 7 per cent. aluminium-bronzes give 70,000 to 80,000 lb. tensile strength, with an elastic limit of over 40,000 lb. per square inch and an elongation of over 30 per cent. in 8 inches. The 5 to 7 per cent. bronzes can be rolled or hammered at a red heat, and can be worked in almost every way that steel can, having the advantage over it of greater combined strength and ductility, and much greater power to withstand corrosion. It is a remarkably rigid metal under transverse strain, and possesses excellent anti-friction qualities. Sound, clean castings of aluminium-bronze can be safely and regularly made, either in sand molds or against chills, if proper precautions are taken.

As a substitute for German silver the Cowles Co. produce what they call "silver-bronze," containing 18 manganese, 1.20 aluminium, 5 silicon, 13 zinc, and 67.5 copper. On small bars it has a tensile strength of about 57,000 lb. and 20 per cent. elongation. Its electrical resistance is about 48 times that of copper and about 37 times that of German silver, considerably greater than that of any other material known which is capable of being drawn into strong, tough wire for resistance coils.

Aluminium in Iron and Steel.—In cast iron, additions of metallic aluminium or of aluminium-iron alloys are occasionally made, the quantity used being from 2 to 5 lb. per ton. It has a similar influence to that of silicon, which is, however, cheaper in the ferro-silicon and high silicon irons used. Additions of aluminium may prove of service where very difficult castings are to be made. The peculiar property of aluminium in reducing the long range of temperature between that at which wrought iron first softens and that at which it becomes fluid has been taken advantage of in the Mitis process of making castings. The widest use of aluminium in the metallurgy of iron is, however, its employ-

ment to improve steel and steel castings, the principal effect being the quieting of the steel in pouring. For open hearth metal the quantity used is 5 to 10 oz. per ton of steel, while for Bessemer metal it should be increased to 7 to 16 oz. It has been found also that aluminium may be made to replace manganesc. The addition of $\frac{1}{4}$ of a lb. of aluminium to 10 tons of spelter in galvanizing has also been found to improve the surface finish of galvanized iron or steel sheets.

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CHARLES KIRCHHOFF.

Alum'nus, plu. **Alumni** (fem. sing. **Alum'na**, plu. **Alumnæ**): a Latin word signifying a "foster-child," applied in modern times to the graduates of a university or college, in order to express the relation between them and their ALMA MATER (*g. v.*). In Germany there were at one time institutions called *alumnat*, founded for the gratuitous education of poor boys, termed alumni.

Alum-Root: either of two species of plants, natives of the U. S., the *Gera'nium macula'tum* and the *Heuche'ra america'na*. Their roots are astringent, and are used in medicine. The latter is found in rocky woodlands from Connecticut to Wisconsin and southward.

Alum-Shale, Alum-Slate, or Alum-Schist: a rock consisting of clay, combined with much iron pyrites and some bituminous or carbonaceous matter. From it the alum of commerce is obtained by a double decomposition, induced by burning the alum-schist slowly until its condition is sufficiently changed, leaching, and then adding sulphate of potash or ammonia to the solution.

Al'mnite, or Alum-stone: a mineral found in various localities, which was formerly largely used for the preparation of Roman alum. It is a basic sulphate of aluminium and potassium.

Aln'ta, called also **Alt**: a rapid river of Transylvania, rises in the Carpathian Mountains, flows southward through Wallachia, and enters the Danube at Nicopolis. Length, 341 miles.

Al'va, or Al'ba, FERNANDO ALVAREZ DE TOLEDO, Duke of: Spanish general; b. of a noble Castilian family in 1508. He entered the army in his youth, and accompanied Charles V. in his campaign against the Turks in 1530. In 1547 he gained a decisive victory over the German Protestants at Mühlberg. In 1555-56, as commander-in-chief of the army of Philip II., he defeated the French and papal forces in Italy. As a general he was inclined to pursue a Fabian policy. He was distinguished for cool determination and remorseless cruelty. In 1567 he was sent by Philip II. to the Netherlands with an army of about 10,000 veterans, to suppress the revolt of the Protestants. He established the "Council of Blood," beheaded Count Egmont after a mockery of a trial, and commenced a reign of terror and sanguinary persecutions of persons suspected of heresy. To defend the country against this bloody despotism, William, Prince of Orange, raised an army in 1568, but the Duke of Alva avoided a battle, and by delay compelled William to retire from the contest, because he could not pay his troops. Although Alva defeated or out-generated the Dutch patriots in war, he utterly failed to subdue or pacify them, and he was recalled in 1573. He boasted that he had put to death 18,000 persons in the Netherlands, besides those killed in battle. In 1580 he invaded and conquered Portugal. D. at Thomar, Jan. 12, 1583. See Prescott, *Philip II.* (vol. ii.); Motley, *History of the Dutch Republic*.

Alvarado: city; Johnson co., Tex. (for location of county, see map of Texas, ref. 3-H); on Missouri, Kansas and Texas and Gulf, Colorado and Santa Fé R. Rs., 26 miles S. S. E. of Fort Worth and 40 miles S. W. of Dallas; it has good schools and churches, cotton-gins and mills. It is surrounded by a fine agricultural district; chief staples, corn and cotton. Pop. (1880) 377; (1890) 1,543; (1900) 1,342.

EDITOR OF "BULLETIN."

Alvarado, al'va-raa'tho, ALONZO: a Spanish officer who served under Cortez in Mexico. After its conquest he went to Peru, held high command under Pizarro, and was defeated and taken prisoner by Almagro in 1537. Alvarado was lieutenant-general in the army which subdued Gonzalo Pizarro's rebellion in 1548, and was made captain-general of Peru, but was overcome in 1553 and shortly thereafter died.

Alvara'do, PEDRO, de: a Spanish general and adventurer, b. at Badajos, who removed to America in 1518. He served with distinction under Cortez in the conquest of Mexico, and in 1520 was selected by Cortez to command in the city of Mexico during the absence of his chief, who marched against Narvaez. He conducted a successful expedition against Tehuantepec and Guatemala in 1523, and was appointed Governor of Guatemala. After a voyage to Spain, he led an army across the Andes into the province of Quito, which he found already occupied by Pizarro. This chief induced Alvarado to retire by the payment of a large sum of money. Alvarado was killed in a fight with some natives in New Galicia in 1541.

Alvarenga Peixoto, IGNACIO JOSÉ: Brazilian poet. See PEIXOTO, IGNACIO JOSÉ ALVARENGA.

Alvares de Azevedo, MANOEL ANTONIO: Brazilian poet. See AZEVEDO, MANOEL ANTONIO ALVARES DE.

Alvares, or Alvares Coelho, DIOGO: See CARAMURÚ.

Alvarez, al'va-rez, FRANCISCO: Portuguese priest; b. at Coimbra; went to Abyssinia in 1515 in company with the Portuguese ambassador, Duarte Galvam. He passed about six years in that country, which he explored, and returned to Portugal in 1527. An interesting account of his travels was published in 1540, entitled a *True Account of the Country of Prester John*. D. about 1540.

Alvarez, al'va-reth, Don JOSÉ: Spanish sculptor; b. at Priego, in the province of Córdoba, Apr. 23, 1768. He gained a prize in 1799, after which he pursued his studies in Paris. He removed to Rome, where he passed many years, and was intimate with Canova. Among his works are *Orpheus Sleeping*; *Antilochus and Memnon*; and *Grupo Colossal de Zaragoza*, which represents a scene in the defense of Saragossa. He was appointed court sculptor to Ferdinand VII. D. at Madrid, Nov. 26, 1827.

Alvarez, JUAN: Mexican general; b. in 1790. He was a leader of the insurgents who took arms against Santa Anna in the spring of 1854, and drove him from power in Aug., 1855. Alvarez became President of Mexico in October, but he resigned in December of the same year. During the French invasion of 1863-66 he was one of the most determined opponents of Maximilian and his party. D. in 1863.

Alvarez, Don LUIS: a contemporary genre painter; b. in Spain; pupil of Federico de Madrazo. First-class medal, Paris Exposition, 1889, for his picture *The Chair of Philip II., The Escorial, 1597*. Studios in Paris and Rome.

Alvary, MAX: See the Appendix.

Al'vinczy, or Al'vinzy, JOSEPH, Baron von: an Austrian general; b. in Transylvania, Feb. 1, 1735. He served with distinction in the Seven Years War, and obtained the rank of lieutenant-field-marshal in 1789. In the summer of 1796 he took command of an army of about 55,000 men sent to oppose Bonaparte in Italy. He fought indecisively at Bassano, and was defeated at Arcola Nov. 17, 1796, and at Rivoli Jan. 14, 1797. D. at Ofen, Sept. 25, 1810.

Al'vord, BENJAMIN, A. M.: soldier; b. at Rutland, Vt., Aug. 18, 1813; graduated at West Point 1833; paymaster-general U. S. A. Jan. 1, 1872, and brigadier-general U. S. Vols. April 15, 1862. He served chiefly at frontier posts 1833-34, in the Florida war 1835-37 and 1841-42, engaged at Camp Izard, Olaklikaha, Thlonotosassa, and Big Cypress Swamp, as assistant professor at the Military Academy 1837-39, in Cherokee nation 1839-40, adjutant Fourth Infantry 1840, in military occupation of Texas 1845-46, in the war with Mexico 1846-47, engaged at Palo Alto and Resaca de la Palma (brevet captain), Paso Ovejas, National Bridge, Cerro Gordo (Aug. 15), Las Animas (brevet major), and Huamantla, and, upon being transferred from the infantry to the pay department, as chief paymaster of the department of Oregon 1854-62. In the civil war was in command, as brigadier-general of volunteers, of the district of Oregon. Brevet lieutenant-colonel, colonel, and brigadier-general U. S. A. Aug. 9, 1865, for faithful and meritorious services; then became paymaster in New York city 1865-67, and chief paymaster of the district of Omaha and Nebraska 1867-72; paymaster-general U. S. A., headquarters at Washington, D. C., 1876-80. Author of a memoir on the *Tangencies of Circles and of Spheres* (1855); *The Interpretation of Imaginary Roots in Questions of Maxima and Minima* (1860); and of numerous essays and reviews, 1833-73. Retired June 8, 1880. D. Oct. 17, 1884.

Alvord, HENRY E.: See the Appendix.

Al'war, or **Al'var**: a semi-independent state of India; at the eastern end of Rajputana; S. of Delhi; in lat. 27° and 28° N., and lon. 76° and 77° E. It is of irregular form, and contains about 3,000 sq. miles, with a population of about 800,000. The eastern portion is open and highly cultivated, the western is diversified by hills and peaks which form a continuation of the Aravalli range. These hills are rich in minerals, and abundant iron ore is found close to the surface. Numerous smelting-furnaces give occupation to a large number of people. Copper is also mined, and silver, lead, and sulphur have been found. Capital and principal town, Alwar. Pop. (1891) 52,490. M. W. H.

Alyat'tes: King of Lydia, who ascended the throne about 618 B. C.; the father of Croesus. During a battle between him and Cyaxares of Media an eclipse of the sun occurred, and made such an impression that they ceased fighting and made a treaty of peace. Some astronomers identify this eclipse with that of 610 B. C. D. about 560 B. C.

Al'zei, or **Alzey**: an old city of Germany, in the grand duchy of Hesse, on the Selz; 19 miles S. of Mentz (see map of German Empire, ref. 6-D). It has a Realschule. Alzei and the vicinity form the scene of the events of the *Nibelungenlied*. Pop. 5,922.

Al'zog, **JOHANNES BAPTIST**: German Catholic theologian; b. at Ohlau, in Silesia, in 1808; became in 1853 Professor of Ecclesiastical History at Freiburg, in Germany. His *Manual of Universal Church History* (Handbuch der Universal-kirchengeschichte, Mainz, 1840; 9th ed. 1872, 2 vols.) has been translated into the principal European languages (Eng. trans., Cincinnati, O., 1874-76, 3 vols.). Another important work is his *Patrologie* (Freiburg, 1866, 4th ed. 1888). D. at Freiburg, Feb. 28, 1878.

Amade'us (Ital. *Amedeo* or *Amadeo*): the name of nine counts and dukes of Savoy, the first of whom was a son of Count Humbert, and lived in the eleventh century.—**AMADEUS V.**, the Great, Count of Savoy, a son of Count Thomas II., was b. at Le Bourget, Sept. 4, 1249. He succeeded his uncle Philip in 1285, increased his dominions by marriage, and was the first Prince of Savoy that made any considerable figure in history. D. at Avignon, Oct. 16, 1323.—**AMADEUS VI.**, of Savoy, grandson of the former; b. at Chambéry, Jan. 4, 1334, and became count in 1343. He was an able and successful ruler, defeated the French in battle in 1354, and added a part of Piedmont to his dominions. D. of the plague in Apuleia, Mar. 2, 1383.—**AMADEUS VIII.**, Duke of Savoy; a grandson of the preceding; was b. at Chambéry, Sept. 4, 1383, and succeeded his father in 1391. He received the title of duke from the Emperor Sigismund in 1419. In 1433 he resigned his power to his son Louis, and retired to the monastery of Ripaille. Having a high reputation for wisdom, he was chosen pope by the Council of Basel in 1439, and took the name of Felix V. As Eugenius IV., who had been deposed by that council, was still recognized as pope by a strong party, a schism ensued in the Church. Felix V. resigned the papacy in 1449, and died at Geneva, Jan. 7, 1451.

Amadeus: King of Spain; a son of Victor Emmanuel, King of Italy; was b. May 30, 1845. He received the title of Duke of Aosta, and married, May 30, 1867, Marie Victoire Charlotte, a daughter of the Prince dal Pozzo della Cisterna. On the 16th of Nov., 1870, the Spanish Cortes, by a vote of 191 against 98, elected him King of Spain, the throne of which had been vacant for two years. Amadeus accepted it, and arrived at Madrid Jan. 2, 1871. On Feb. 11, 1873, he abdicated the throne, being unable to maintain order, and the republic was proclaimed. D. at Turin, Jan. 18, 1890.

Am'adis of Gaul (*Amadis de Gaula*): the hero of a celebrated prose romance of chivalry known by the same name. The oldest version extant is the Spanish redaction made by Garcí-Ordoñez de Montalvo about 1470, but some form of the romance was popular in Spain as early as 1350. A Portuguese version by Vasco Lobeira (died about 1400) is lost, and some scholars even deny that it ever existed. In any case, there is no evidence that Montalvo's book is a translation from Lobeira. A French version of Montalvo's redaction, begun by Nicholas de Herberay (died about 1552), greatly extended the popularity of the story. Southey's English translation of Montalvo is judiciously retrenched. The romance had several continuations, and its direct influence on the literature of Europe did not die out till the beginning of the nineteenth century. See E. Binet's *De l'Amadis de Gaule* (Paris, 1873); L. Braunfels's *Kritischer Versuch über Amadis* (Leipzig, 1876). See ROMANCES. G. L. KITTEDGE.

Amador de los Rios. **JOSÉ**: Spanish historian and critic; b. 1818, at Baena; began his serious work with a translation into Spanish of Sismondi's *Littératures du Midi de l'Europe* (1841-42). Established in Madrid, he published his *Estudios políticos y literarios sobre los Judíos de España* (1848). Then, after several critical editions of Spanish authors, he undertook the work for which he is most celebrated, his *Historia crítica de la literatura española*, of which but seven volumes were completed before his death (Madrid, 1861-65). His intention was to give Spain a work like the famous *Histoire littéraire de la France* by the Benedictines. Hence he undertook to trace the literary development of Spain from the earliest times, through the Latin, Gothic, and Saracenic, as well as the Spanish period proper. The task, however, was beyond his strength, or indeed the strength of any single man. Hence the work is, even for the portion completed, too often diffuse and inaccurate. It is, however, still indispensable to students of Spanish literature. He wrote also an *Historia de la villa y corte de Madrid*, and works on the monuments of Seville and Toledo. D. Mar., 1878. A. R. MARSH.

Am'adou, or **German Tinder**: any one of several species of fungi growing on oak and ash trees in Europe. The hard amadou (*Polyporus igniarius*) and the soft amadou (*Polyporus fomentarius*) are used for tinder, and applied to wounds as styptics. Some varieties are prepared for tinder by charging them with saltpeter.

A'mager: a small island of Denmark; adjoining the harbor of Copenhagen; partly occupied by a suburb of that city. Area, 22 sq. miles. Here are gardens which supply that capital with vegetables, and a large chemical factory. Pop. 9,000 (besides suburb Christianshafen), consisting of the descendants of a Dutch colony brought here in 1516, and still retaining many peculiar customs.

Amal'arie; b. in 501; the son of Alaric II., King of the Visigoths; succeeded his father in 507 by the aid of his grandfather Theodoric, King of the Ostrogoths, and married in 527 Clotilde, a daughter of Clovis, King of the Franks, but in order to compel her to embrace Arianism he treated her so cruelly that her brother Childebert came to her rescue with a great army in 531. Amalarie was defeated and slain, and Theudis succeeded him as King of the Visigoths, while Clotilde returned with her brother to the land of the Franks, where she died shortly after.

Amala'rius Fortunatus: Archbishop of Treves; sent by Charlemagne in 811 A. D. to diffuse Christianity among the Saxons, and established the first church at Hamburg. D. in 814 A. D.

Amalason'tha: b. in 498; a daughter of Theodoric the Great, King of the Ostrogoths; married in 515 Eutharic and bore him a son, Athalaric, who, in 526, when only ten years old, succeeded his grandfather as King of Italy under the guardianship of his mother, his father having died in 522. The government of Amalasontha was very successful, but her son grew up a debauched and dissipated drunkard, utterly unfit to reign. He died in 534. Amalasontha then married her cousin Theodatus, in order to strengthen her power, and made him co-regent; but, stung by the contempt with which his wife treated him, and desiring to rule alone, Theodatus imprisoned her and had her strangled in 535. This arbitrary action was the pretext for Justinian's invasion of the East Gothic kingdom, which led to its overthrow.

Am'alek: a grandson of Esau, and one of the chieftains of Edom (Gen. xxxvi. 12, 16). A remnant of his posterity existed in the time of Hezekiah (1 Chron. iv. 43).

Amal'ekites: a nomadic and warlike people, occupying, at the time of the Exodus, the Sinaitic peninsula and the wilderness between Egypt and Palestine. Opposing the march of the Israelites, they were signally defeated at Rephidim (Ex. xvii. 16). Centuries later they were severely punished by Saul (1 Sam. xv.), and finally destroyed by David (1 Sam. xxx.).

Amal'fi: an ancient and decayed city and seaport of Southern Italy; on the Gulf of Salerno; 25 miles S. E. of Naples (see map of Italy, ref. 7-F). During the several centuries of the Middle Ages it was a great commercial emporium and the capital of a republic. It is the seat of an archbishop. Its situation is rocky and very picturesque. Amalfi was the birthplace of Masaniello and of Flavio Gioja, called the inventor of the mariner's compass. Pop. 4,186.

Amal'gam [possibly from Gr. μάλαγμα (μαλάσσειν), an emollient]: a combination or alloy of mercury with another metal. Some amalgams are definite chemical compounds. Glass plates are converted into mirrors or looking-glasses by covering one surface with an amalgam of tin. Gold and silver are dissolved in mercury, and form amalgams which are used in the processes of gilding and plating various objects.

Amalgama'tion: the act or process of combining mercury with another metal; especially the process of separating gold and silver from the quartz-rock in which they are found imbedded. This is effected by shaking the crushed quartz-rock in a barrel in contact with mercury which readily unites with the particles of gold and silver. See GOLD and SILVER.

Amalie, MARIE: wife of Louis Philippe, King of France; daughter of Ferdinand I., King of the Two Sicilies; b. Apr. 26, 1782; married the Duke of Orleans, then a political refugee with no prospect of reaching the throne, Nov. 25, 1809, at Palermo; Queen of France, 1830-48; d. Mar. 24, 1866, at Claremont; distinguished for piety and exemplary domestic life.

Amal'rich of Be'na: a Scholastic philosopher who taught dialectics and the liberal arts at Paris in the twelfth and thirteenth centuries; was b. at Bena (Bène) near Chartres, and attempted to reconcile theology with the Averroistic and materialistic interpretation of Aristotle's metaphysics. He and his book (*Physion*) were condemned by the university and the pope in 1207; and Amalrich, after an enforced recantation, died of grief in Paris in 1209. In 1210 his bones and his books were burned together. His followers (Almericians) appear to have been a pantheistic and mystical sect, finally developed into that of the Brethren of the Free Spirit. Their doctrines, briefly, were (1) God is all; (2) every Christian is a member of Christ's body; (3) those who abide in the love of God can not sin. The last proposition naturally was the occasion and the justification of their excesses. They rejected the Church and the sacraments. They were subjected to severe persecutions.

Revised by S. M. JACKSON.

Amalthe'a, or Amaltheia: in classic mythology, the nurse of Jupiter; supposed to have been a goat, the horn of which, broken off by Jupiter, was endowed by him with magical power, and became famous as the cornucopia, or the "horn of plenty."

Ama'ma, SIXTIVS: b. at Franeker, Netherlands, in 1593; was a Protestant biblical philologist, and Professor of Oriental Languages at Franeker 1618-29, and was author of a critical work on the historical books of the Old Testament and some Latin treatises. D. in 1629.

Amani'ta: a genus of fungi nearly allied to *Agar'icus*, from which is derived a poisonous principle called *amanitine*. The *Amani'ta musca'ria*, a native of Europe, is very poisonous, and is used to kill flies.

Amapa'la: a city and seaport of Honduras; situated on Tigre, the most important island of the bay of Fonseca, which contains a number of excellent harbors (see map of Central America, ref. 5-G). The chief articles of export are tobacco, hides, precious woods, and indigo. Pop. about 1,000.

Amar, J. P.: a French Jacobin, notorious for his cruelty; b. at Grenoble in 1750. He became a member of the Convention in 1792, voted for the death of the king, and in Oct., 1793, presented to the Convention a report which condemned to death twenty-two Girondists. He contributed to the ruin of Robespierre on the 9th Thermidor, 1794. D. in Paris in 1816.

Am'aranth [from Gr. ἀμάραντος, unfading; ἀ-, not + μαρῖνειν, to wither. The final *h* due to false association with ἄνθος, flower]: a plant of the genus *Amarantus* and family *Amarantaceæ*, bearing small but aggregated flowers that are scarious, persistent, and not liable to wither, and which, in some species, are highly colored. The *Amarantus caudatus* ("prince's-feather"), "love-lies-bleeding," and other exotic species, are cultivated in the gardens of the U. S. Several other unsightly species are naturalized as weeds.

Amaranthaceæ: the AMARANTH FAMILY (*q. v.*).

Amaranth Family (Amarantaceæ): mostly herbaceous, apetalous flowering plants, related to the chenopods, buckwheats, pinkworts, etc. About 480 widely distributed species are known.

Amaranthus, or Amarantus: a genus of plants. See AMARANTH.

Am'arapu'ra (i. e. city of the gods): a decayed city of Burma, on the Irrawadi river, about 8 miles N. E. of Ava (see map of N. India, ref. 8-L). It was formerly the capital of Burma, and had at one period a population of about 170,000, but after the seat of government was removed in 1819 it rapidly declined. The houses are mostly of bamboo. Pop. 50,000.

Am'ara-Sing'ha, or -Sin'ha: an eminent Hindu poet and grammarian of unknown period, supposed by some to have lived about 50 B. C. He was a Bûddhist, whose works were all destroyed by the Brahmins, except his *Amara Kosha*, which is a vocabulary of about 10,000 Sanscrit words.

Amargosa Desert: See GREAT BASIN.

Ama'ri, MICHELE: an Italian statesman and Orientalist; b. at Palermo, July 7, 1806. His political life calls for no comment beyond the statement that he was intimately associated with the policy and plans of Garibaldi, and subsequently of Cavour. He is known to scholars by his *Guerra del Vespro siciliano* (1842; 9th ed. 1886; Eng. trans. by Lord Ellesmere); his *Storia dei Musulmani di Sicilia* (1854-68); and his *Diplomi Arabi del Archivio fiorentino* (1863). He translated from the Arabic the *Solwan* of Ibn Djafer (English translation, Lond. 1852). D. in Rome, July 16, 1889.

Amarna, or el-Amarna: ruins of a city on the Nile, midway between Thebes and Memphis, built by Amenophis IV., the great sun-worshiping Pharaoh of the eighteenth Egyptian dynasty. Here were discovered several hundred cuneiform tablets in 1887. See ASSYRIAN EXPLORATION.

D. G. L.

Amaryllida'ceæ: the AMARYLLIS FAMILY (*q. v.*).

Amaryllis: a genus of bulbous-rooted plants of the family *Amaryllidaceæ*, including but one South African species, *A. belladonna*. The name amaryllis is commonly applied to species of several other genera—e. g. *Crinum*, *Nerine*, *Zephyranthes*, etc.

C. E. B.

Amaryllis Family (Amaryllidaceæ): herbaceous, monocotyledonous plants, mostly bulbous, and related to the yams, irises, cannas, bananas, etc. About 650 species are known, mostly in warm climates. *Narcissus*, *Amaryllis*, *Polyanthus*, and *Agave* are important genera.

C. E. B.

Ama'sia, Amasieh, or Amasiyah: a city of Asia Minor; on the Yeshil-Irmak, 355 miles E. of Constantinople (see map of Turkey, ref. 4-G). It contains nearly 4,000 houses, many of which are of stone, a strong citadel, and a fine mosque. Silk is produced here and is exported. Strabo was a native of Amasia, which was formerly the capital of the Kings of Pontus (*q. v.*). Pop. between 20,000 and 25,000.

Ama'sis: a famous King of Egypt, who succeeded Apries about 570 B. C.; was more friendly to the Greeks and other foreigners than his predecessors. Under his reign Egypt enjoyed peace and prosperity. He built magnificent monuments at Memphis, his capital. D. about 525 B. C., and was succeeded by his son, Psammeticus III.

Amat', FELIX DE TORRES: Aragonese ecclesiastic and literary historian; b. at Sallent, Aug. 6, 1772; became Bishop of Astorga, and a senator under the reformed constitution of 1837. In 1808 he was charged by the Government of Spain to prepare and annotate a new Castilian translation of the Bible. Of this work the first edition appeared in 1823, in eight volumes, besides a volume of notes and appendices. In the edition of 1832 the notes are chiefly printed at the foot of the pages. D. at Madrid on Dec. 29, 1840. Amat is best known abroad by his *Memorias para ayudar a formar un Diccionario crítico de los escritores Catalanes* (Barcelona, 1 vol. 8vo, 1836). A supplement to the *Diccionario*, by Juan Corminas, appeared at Burgos in 1 vol. 8vo, in 1849. These works are valuable contributions to the history of Catalan literature, and indispensable to all who wish to become acquainted with that literature and its bibliography.

GEORGE P. MARSH.

Am'athus: an ancient city of Cyprus, especially addicted to the worship of Venus, who was hence called Amathusia. Adonis also was worshiped here.

Ama'ti, ANDREA: an Italian who lived at Cremona about 1550; made excellent violins, which are equal or superior to any made in the present time.—ANTONIO, a son of the preceding, was born about 1565. He was a celebrated maker of

violins. D. 1635.—NICOLÒ, ANTONIO (1550–1635), and GERONIMO, all excelled in the art, but Nicolò, jr. (b. Dec. 3, 1596; d. Aug. 12, 1684), excelled the rest of the family in the number and quality of his violins.

Amatitlan', or **Amatitan'**: a town of Central America, in Guatemala, 19 miles S. W. of the city of Guatemala, near the lake of the same name; lat. 14° 28' 39" N., lon. 90° 37' 50" W. (see map of Central America, ref. 4-D). The houses are made of mud, and are only one story high. Wells of boiling hot water occur in this vicinity. The chief business is the production of cochineal. Pop. about 4,000.

Amaton'galand: an independent native state of South Africa, extending along the coast of the Indian Ocean from Delagoa Bay to St. Lucia Lake, and inland to the Transvaal. Area, 5,300 sq. miles. Pop. estimated at 37,000. The Amatonga people are of Zulu extraction, but are much mixed with Swazi blood. They are governed by a queen, under whom are seventeen feudal chiefs. M. W. H.

Amaurosis: See BLINDNESS.

Amaur'y (or **Amal'ric**) I.: King of Jerusalem; a son of Baldwin II.; b. in 1135. He began to reign at the death of his brother, Baldwin III., in 1162 or 1163. In 1168 he invaded Egypt, from which he was soon forced to retreat by Saladin, who in turn invaded Amaury's dominions in 1170. D. July 11, 1173.

Amaury II., sometimes called **Amaury de Lusignan**: became King of Cyprus as heir of his brother Guy, and on his marriage with Isabella took the title of King of Jerusalem in 1198. His dominions were occupied by the victorious Saracens, so that his reign was only nominal. D. in 1205.

Amaxichi, an-aks-ee'kee, or **Santa Maura**: the capital of the Ionian island of Santa Maura (or Leucadia), is on its east coast. It has a lighthouse, and a harbor adapted for small vessels. It is the residence of a Greek archbishop. Pop. 7,000. Earthquakes often occur here. The remains of cyclopean walls are found in the vicinity.

Amazi'ah: King of Judah (2 Kings, xiv. 1–20), succeeded his father Joash about 837 B. C. He waged war with success against the Edomites, and reigned twenty-eight or twenty-nine years. He was killed by conspirators at Lachish, in 809 B. C.

Am'azon, or **Amazons** [so called from the fabled tribe of female warriors said by the Indians to exist on its banks, and which Orellana imagined he had encountered]: a South American river, and the largest river on the globe, rises among the Andes in Peru. It is formed by the union of several large head-streams called the Beni, Apurimac, Ucayale, and Tunguragua, which last is the most western branch, and is sometimes called the upper Marañon. Geographers have not unanimously decided which of these is the main stream. The Apurimac, the most southern of all the branches, rises about lat. 15° S.

By South Americans this river is known under three different names in different parts of its course: from its mouth to the mouth of the Rio Negro it is called the Amazonas or Amazon; from the mouth of the Rio Negro to Tabatinga, on the borders of Ecuador, it is known as the Solimoens; and from Tabatinga to its source in the Andes it is called the Marañon (corruption of the Tupi-Indian word *paraná*, a great body of water: the name given by them to the whole river). The Amazon, from its junction with the Napo in Ecuador, has a nearly due eastern course, varying therefrom not more than two or three degrees throughout its whole length; it is therefore almost wholly in the same latitude, which is not the case with any other large river on the globe. It is also entirely within the tropics—its average distance from the equator is less than 200 miles—but the climate is not so hot and sickly as might, from this, be supposed, the average temperature being 84°, and the extremes 72° and 94°. The waters of the main river, owing to the clay which they contain, are somewhat turbid, but those tributaries which rise in the woody plains have their waters black or of a dark amber color, and in some cases of a deep green, being dyed by the vegetable matter found so abundantly along their banks. This mighty stream, flowing through Ecuador and the boundless forests of Brazil, and increased to an immense volume by the great tributaries that enter it from the right and from the left, empties itself into the Atlantic Ocean under the equator. Its whole length, including windings, is rather more than 3,000 miles, and the area of the countries which it drains is estimated at 2,500,000 sq. miles. It is said to be 4 miles wide at the mouth of the

Japura, more than 1,000 miles from the sea. The navigation of the upper Marañon is obstructed by rapids. One of the most interesting facts connected with the Amazon is the smallness of its fall; at a distance of 2,500 miles from its mouth the elevation is only 210 feet; the descent is therefore about an inch to the mile. According to Lient. Herndon, the river and its Ucayale branch are navigable for a distance of about 3,300 miles from the ocean, but this is overestimated. The Tunguragua is likewise navigable for many miles above the mouth of the Ucayale. Boats can also be navigated from the Amazon, through the Rio Negro and the Cassiquiari, into the Orinoco, but they are obliged to pass rapids on the Negro, and again on the Orinoco, before they can reach the sea. It is estimated that the Amazon and its affluents open to the ocean 15,000 miles of interior navigation for large vessels. The tide ascends it over 400 miles, and about the time of full moon a great tidal wave rushes into the mouth of the river with such violence that it raises the water nearly 30 feet high. This wave, which is very dangerous to small vessels, is called *bore* in English and *pororoca* by the natives. The river abounds, in some parts, in turtles, whose eggs yield a valuable oil. The principal affluents on the right are the Ucayale, the Yuma, the Purús, the Madeira, and the Tapajós. Those that enter it from the left are the Napo, the Putumayo, the Japurá, and the Rio Negro. The Tocantins is not properly a branch of the Amazon. During the rainy season the Amazon overflows its banks and submerges a large extent of country. It is well supplied with fish, and flows through a region of great fertility, which is densely covered with primeval and almost impassable forests, in which jaguars, pumas, monkeys, tapirs, and other wild animals abound. The river incloses numerous large islands, besides that named Marajó or Joannes, which is 150 miles in diameter. This island separates the mouth of the Amazon from that of the Tocantins, but the two rivers are connected W. and S. of Marajó by channels, through which a small portion of Amazonian water reaches the Tocantins and its mouth, the Pará. The mouth of the Amazon was discovered by Yanez Pinzon in 1500, but the first European who explored the river was Orellana, in 1539. Early maps sometimes name the river Rio de Orellana, after this explorer. Since 1867 the river has been opened for trade to all nations. The dense forest that covers the valley of the upper Amazon is a remarkable feature. See H. W. Bates, *The Naturalist on the Amazon* (1st ed. Lond. 1863; the subsequent ones are somewhat abridged); Orton, *The Andes and the Amazon*; Keller, *The Amazon and Madeira Rivers*; Edwards, *A Voyage up the River Amazon*; Spix and Martius, *Reise in Brasilien*, vol. iii.; C. R. Markham, *Valley of the Amazon*; and the works of Hartt, Wallace, Von den Steinen, Penna, H. H. Smith, Myers, Hassaurek, Maw, Smythe, Herndon, Gibbon, Acuña, Poeppig, Barboza, Rodriguez, and Chandlers.

Revised by H. H. SMITH.

Amazo'nas, or **Al'to Amazo'nas** (i. e. upper Amazon): a state in Northern Brazil; bounded N. by Dutch and British Guiana and Venezuela, E. by the province of Para, S. by Bolivia and Matto Grosso, and W. by the United States of Colombia, Ecuador, and Peru. Area, 732,460 sq. miles. It consists chiefly of forests, inhabited by small independent tribes of Indians. The most important rivers in this province are the Amazon, which is called the Solimoens above Manaos, the Negro, Putumayo, Purús, and Madeira. The entire civilized population amounts to (1888) 80,654. Capital, Manaos (formerly Barra do Rio Negro).

Amazonas: a territory of Venezuela, forming the extreme south of that country, with Brazil on the S. and S. E. and Colombia on the W. It is claimed by Brazil. Area, 90,928 sq. miles. Pop. about 19,000, mostly Indians. It is drained in part by the Orinoco, in part by the Amazon, and within it is the celebrated river Cassiquiari, which connects the Orinoco with the Rio Negro, a branch of the Amazon. See CASSIQUIARI. M. W. H.

Amazonas: a department of Peru; bounded N. by Ecuador, E. by Loreto, S. by Junin, and W. by Cajamarca and Libertad. The soil is fertile, but, owing to thinness of population, very little is done to cultivate it. Straw hats of a superior quality are made here and exported. Chief town, Chachapoyas. Area, 14,129 sq. miles. Pop. 34,245.

Am'azons [from Gr. ἀμαζών. The Gr. explanation from ἀ-, not + μαζός, breast, is no more than a folk-etymology]: female warriors; a semi-fabulous nation of martial women which was celebrated by the ancient Greek poets. They are said to

have cut off their right breasts, so as not to interfere with their aim in shooting. According to tradition, they lived in Asia Minor, and fought against the Greeks at the siege of Troy, where they were commanded by their queen, Penthesilea. Another Queen of the Amazons, named Thalestris, is said to have made amorous overtures to Alexander the Great. The battles of the Amazons were favorite subjects with ancient Greek painters and sculptors. In modern times the African kingdom of Dahomey has been noted for its army of Amazons, distinguished for their bravery.

Ambal'a, or Umballa: a city of India; in the North-western Provinces; capital of a district and division of the same name (see map of Northern India, ref. 4-E). Pop. (1891) 79,270. Here a treaty was concluded between the Governor-General of India, Lord Mayo, and the Emir Shere Ali of Afghanistan in 1869.

Ambale'ma: a town in the republic of Colombia; in the state of Cundinamarca; on the Magdalena, about 50 miles W. of Bogotá (see map of South America, ref. 2-B). Excellent tobacco is produced in the neighborhood. Pop. about 9,700.

Ambarva'lia [Lat. *amb-*, around + *arva*, fields]: a religious festival observed by the ancient Romans in the month of May, in order to propitiate Ceres and invoke her blessing on the coming harvest. It was so called from the victims being carried round the fields by the priests.

Ambas'sador, or Embassador [viâ Fr. *ambassadeur*; Ital. *ambasciatore*, from mediæv. Lat. **ambactia'tor*, deriv. of Lat. *ambac'tus*, retainer. The spelling with *em-* was the commoner two centuries ago, and remains now in *embassy*]: a diplomatic minister of the highest order, sent by a prince or nation to the court of another power to manage special affairs of state. He is expected not only to be the agent of his government, but to represent the power and dignity of his sovereign or his country. (See DIPLOMATIC AGENTS.) The word ambassador is recognized as an official title of the highest rank of the diplomatic service of the U. S. See INTERNATIONAL LAW, Summary of its Principles.

T. S. WOOLSEY.

Amba'to: a town of Ecuador, 65 miles S. S. W. of Quito (see map of South America, ref. 3-B); has an active trade in grain, sugar, and cochineal. It was destroyed in 1698 by an eruption of Cotopaxi, but was soon rebuilt. Pop. 12,000.

Am'ber [Fr. *ambre*, from Arab. *anbar*, ambergris, by confusion extended to the resinous amber (Gr. *ἤλεκτρον*). The French distinguish *ambre gris*, gray amber, ambergris, and *ambre jaune*, yellow amber]: a fossil resin, usually of a pale yellow color, opaque to perfectly transparent. It is found in many parts of the world in deposits of cretaceous or tertiary age, and is now known to be a resinous exudation from several species of extinct coniferous trees, of which one, called *Pinites succinifer*, is supposed to have produced the greater part. Over 800 species of insects have been found preserved in amber, and leaves or other fragments of 163 species of plants. Amber is extensively used for ornaments, and especially for the mouthpieces of pipes, the consumption being greatest in Eastern Europe, Turkey, Persia, etc. The largest mass known is in the Cabinet at Berlin; it weighs 18 lb. and is valued at \$30,000. Most of the amber of commerce was formerly obtained from the shores of the Baltic, between Königsberg and Memel; but now the greater part is systematically dug or mined for near the latter place, at some distance from the sea. Small pieces are frequently found in the green sand of Gay Head and New Jersey, and in the tertiary coals of the far West. Amber was highly prized and much used by the ancients, and was one of the chief articles of commerce among the early Britons, Celts, Romans, etc. It was formerly employed as a charm against witchcraft, etc.; many superstitions as to its fancied virtues are still believed by the credulous. It was an object in many of the voyages of the Phœnicians, and was an article of exchange long anterior to the dawn of history, as we know by its frequent occurrence in the remains of the lake-dwellings of Switzerland.

Amber exhales a fragrant odor when burned, and was formerly in high repute as a medicine. An acid obtained from it (succinic) is a useful agent in chemical operations. When rubbed, amber becomes strongly electro-negative, and the first exhibition of electric force which received intelligent attention was the attraction exerted on light bodies by amber. This force, at first supposed to be possessed by

amber alone, took the name of that substance, *ἤλεκτρον*, from which "electricity" is derived.

Revised by GEO. F. KUNZ.

Amber-fish, or Amber-jack: a large fish of the genus *Seriola* and family *Carangidae*. The amber-fishes are allied to the cavallas and mackerels, and reach a length of from 3 to 5 feet in the tropical seas. They are of fair quality as food.

Am'berg: a walled town of Bavaria; on the river Vils; 39 miles E. of Nuremberg (see map of German Empire, ref. 6-F); was formerly the capital of the Upper Palatinate. It is well built, and has a gymnasium, a normal school, and a large public library; also a royal manufactory of muskets, and several breweries and potteries. The French Republican army under Jourdan was defeated near this town by the Archduke Charles, commanding the Austrians, in 1796. Pop. (1880) 14,583; (1890) 19,098.

Am'bergris [from Fr. *ambre gris*, i. e. gray amber]: a concretion formed in the intestines of the sperm whale (*Physeter macrocephalus*), and found floating on the surface of the seas where this animal occurs. In it are often found embedded the horny beaks of the squids, on which the whale feeds. It was formerly used in medicine, but is now dissolved in alcohol and used as a base in perfumes, rendering them more lasting. The price of it is about \$5 an ounce. It affords about 85 per cent. of a peculiar fatty and crystalline subject called *ambrein*. The specific gravity of ambergris is about 0.8.

Ambergris (so called from the ambergris found on its shores): a barren island at the S. W. angle of Yucatan; is 30 miles long from N. E. to S. W., and 3 miles wide; said to be uninhabited.

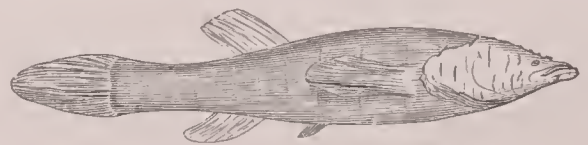
Ambi'orix: a famous Gallic chief who ruled over the Belgic tribe of Eburones, and waged war against Julius Cæsar. By insidious measures and stratagem he gained a decisive victory over the Roman Generals Sabinus and Cotta, whose army he annihilated in 54 B. C., during the absence of their commander. He was afterward signally defeated by Cæsar.

Am'bitus [Lat., a going round, i. e. to canvass for votes; from *ambi're*, *amb-*, round + *ire*, to go]: a term used by the ancient Romans to designate the going about and soliciting votes by candidates for office. The practice of offering one's self as a candidate in an open and honorable way was called *ambitus popularis*. Another kind, which was common, but disreputable, consisted in cajolery, bribery, etc.

Ambler: borough (organized in 1888 from parts of Upper Dublin and Gwynedd townships), Montgomery co., Pa. (for location of county, see map of Pennsylvania, ref. 6-J); 16 miles N. of Philadelphia; on the Philadelphia and Reading R. R.; is a manufacturing place, situated in an agricultural district. Pop. (1880) 251; (1890) 1,073; (1900) 1,884.

Ambletense: a decayed seaport of France, on the English Channel, 6 miles N. of Boulogne, and about 25 miles from the English coast (see map of France, ref. 1-E). Here James II. of England landed after his abdication in 1689, and here Napoleon I. erected a granite column in honor of the Grand Army in 1805.

Amblyop'sis [from Gr. *ἀμβλῦς*, dull + *ὄψω-*, see in *ὄψω*, eye, *ὄψωπα*, have seen, *ὀπάζομαι*, look, etc.: *ἀμβλυωπία* suggests the correcter *amblyopia*]: a genus of blind fishes. This genus contains a single species (*Amblyop'sis spelæus*), which is found in the caves of Kentucky and Indiana. The eyes of this fish, though seemingly absent, exist in a rudimentary



Amblyopsis spelæus.

state, hidden beneath the skin. The body is translucent, and partly covered with scales, and reaches a length of about 5 inches. Prof. Cope, describing the habits of these fish, says: "They are easily taken by the hand or net if perfect silence be preserved, for they are unconscious of the presence of an enemy except through the sense of hearing. This sense is, however, evidently very acute, for at any noise they turn suddenly downward and hide beneath stones, etc., on the bottom." Their food consists in a great part of the crayfish found in the cave, but they sometimes feed on other

fish, in the pursuit of which they show remarkable activity, thus proving that the tactile sense is well developed. The genus belongs to the order *Haplomi*, its nearest kindred being mud-minnows, pickerels, and killifishes. The family of *Amblyopsidae* contains three genera, *Amblyopsis* and *Typhlichthys*, which are blind and are confined to the caves, and *Chologaster*, which has well-developed eyes, and is found throughout the swamp region from Virginia southward. From *Chologaster* or some similar type the others are evidently descended. See an account (by F. W. Putnam) of the Blind Fishes of the Mammoth Cave in the *American Naturalist* for Jan., 1872.

Revised by DAVID S. JORDAN.

Amblys'toma [from Gr. ἀμβλός, blunt + στόμα, mouth]: a genus of American salamanders containing many species, the commonest and most widely distributed of which is the tiger salamander, *A. tigrinum*. This large salamander is common over all of North America, and in the West and South its larva is conspicuous in ponds and streams. Its metamorphosis may easily be retarded, and in Mexico seems to take place rarely, the animal propagating in the larval state while retaining its external gills. See AXOLOTL.

DAVID S. JORDAN.

Am'bo [Lat. *ambo*, -o'nis, from Gr. ἄμβων, ridge, reading-desk]: a reading-desk or pulpit which was common in ancient Christian churches, and is still found in Oriental churches. The Gospels and Epistles were read from the ambo.

Amboina: See AMBOYNA.

Amboise, am'-bwaws' (anc. *Ambacia*): an old town of France, in the department Indre-et-Loire, on the railway from Orleans to Tours, 14 miles by rail E. N. E. of Tours (see map of France, ref. 5-E). Here is a splendid château of the time of the Renaissance. It is celebrated as the place of imprisonment of Abd-el-Kader from 1848-52. Here the "Conjuration d'Amboise," a conspiracy of the Huguenots against the Guises, was formed in 1560. It has been the residence of several of the Kings of France. Pop. (1881) 4,167.

Amboise, GEORGES, Cardinal d': French statesman; b. at Chaumont-sur-Loire in 1460. He became Archbishop of Rouen in 1493, and a faithful adherent of the Duke of Orleans, who, on ascending the throne as Louis XII. in 1498, chose him for his prime minister, and in the same year he became a cardinal. He was an able administrator and a prudent counselor. He retained power until his death at Lyons, May 25, 1510.

Am'boy: city; Lee co., Ill. (for location of county, see map of Illinois, ref. 2-E); 94 miles W. of Chicago; at the junction of the C., B. and Q. and Ill. Cent. R. Rs. It has a fine public hall, 4 free-school buildings, 6 churches, 2 newspapers, grain-elevators, and the Illinois Central shops, employing over 400 hands. It was laid out in 1854. Pop. (1870) 2,825; (1880) 2,448; (1890) 2,257; (1900) 1,826.

PUBLISHER OF "NEWS."

Amboy'na (Malay, *Ambun*): the most important, though not the largest, of the Moluccas or Spice islands, situated E. of Booro, in lat. 3° 46' S., lon. about 128° E. (see map of East Indies, ref. 8-I). It is about 30 miles long, and has an area of 264 sq. miles. The surface is mountainous, and granite rock occurs on the summits of some of the mountains. The staple production is cloves, the trade in which was once monopolized by the Dutch. About 500,000 lb. of cloves is the average quantity annually produced here. The aborigines of the island are called Horaforas, but the most of the population are Malays, and the inhabitants are mostly Christians or Mohammedans. The Portuguese were the first Europeans that visited Amboina (1512), and they obtained peaceable possession in 1580; it was taken by the Dutch in 1605. A British settlement was made here about 1615, which was destroyed by the Dutch in 1623. The island was taken by the British in 1796, and restored in 1802; retaken by the British in 1810, and restored again in 1814. Pop. estimated at 30,000.

Amboyna: the capital of the Dutch Government of Amboina, on the island of the same name, and defended by Fort Victoria (see map of East Indies, ref. 8-I). It is regularly built, has a public garden, and a good harbor. Pop. about 13,000.

Ambra'cia: a town of ancient Greece, on the site of the modern Artta; was the capital of Epirus during the reign of King Pyrrhus, who was killed 272 B. C.

Am'briz: formerly a small native kingdom on the west coast of Africa, about the lower part of a river of the same name, now a part of the Portuguese colony of Angola. The name is applied now to a race of natives in this part of Africa, and the river is called Brisho or Loge.

Am'bros, AUGUST WILHELM: German composer; b. at Mauth, Bohemia, Nov. 17, 1816; became in 1869 Professor of Music in the University of Prague. Among his works are overtures to *Genofeva* and *Othello*, and a *History of Music* (Geschichte der Musik, 1862-68). D. in Vienna, June 28, 1876.

Am'brose, SAINT: one of the Latin Fathers of the Church; b. in Gaul about 340 A. D. He was a son of the Roman prefect of Gaul, and is supposed to have been born at Treves. Having studied law, he was appointed Governor of Liguria and Æmilia, with his residence at Milan, about 370, and distinguished himself in that position by his wisdom and moderation. On the death of the Bishop of Milan in 374 A. D., a violent contest ensued between the Catholics and Arians about the choice of his successor. By general consent Ambrose, who was not obnoxious to either party, was elected bishop, although he had never been a priest. He accepted the office with reluctance, but performed its duties with great ability and zeal. Under his preaching Augustine was converted. He favored the Catholics and earnestly opposed Arianism, but he does not appear to have been a violent persecutor. On several occasions he manifested moral courage by denouncing the sins and checking the arrogance of temporal rulers and potentates. The Emperor Theodosius the Great having ordered a massacre of the Thessalonians in 390, Ambrose forbade him to enter the church, and extorted from him the performance of a public penance of eight months, and the promise that thereafter no sentence of death should be executed until thirty days after it was passed. D. at Milan, April 4, 397 A. D. He was the author of a method of singing called the "Ambrosian Chant," and left numerous religious works and letters. He is commended by Villemain as "a man who, amid the turbulence and instability of the empire, never had a foible or a stain on his character, and whose magnanimity was adequate to all trials."

Revised by S. M. JACKSON.

Ambro'sia [from Gr. ἀμβροσία, to ἀμβροτος, immortal; ἀ-, not + βροτός (< *μροτός), mortal]: in classic mythology, "the food of the gods," which was supposed to confer immortal youth. According to a poetical legend, it was sometimes given to mortals who were favorites of the gods, and was used by Jupiter and Venus to anoint their hair. Ambrosia is also the name of a genus of weeds, one species of which, common in the U. S., is known by the name of hogweed or Roman wormwood.

Ambrosian Chant: the choral music of the early Christian Church; derived its name from St. Ambrose, Bishop of Milan, who introduced it into the Western Church about 386 A. D. The style of singing was antiphonal; the musical notation was, no doubt, borrowed from the Greek, and adapted to the church services. The Ambrosian chant is the foundation of ancient church music.

Am'brototype: See PHOTOGRAPHY.

Ambula'era [plur. of Lat. *ambula'crum*, walk, avenue, from *ambula're*, walk]: the series of tube-feet or locomotor organs of the starfishes, sea-urchins, and other echinoderms. In those with hard exoskeleton the feet protrude through perforations in the shell, and are grouped in definite areas, occupying in the starfish grooves along the under side of the arms, and in the sea-urchin forming usually five meridional bands. Each tube-foot consists of a thin extensible tube with muscular walls, provided with a terminal sucker for attachment to foreign bodies. Attachment being made, the tube contracts and draws the animal forward. The tube-feet form a part of the water-vascular system, and are filled with fluid. They are sensory as well as locomotor in function, those nearest the tips of the arms in the starfish being largely used for this purpose. The term ambulacra is also used for the perforated areas of the shell.

DAVID S. JORDAN.

Am'bulance [Fr. for earlier *hôpital ambulant*, movable hospital; Lat. *ambula're*, to walk]: in France, a movable hospital attached to each division of an army, and furnished with apparatus for the relief of the sick and wounded. It was invented or improved by Baron Larrey, and is only intended to afford help of a more or less temporary kind. The name is now commonly given to a covered vehicle by means

of which wounded men are removed from the field of battle. Improvements were made in the construction of ambulances during the civil war in the U. S., 1861-65, the excellence of which was recognized by their use during the Franco-German war of 1870. Ambulances are now attached to the hospitals of many American and European cities.

Ambulance Corps: a body of men employed in the British army in the Crimean war to drive ambulances and attend the sick and wounded. The experiment was not successful, and the ambulance corps was superseded by the land transport corps. In the civil war of the U. S. (1861-65) the officers and men of the ambulance corps were detailed from the line.

Amelan'chier: See JUNE-BERRY.

Ame'lia: See AMERIA.

Amelia Island: in the Atlantic; a part of Nassau County, which forms the N. E. extremity of Florida (for location, see map of Florida, ref. 2-J). It is 16 miles long and 4 miles wide. Amelia island light, in lat. 30° 40' 23" N., lon. 81° 28' 20" W., is at the N. end of the island. The lighthouse is built of brick, 58 feet high, and shows a flashing white light 112 feet above the level of the sea.

Amélie-les-Bains, ä-mäy-lee'lä-bän' (i. e. the baths Amelia): a celebrated bathing-resort in the Eastern Pyrenees, France; 700 feet above sea-level (see map of France, ref. 9-F). The waters are sulphurous saline, with temperatures ranging from 71° to 172° F. They are useful in diseases of the liver and respiratory organs, rheumatism, scrofula, and syphilis. Pop. about 2,000. M. W. H.

Amelot de la Houssaye, äm'lō' de-la-oo'-sä', ABRAHAM NICOLAS: b. at Orléans, France, in 1634; served for some time as secretary to the French embassy at Venice, but devoted himself afterward exclusively to the study of history and literature. D. in Paris, Dec. 8, 1706. He wrote *Histoire du Gouvernement de Venise* (3 vols., 1676); also translated Paoli Sarpi's history of the Council of Trent, and the *Prince* by Macchiavelli.

Amen [Gr. ἀμήν, from Heb. *āmēn*, certainty; as an adv., surely]: in the service of the Christian Church, a response and expression of assent at the end of a prayer. In some passages of the New Testament, at the beginning of an emphatic declaration, it is translated "verily."

Amende Honorable: in French law, a form of infamous penalty to which criminals who offended against public decency or morality were condemned. The simple *amende honorable* consisted of a confession in open court made by a bareheaded and kneeling criminal. The *amende honorable in figuris* was made by a culprit kneeling in his shirt, with a torch in his hand and a rope round his neck. In modern speech the term is applied to a public recantation or apology.

Amend'ment: in law, is the correction of an error committed in any process, or the alteration of the record or of any pleadings in a civil or criminal cause. The deficiency of means of amendment in pleading at common law led to the statutes of amendments and jeofails.

AMENDMENT, in legislation, is an alteration in the words of any bill, motion, or resolution. Any member may move an amendment to a bill or resolution after it has been read twice, and it is usual to take a vote on the amendment first, and next on the main question. An opponent of a bill has a right to move an amendment to it by a motion to strike out all after the enacting clause, and to substitute a contrary principle. Either House of Parliament (or Congress) has a right to amend a bill which has been approved by the other, but such amendments must receive the assent of both Houses before the bill can become a law.

The term amendment is also applied to an alteration of the Constitution of the U. S. To render an amendment valid it must be first proposed by two-thirds of both Houses of Congress, and must be ratified by the Legislatures of three-fourths of the several States. The most recent of these changes in the organic law is the Fifteenth Amendment, which ordains that no man shall be disfranchised on account of color or race. See CONSTITUTION.

Ameno'phis (or Am'enoph) I.: a powerful King of Egypt; the second of the ten kings of the eighteenth dynasty, began to reign about 1500 B. C.

Amenophis (or Amenoph) II.: the sixth king of the eighteenth Egyptian dynasty; regarded by some authors as identical with Memnon, who fought against the Greeks at the siege of Troy. See MEMNON.

Amenophis III.: a grandson of the preceding, and the eighth king of the eighteenth Egyptian dynasty. He ascended the throne about 1400 B. C. His reign was long, and greatly promoted the prosperity of Egypt, which he adorned with many noble monuments. He is supposed to have built the palace of Luxor (El-Ukser) at Thebes, which was his capital. His military exploits are recorded on the obelisk now standing in the Place de la Concorde in Paris. According to Bunsen, Amenoph III. was the king whom the Greeks called Memnon.

Amen'ta, NICCOLO: b. at Naples, Italy, in 1659; was a poet, lawyer, and philologist, and composed popular comedies. Among them are *Constanza, Il Forca,* and *La Carlotta*. He wrote also *Della Lingua nobite d'Italia*. D. in 1719.

Amenta'ceæ [from Lat. *amenta'ceus*, having an amentum or thong]: a name given by Jussieu to a natural order of dicotyledonous trees or shrubs having their flowers arranged in aments or catkins. It included the birch, willow, alder, and other common trees. By many botanists this order has been broken up into the *Betulaceæ, Saticaceæ,* and others. The order (or cohort) *Amentales* of recent botanists includes the families *Cupuliferæ, Juglandaceæ, Myricaceæ, Casuarinaceæ, Salicaceæ, Piperaceæ, Chloranthaceæ,* and *Lacistema-ceæ*.

CHARLES E. BESSEY.

Amentum: same as *Ament*. See CATKIN.

A'merbach, BONIFACE, son of JOHANN AMERBACH: b. at Basel, Switzerland, in 1495; taught civil law at the University of Basel for twenty years, and was intimate with Erasmus, who appointed him his residuary legatee. With his brothers he corrected an edition of St. Jerome (1516-26). D. at Basel in 1562.

Amerbach, JOHANN: b. at Reutlingen, Swabia, in 1443; was a famous printer of Basel, Switzerland, in the fifteenth century. He was the first to use the Roman type instead of Gothic and Italian, and published the first edition of the complete works of St. Augustine, on which he spared no labor or expense. He was rich, learned, and pious, and had previously published the works of St. Ambrose, and afterward undertook to prepare those of St. Jerome, which were published after his death under the direction of his sons. D. at Basel, Dec. 25, 1513.

Amercement, or Amerciament [Anglo-Fr. *amercement*, from vb. *amercier*, deriv. of *à merci*, e. g. in phrase *estre à merci*, to be at mercy of; *estre amercie*, to be fined at discretion; *merci* < Lat. *mer'ces*, -e'dis, wages, gift, favor, mercy]: a pecuniary punishment which is imposed at the discretion of the judge or court. Fines differ from ameracements by growing expressly from some statute, while ameracements are such as are arbitrarily imposed.

Ame'ria: one of the most ancient cities of Umbria, and one of the most important; about 15 miles S. of Tuder and 7 W. of Narni, between the Tiber and the Nar and a few miles above their junction (see map of Italy, ref. 5-E). It is said to have been founded in 1135 B. C., but this date is not historical. Its territory extended to the Tiber and abounded in osiers and fruit-trees. Its lands were divided by Augustus among his veterans. The modern town of *Amelia* retains the ancient site and parts of the ancient wall. It is the see of a bishop, and has a population of 9,000.

Amer'ica [so named from Amerigo Vespucci, who discovered a portion of the continent in 1499]: one of the four great recognized divisions of the globe; first practically made known to Europeans by Columbus in 1492, although parts of it were visited by the Northmen in the eleventh century, but they made no permanent settlements.

Situation and Area.—America appears to be separated into two continents, North and South America, connected by the Isthmus of Panama or Darien. It stretches from Boothia Felix, lat. 71° 55' N., to Cape Horn, 56° S. In its widest parts it measures over 3,000 miles, the extreme E. point being Cape St. Charles, in lat. 55° N., and the farthest W., Point Parina, lon. 81° W. from Greenwich. The narrowest part at the isthmus is 28 miles. The N. boundary is the Arctic Ocean; the E., through its whole extent, the Atlantic; the Southern Ocean washes its coast on the S., and its W. shores are bounded by the Pacific. America is about four times as large as Europe, and one-third larger than Africa. While rather less than Asia in area, it embraces about three-tenths of the land on the earth. In physical features it surpasses all other regions of the globe in the length and volume of its rivers, the area of its lakes, the extent of its valleys, and the number of its mountain-ranges

(inferior in height to the Himalayas alone), while its active volcanoes embrace more than two-thirds of those known to exist. The continent stretches over about 126° of latitude—8,280 miles—being much longer than any other.

The following table, based on the best authorities, gives the principal political divisions of the continent, with their areas and populations:

NAMES OF COUNTRIES.	Sq. miles.	Population.
North America	8,629,790	80,056,538
Bermuda islands.....	20	15,884
Canada, Dominion of.....	3,315,647	4,829,411
Greenland.....	500,000	10,221
Mexico.....	756,232	11,984,483
Newfoundland and Labrador.....	462,300	210,556
St. Pierre and Miquelon.....	91	5,983
United States.....	3,595,600	63,000,000*
Central America	169,328	3,296,488
Costa Rica.....	20,873	243,205
Guatemala.....	46,800	1,452,000
Honduras, British.....	8,000	31,471
Honduras, Independent.....	46,400	431,917
Nicaragua.....	40,000	360,000
Salvador.....	7,255	777,895
West Indies	90,403	5,461,980
Spanish possessions.....	46,934	2,439,395
British possessions.....	13,241	1,379,748
Haiti.....	10,204	572,000
Santo Domingo.....	18,045	610,000
French possessions.....	999	342,889
Danish possessions.....	127	32,786
Dutch possessions.....	403	45,162
Venezuelan possessions.....	450	40,000
South America	7,186,811	38,367,255
Argentine Republic.....	1,125,086	3,973,626
Bolivia.....	567,240	2,019,549
Brazil.....	3,209,878	16,300,000
Chile or Chili.....	293,970	3,414,000
Colombia.....	514,000	4,200,000
Ecuador.....	120,000	1,270,000
Guiana, British.....	109,000	288,323
Guiana, French.....	46,840	25,796
Guiana, Dutch.....	46,060	82,000
Paraguay.....	97,707	490,000
Patagonia (in Argentina and Chile).....	.....	.....
Peru.....	378,000	3,250,000
Uruguay.....	72,170	728,447
Venezuela.....	597,960	2,323,520
Falkland islands.....	6,500	1,789
Galapagos islands.....	2,400	200
Total America	16,076,332	127,182,261

* Including Alaska and Indians.

NORTH AMERICA.

North America extends from the Arctic Ocean to the Gulf of Mexico and Central America on the S. With the general outline of a triangle, it is deeply indented by inlets, bays, and gulfs, and has a length of about 13,700 miles on the Atlantic, 10,500 on the Pacific, and 3,500 on the Arctic; total, 27,700 miles of coast-line. The continent approaches closely to Asia on the N. W. at Bering Strait, 48 miles wide. In the N. E., Greenland is separated from the continent by Baffin Bay and Davis Strait.

Physical Features.—North America may be roughly stated as presenting—1. In the N. a vast series of plains, bleak and barren and crowded with lakes, extending from about lat. 50° N. to the Frozen Ocean; 2. The region E. of the Appalachian range, consisting of lands mostly of low elevation and diversified soil; 3. The central valley of the Mississippi, reaching from the Alleghanies to the Rocky Mountains, and embracing in its E. region the richest agricultural portion of North America, in its W. the arid and sandy plains of the Great American Desert; 4. The W. plateau, stretching from the Rocky Mountain range to the Pacific, a region rich in minerals, with a varied soil and a generally equable climate; 5. The elevated table-lands of Mexico, with their extensive mountain-ranges, and narrow coast-line of lowlands on the E. and W.

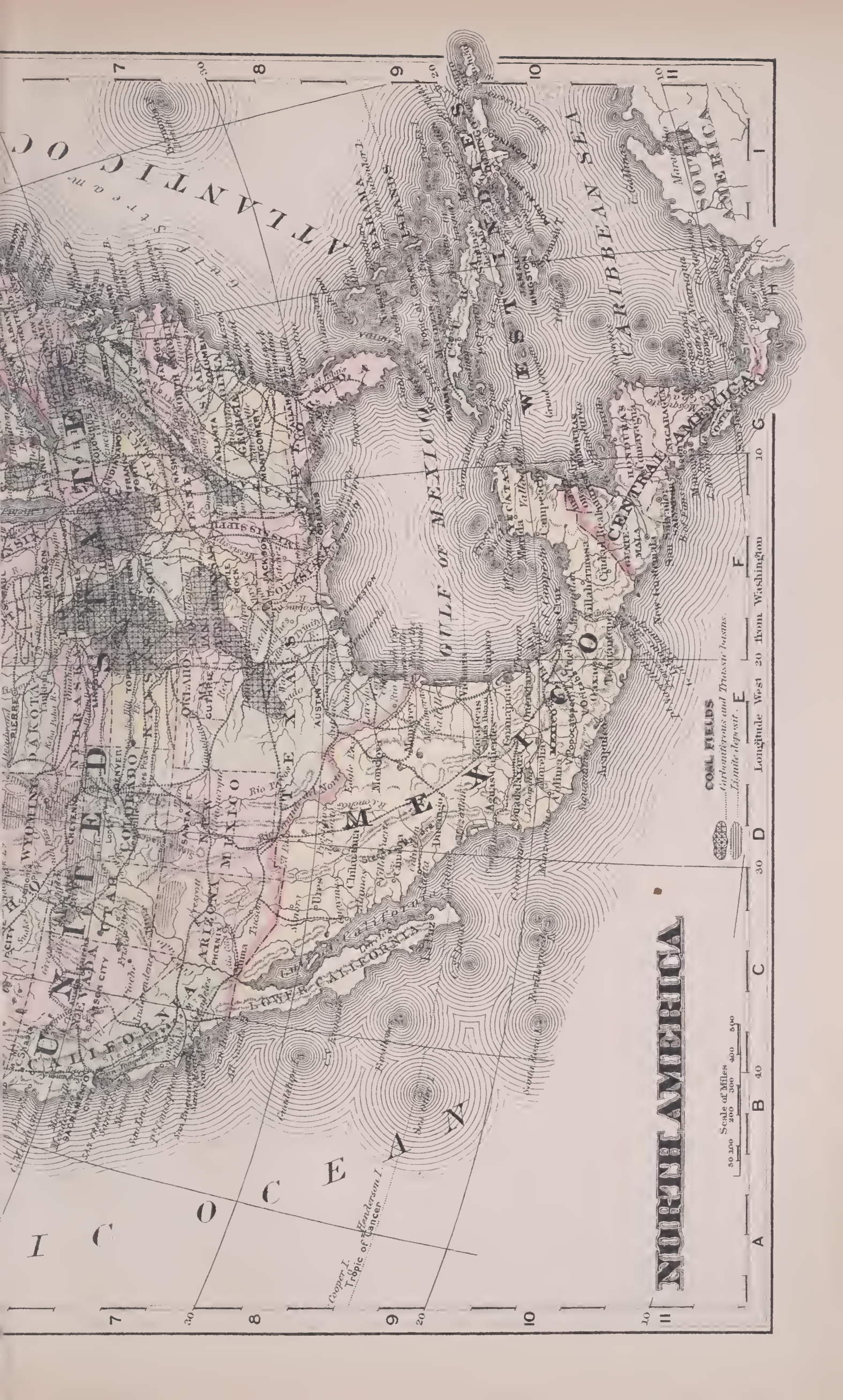
Mountains.—The great characteristic ranges of mountains in North America, creating marked divisions of its watersheds, and with broad valleys between, are the Rocky Mountain range in the W. and the Appalachian (sometimes called the Alleghanies) in the E. The Rocky Mountains (*q. v.*) may be said to begin in British American territory, above lat. 60° N., stretching in a southern direction through Montana, Idaho, Wyoming, and Colorado, until they meet the Sierra Madre range, which runs from New Mexico through the greater part of the Mexican republic. The highest Rocky Mountain peaks are the Holy Cross, Pike's, Long's, and

Torrey's peaks, rising to a height of between 14,000 and 14,400 feet. They are, however, overtopped by Mt. Whitney, in the Sierra Nevada range, California, 14,898 feet high. Numerous collateral ranges, frequently classed as part of the Rocky Mountain system, run in directions generally parallel. These comprise the Cascade Mountains, stretching far northward from S. Oregon into British America, the Coast Range and Sierra Nevada in California, the Wasatch Mountains in Utah, the Wind River Mountains and the Black Hills in Wyoming and Dakota. The Cascade range extends along the coast as far N. as Alaska, its loftiest peak, Mt. Logan, about 60° 30' N., being 19,500 feet high. Southward the mountain-ranges of Mexico have the volcanic peaks of Orizaba, 18,314 feet, and Popocatepetl, 17,887 feet. The Appalachian system stretches from Western North Carolina northward in Virginia and Pennsylvania, terminating in isolated mountains of lesser elevation and the White Mountain range in the New England States. The highest summit of the White Mountains is Mt. Washington, 6,293 feet. The highest Appalachian peak is Mt. Mitchell in the Black Mountains of North Carolina, 6,688 feet. See APPALACHIAN MOUNTAINS.

Rivers.—A marked feature of North America is its navigable rivers, affording means of interior communication to an extent unequalled on the other continents. The Mississippi alone, with its branches, supplies more miles of inland navigation than all Europe possesses. The distance from the mouth of the Mississippi to the farthest point navigable on the head-waters of the Missouri is 3,900 miles, and this great river, with its tributaries, drains twenty States and three Territories. The St. Lawrence affords a water transit (including the lakes with which it communicates) of 2,200 miles. The Mackenzie river in the N. flows through British territory into the Arctic Ocean (about 2,300 miles), and the Saskatchewan (1,200 miles) into Lake Winnipeg, while the Frazer river runs through British Columbia to the Pacific. The Yukon, of Alaska, is about 2,000 miles long. The Columbia rises in the Rocky Mountains, flows through Washington and Oregon, and reaches the Pacific. The Hudson, navigable for 150 miles above New York, is always crowded with commerce. The Rio Grande del Norte flows into the Gulf of Mexico, and the Colorado into the Gulf of California.

Lakes and Bays.—The inland seas of North America comprise Lakes Superior, with an area of 30,829 sq. miles; Erie, 9,900 sq. miles; Ontario, 7,104 sq. miles; Huron, 22,322 sq. miles; and Michigan, 21,729 sq. miles. Lake Champlain lies between New York and Vermont. All these are great avenues of commerce, while Lakes Winnipeg, Athabasca, Great Slave, and Great Bear, lying in the bleak regions of the N., are less navigated. Many lesser lakes are scattered through the Northern U. S. The Gulf of Mexico washes the southern boundary of the U. S.; the Gulf of California is on the W. coast. Baffin Bay and Hudson Bay are large and almost land-locked bodies of water to the N. of Canada; and these, with the Gulf of St. Lawrence, form the most notable of the bays which indent the coast, but the smaller ones are almost innumerable.

Geology and Minerals.—It is impossible to analyze the diversified geological structure of the continent in a brief space. The palæozoic rocks cover the greater portion, consisting of Silurian, Devonian, and carboniferous strata, the latter furnishing great coal-fields in Pennsylvania and other border-lands of the Appalachian chain, in Illinois, Michigan, and in British America. Glacial drift and bowlders are scattered profusely over many regions N. of about 40°. The Atlantic coast develops the cretaceous and tertiary strata, with gneiss beneath it, the latter covered partially by new red sandstone on the east slope of the Alleghanies. Large areas of cretaceous, triassic, and oölitic rocks are found in the W., and in California the secondary strata and tertiary beds are most prominent. British America abounds in the Laurentian and Huronian rocks, being the most ancient yet found, and these extend S. to the Adirondack region in New York. The Rocky Mountains exhibit volcanic rocks and the upheaved strata of granite, slates, and carboniferous rocks. The great plateau running from Mexico to British America, W. of the Rocky Mountains, and bisected by the cañons of the Colorado to the depth of several thousand feet, exhibits specimens of almost all the geological structures. North America, since the middle of the nineteenth century, has been one of the richest parts of the globe in the production of gold and silver. As regards gold, it is now surpassed in richness and production by both South



NORTH AMERICA

Scale of Miles
0 100 200 300 400 500

COAL FIELDS
Carboniferous and Triassic basins.
Lignite deposit.

Longitude West 20 from Washington

Cooper I.
Topic of Anderson I.

Africa and Australia (see WITWATERSRAND), but still holds first place as regards silver. Copper is largely mined on the shores of Lake Superior in Michigan, and in Mexico. The upper Mississippi affords lead-ore in abundance, and the Sudbury district of Ontario is rich in nickel. Quicksilver is found in California and Mexico. Iron abounds, salt is distributed widely, and the immense coal-beds, both bituminous and anthracite, afford a practically inexhaustible supply of fuel.

Climate.—All the climates of the globe may be found in North America. The New England regions are colder than the W. in the same parallels of latitude, and 10° or 12° lower than the same latitude in Western Europe. Vast regions N. of the lakes are almost uninhabitable from the intense cold, while in the Southern States and parts of Mexico the climate of the torrid zone prevails during a part of the year. The mean range of temperature for the year is as follows in the regions named: Alaska, 42° F.; Alabama, 66°; Massachusetts, 46°; Washington (city), 56°; Greenland, 13°; Mexico (city), 61°; Nova Scotia, 44°; Quebec, 40°; California, 55°; Minnesota, 42°; Florida, 70°. Extremes of temperature and sudden changes occur in most regions remote from the seaboard. The rainfall is variable. Parts of Mexico and California are dry almost throughout the year. The trade-winds blowing from the Gulf of Mexico carry the moisture of the torrid zone up the Mississippi valley, while the great plains directly E. of the Rocky Mountains present an almost rainless region.

Soil and Productions.—With the exception of the arid region near the Rocky Mountains, the stony or sandy or exhausted lands along the Atlantic coast, and the vast bleak regions lying below the Arctic Ocean, the soil of North America is singularly fertile. The rich alluvium on the banks of the Ohio, Mississippi, and other rivers, is almost inexhaustible. The Western prairies and the wooded regions of the Northern and Southern States have a productive soil. The table-land of Mexico, with parts of California and the Great American Desert, are without forests. Canada is rich in timber; so are some parts of the Northwestern and Southern States. The most valuable forest trees are the oak, maple, hickory, chestnut, pine, ash, beech, poplar, black walnut, tulip, and white cedar. Indian corn, or maize, is the most important grain crop; wheat, oats, rye, and barley come next. The hay crop is of great value; so are potatoes. Cotton ranks among the most important products. Large quantities of tobacco, rice, and sugar-cane are produced, although their area of production is limited. Fruit-trees, including the apple, pear, peach, orange, etc., are widely raised. The grape has of late years become a very important crop.

Zoölogy.—The animals of North America include every important species known in Europe, and there are remains of several extinct mammals and birds. The bisons, or buffaloes, are fast disappearing. The deer family embraces several varieties—reindeer in the Arctic region, the moose in Maine and British America, and the *Cervus americanus* among the forests and mountains of several States. Other wild animals are the bear, panther, lynx, wildcat, wolf, dog, fox, beaver, otter, raccoon, badger, opossum, antelope, squirrel, muskrat, hedgehog, hare, weasel, and gopher. Among domesticated animals, horses, sheep, cattle, and swine are abundant. The birds of North America, elsewhere described, number about 700 species, embracing the turkey, pheasant, buzzard, hawk, pigeon, eagle, vulture, owl, grouse, quail, wild goose, swan, duck, pelican, lark, thrush, mocking-bird, robin, woodpecker, parrot, humming-bird, grosbeak, whip-poor-will, kingfisher, bluebird, jay, oriole, cedar-bird, etc. Serpents are numerous, the rattlesnake being the most venomous. Alligators abound in the Southern rivers, and turtles, toads, and frogs everywhere. Fish are abundant and valuable, including salmon, shad, cod, mackerel, sturgeon, trout, whitefish, herring, sheepshead, bass, perch, bluefish, etc.

Population and Language.—What may have been the origin of the aborigines of North America is a problem still unsolved. There yet remain of the indigenous races between four and five millions, mostly in Mexico. The Esquimaux appear to be a distinct race. All the native races are copper colored, though of a different tinge, with black straight hair. They are in general a stationary, unprogressive race. The number of languages spoken nearly equals that of all the rest of the globe, and all attempts to trace these confused dialects to Eastern originals are more fanciful than scientific. The natives of Alaska are sup-

posed to be of different origin from the other American Indians. (See INDIANS OF NORTH AMERICA.) The African race, originally introduced as slaves, now number over 7,000,000, mostly in the Southern U. S. The white population numbers about 75,000,000, of whom more than three-fourths inhabit the U. S. They are mostly of the Germanic branch of the Caucasian race, those of Latin descent being chiefly in Mexico. The Anglo-Saxon element peoples over two-thirds of the settled regions, and the English language is that of nearly nine-tenths of the population, the one considerable exception being the Mexican use of the Spanish tongue.

Religion, Education, etc.—Protestant Christianity is the more prevalent religious belief in North America. Methodism outnumbers any other, the Baptist coming next, and the Presbyterian third, followed by the Congregational and the Episcopal. The Roman Catholic worship is widely prevalent in the U. S., and in Canada embraces more than one-third of the population. In Mexico the great majority are Roman Catholics. Mormonism's main foothold is in Utah. Education is widely diffused in the U. S. and Canada. The percentage of illiteracy, however, embraces one-fifth of the population of ten years and upward. In Mexico and New Mexico there is a large ignorant native population.

Discovery and Settlement.—As has already been said, Northmen landed in Greenland early in the eleventh century, and undoubtedly went as far S. as what is now Rhode Island. Columbus reached the West India islands in 1492, and subsequently discovered the mainland of South America. The mainland of North America was probably first touched by John Cabot in 1497. In 1500 the Portuguese Cortereal touched at Labrador; in 1513 Balboa crossed the Isthmus of Darien and found the South Sea; in 1519 Cortez invaded Mexico, and finished its conquest in 1521; in 1535 Cartier sailed through the Gulf of St. Lawrence; in 1537 Cortez discovered California, and took possession of it in the name of Spain; in 1578 New Albion was discovered by Sir Francis Drake; in 1587 John Davis found the Cumberland islands and Davis Strait; in 1604 De Monts made the first settlement in Acadie (Nova Scotia). The first permanent English settlement in North America was made in 1607 at Jamestown, Va. In 1608 the French founded Quebec; in 1611 Newfoundland was colonized by the English, and the Dutch settled on the Hudson; in 1614 New York was founded; in 1618 Baffin sailed N. to lat. 78°, and named Baffin Bay. In 1620 took place the settlement at Plymouth of the first English colony in New England. In 1682 William Penn founded a colony in Pennsylvania, and in the same year La Salle took possession of Louisiana in the name of France; in 1683 Georgia was colonized by the English.

History.—The most marked historical events in the history of North America have been—1. The transfer of most of the French colonies to Great Britain after the French war of 1756–63, by the treaty of Paris, in the latter year; 2. The American Revolution, ending in the independence of British rule of the U. S., 1775–83; 3. The independence of Mexico of Spanish rule, accomplished in 1821. The subsequent history of the various countries, the United States, Mexico, and the British colonies will be found under their respective headings.

LITERATURE.—Humboldt, *Examen critique de l'histoire de la géographie du Nouveau Continent* (5 vols., Paris, 1837); Fiske, *The Discovery of America* (2 vols., Boston, 1892); *Narrative and Critical History of America*, ed. by Winsor (8 vols., Boston, 1886–89); Payne, *History of the New World called America* (London, 1892).

A. R. SPOFFORD.

Revised by R. LILLEY.

CENTRAL AMERICA.

CENTRAL AMERICA is an isthmal prolongation of the southern end of North America, joining it to South America, and lying between the Caribbean Sea on the E. and the Pacific Ocean on the W. The name is variously used to include widely different extents of territory. Physically, Central America begins southeastward where the Isthmus of Panama joins South America, and it may be said to extend northward to the Isthmus of Honduras or to that of Tehuantepec, thus including Yucatan and Southern Mexico. With zoölogists and botanists the term now includes the region from Panama through Mexico into Southern Texas, but only part of Northern Mexico. In its early history Panama must be included, while Guatemala and Yucatan are linked rather to Mexico. In its later history Pana-

ma is excluded, and Yucatan, Guatemala, and the Mexican state of Chiapas are taken in. Politically, at the present day (1893) the name Central America is used collectively for the five independent states of Guatemala, Salvador, Honduras, Nicaragua, and Costa Rica; the Isthmus of Panama is ruled by Colombia, and is thus included in South America; Chiapas and Yucatan are joined to Mexico; and Belize is a colony of Great Britain. For convenience, we shall include Belize and the Panama isthmus with the five independent states in our general description.

In this sense, then, Central America is a great isthmus extending from the southern boundary of Mexico, at first southeastward and then in a double curve E. N. E. and E. S. E., until it joins the extreme northwestern angle of South America in about 7° 30' N. lat. and 77° W. long. The whole length, including the curves, is about 1,280 miles. The extreme breadth at the northern end is about 315 miles; the eastern indentation of the Gulf of Honduras narrows it to 160 miles; it widens again to 265 miles across Honduras and Nicaragua, thence narrows rapidly to 70 miles in Costa Rica; and the curved portion is a slender neck nearly 400 miles long and, in parts, less than 30 miles wide. This neck is generally known as the Isthmus of Panama, but that name is used in a more limited sense for the eastern portion. See PANAMA.

From N. W. to S. E., Guatemala, Honduras, Nicaragua, Costa Rica, and Panama (Colombia) form a line, all of them extending from the Caribbean Sea to the Pacific. Salvador is a strip cut out from the southwestern side of Honduras, and leaving only a small extent of Pacific coast to the latter; Belize, on the opposite side, is physically a part of Yucatan, and it nearly cuts off Guatemala from the Caribbean Sea. The whole area, including Panama, is about 207,474 sq. miles, and the population about 3,500,000, of whom probably less than 200,000 are whites. See table given on page 148.

Physical Characters.—From the Mexican frontiers to the eastern curve, Central America may be described as mountainous, with small inland plateaus which are little more than wide valleys and strips of low land along the coasts, principally on the Caribbean side. The highest mountains are near the Pacific coast, and they form a broken chain, either close to the ocean or separated by lower but often very hilly lands which may be 50 or 60 miles wide; the descent on the Pacific side is steep. To the E. the slope is gentler, and there is a network of branches spreading over the country and inclosing numerous valleys and plateaus; the latter, by their succession, sometimes forming a series of terraces to the Caribbean coast. The main chain is a continuation of the Mexican Sierra Madre del Sur, but it has no collective name; northward, in Guatemala, its average height is nearly 7,000 feet, and there are peaks rising to nearly 14,000 feet; southeastward it is generally lower and more central, with many low passes, until it dies into the hills of Panama. In Guatemala some of the plateaus are 4,000 feet above the sea, with mountains about them much higher. The Panama isthmus is hilly rather than mountainous, and in some parts of it the highest elevations hardly exceed 300 feet. Structurally it seems to be rather a spur of the Central American mountains than a part of the main chain, and there is no proof that it forms a connecting link between them and the Andes. So far as our present knowledge goes, the old theory that the Andes and the Rocky Mountains formed a continuous chain through Mexico and Central America must be abandoned.

Depressions, Lakes, and Rivers.—East of the main chain in Nicaragua, Central America is traversed diagonally by a great depression. The bottom of this depression is really below the sea-level, but the waters of the two lakes, Nicaragua and Managua, which fill its deeper portions, are somewhat more than 100 feet above mean tide. There are three low passes from the lakes westward to the Pacific, and to the S. E. Lake Nicaragua discharges its waters by the San Juan river into the Caribbean Sea. The rivers, lakes, and one of these passes form the proposed route for the Nicaragua ship-canal. (See NICARAGUA, PANAMA, ISTHMUS OF, and SHIP-CANALS.) There are numerous other lakes in Central America, but most of them are small and some are nothing more than the flooded craters of volcanoes. The whole country is well watered, nearly all the rivers flowing into the Caribbean Sea. From the narrow extent of country drained, none is very long, and only a few are available for navigation.

Volcanoes and Earthquakes.—Central America is intensely

volcanic; forty active or hardly quiescent peaks are known, and the number of extinct volcanoes is very great. The principal centers of active force are at present (1893) in Nicaragua and Salvador. Belize lies beyond the volcanic belt. Among the great eruptions we may mention that of the Volcan de Agua (1541), which overwhelmed the city of old Guatemala by a deluge of water from its crater; and that of Coseguina in Nicaragua (1835), which, during four days, threw out such a tremendous cloud of ashes and sand that the country for a hundred miles around was in midnight darkness. Earthquakes are very frequent, hardly a month passing without at least a slight tremor.

Geology and Minerals.—Too little is known of the geology to attempt any general description at present. What is known of the structure leads us to suppose that Central America was formed by upheavals of very ancient rocks which now appear as highly altered and inclined strata. Along the eastern side there are beds of limestone, some of them said to be of Jurassic age, and the coast alluviums are tertiary or newer. From the general resemblance of marine life on the Caribbean and Pacific side, it has been surmised that there was an opening through the isthmus, probably not longer ago than the middle tertiary.

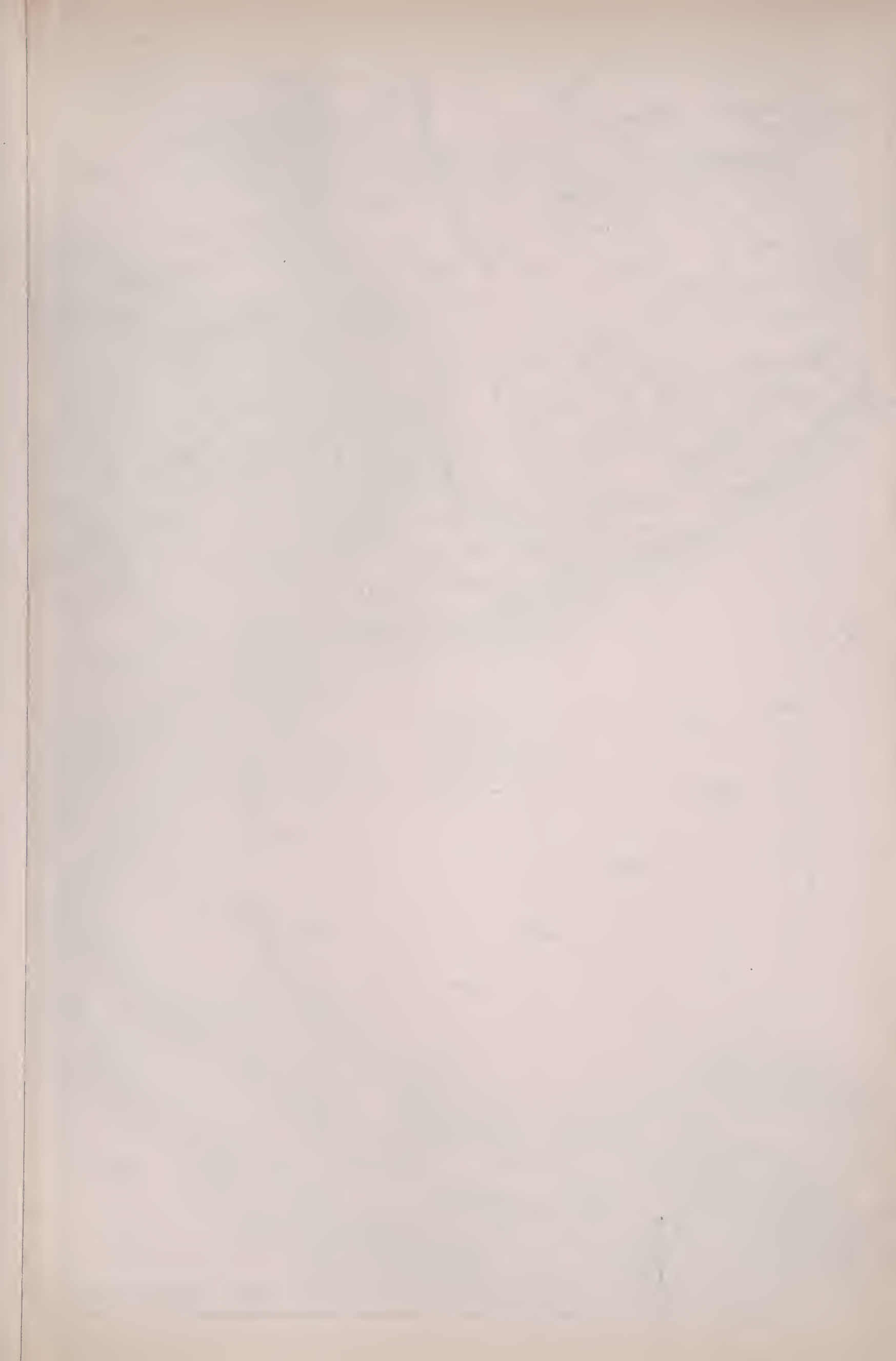
Gold and silver are about the only minerals which are regularly mined. This was the first part of America in which the Spaniards obtained considerable quantities of these metals from the Indians; but the mines thus far have not proved very rich. Copper has been mined and is said to be abundant, and promising deposits of lead, zinc, and nickel have been reported; but these are little more than vague rumors, such as are heard in most thinly settled regions. There are rich iron-ores, but they cannot be profitably worked, owing to the lack of coal. Opals are mined to a small extent in Honduras; large beds of lignite are found in that state, and marble is quarried in Guatemala.

Climate and Distribution of Plant-Life.—Central America receives the trade-winds on its eastern side; these strike the mountains and their moisture is precipitated in heavy rains near the coast. In the interior and on the Pacific coast the abundance or scarcity of rains is due mainly to local causes, the vicinity of high mountains, or the extent of plateaus. The trade-winds also appear to cross the low passes of Nicaragua and Costa Rica diagonally, and strike portions of the Pacific coast. Generally, however, it may be said that the western side is considerably drier than the eastern, though never devoid of rain or subject to long droughts. The so-called dry seasons are only marked by less frequent and less abundant showers. Their period varies in different regions; along most of the eastern side the driest and coolest months are February, March, and April. On the Caribbean coasts the climate is unpleasantly warm and in many places insalubrious. The interior plateaus and valleys are temperate and healthful.

The forests follow the rainy belts. They cover the Isthmus of Panama and most of Costa Rica in one luxuriant mass, hardly broken by the scattered towns and plantations. This forest is continued on the eastern side to Yucatan, in a belt varying in width and including the low coast lands and the eastern mountain sides. In the interior the steeper slopes are generally wooded, but the plateaus and valleys embrace large tracts of grass-land or open tracts with scattered bushes and trees. On the higher mountains there are often forests of oak and pine.

Fauna and Flora.—Central America has a rich fauna and flora, closely related to those of tropical South America. The largest mammalia found are the jaguar and a kind of tapir; among peculiar birds may be mentioned the quetzal (*Trogon resplendens*), whose feathers were formerly used as insignia of rank by the Aztec princes. The rivers and coasts abound in fish. Along the eastern coast, especially in Belize, Guatemala, and Honduras, mahogany-cutting is a regular branch of industry, employing many thousands of the poorer classes; logwood and rosewood are cut and exported in smaller quantities. There are many other valuable timbers, but they are unknown to commerce. The Castilloa rubber-tree (*Castilloa elastica*) grows wild near the eastern coasts, and of late years considerable quantities of rubber have been exported. Sarsaparilla and vanilla are at present the only other forest products of commercial importance.

Soil and Agriculture.—The soil of Central America seems to be naturally fertile, and especially over volcanic rocks which have had time to disintegrate. Only small portions are cultivated and that generally in a very slovenly manner. The most important products for export are sugar





C 02 D 00 E 08 F 88 G Longitude West 86 H

GUATEMALA HONDURAS

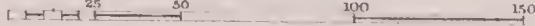
EL SALVADOR

NICARAGUA

15 C D 13 E F 11 G Longitude West 9 H

CENTRAL AMERICA

Scale of Miles



and coffee, but cacao has latterly come into prominence. Indigo, formerly much cultivated on the Pacific side, has been abandoned, the product being superseded by other dyes. All the tropical fruits grow almost without care, and considerable quantities of oranges, bananas, and coconuts are sent to the New Orleans markets. Beans and maize, with yams, sweet potatoes, and the other common tropical vegetables, are grown for home consumption. Manioc is cultivated principally in Belize, Costa Rica, and Panama. The grazing industry is unimportant, though large districts are well adapted to it.

Ethnology and Archaeology.—At the time of the conquest the dominant race in Guatemala, Yucatan, and southern Mexico was what is now known as the Maya stock. Some of them—notably the Quiches and Cakchiquels in Guatemala—had attained a degree of civilization superior, in some respects, to that of the Aztecs. They are among the few American aborigines who have left us written chronicles, legendary in great part, but extending back at least through several hundred years, and perhaps to the eighth century. Their cities were large and well built, and remains of them may still be seen. (See INDIANS OF CENTRAL AMERICA.) But deep in the forests of this region and southward remains of much older cities have been found, and of these we have no historical record. The ruins are of great extent and covered with elaborately carved figures and symbols. The latter appear to be hieroglyphic, but thus far they have baffled every effort to decipher them. That the builders of these cities were powerful appears certain, and their work indicates stability and some degree, at least, of civilization. Some of the sculptures seem closely allied to those of the Aztecs, and possibly they were related to that race. See CENTRAL AMERICAN ANTIQUITIES.

South of Guatemala, Central America was occupied by small tribes, some of whom were agricultural and others wandering hunters and robbers; none appear to have been raised above the savage state. The Spaniards called some of these Indians Caribs, but it does not appear that any true Caribs were found in Central America. The present Caribs of Eastern Honduras, Guatemala, and Belize are descendants of those brought from the West Indies in 1798. See CARIB.

History.—Columbus on his fourth voyage discovered Honduras (Aug. 14, 1502), and followed the coast to South America. Before that, Bastidas, exploring the northern shore of South America, had reached the site of Darien (1501). It is possible, but not probable, that Central America was visited still earlier by an expedition in which Vespucci was a subordinate. (See VESPUCCI.) Pinzon and Solis explored the eastern coast in 1506. In 1509 the Spanish court commissioned Alonzo de Ojeda and Diego de Nieuesa to colonize these countries. Both failed in their attempts, but their expeditions resulted in the founding of Darien by Martin Fernandez de Eneiso (1510). Vasco Nuñez de Balboa, left in charge of this colony, explored the surrounding country, won the good will of the Indians, and heard of the Pacific, which he at length succeeded in reaching (Sept. 28, 1513). See BALBOA.

Pedro Arias de Avila, better known as Pedrarias, was appointed governor of Darien in 1513; he brought with him large accessions to the colony, and during his administration the whole Panama isthmus and portions of Costa Rica were conquered. In 1519 the seat of government was changed from Darien to Panama, on the other side of the isthmus, the former town being for the time abandoned. Pedrarias, on account of his severity, was much disliked. He quarreled with Balboa, and put him to death on a real or fancied charge of treason. When (1522) Gil Gonzales de Avila explored the western coast and attempted to colonize Nicaragua, Pedrarias claimed the territory and sent Francisco Hernandez de Córdoba to drive him out (1524). Meanwhile Cortez had conquered Mexico, and sent expeditions into Central America. Alvarado had conquered Guatemala for him (1523 and 1524), and Cristobal de Olid had advanced into Honduras. Gil Gonzalez, retreating from Córdoba, was driven north into Honduras; and here the three rival factions met: Olid, sent by Cortez from the N.; Córdoba, acting as lieutenant of Pedrarias and coming from Darien; Gil Gonzalez, who owned allegiance to neither. A desultory but bloody warfare ensued, by which Gil Gonzalez was driven out. The other two coveted the country for themselves. Olid threw off allegiance to Cortez, but was killed by Casas; Córdoba rebelled against Pedrarias, but was captured and executed. In these and subsequent quarrels among rival bodies of Spaniards, not only were the ter-

ritorial rights of the Indians ignored, but they were treated as beings who had no rights at all; great numbers were enslaved, and several hundred thousand perished during a few years.

The struggle for supremacy continued in Honduras. Cortez himself marched overland into that country (1524–25), in one of the most terrible journeys ever recorded. Obligated to return, he left a governor there. Soon after, the Spanish court, probably hoping to end the quarrel, formed the captain-generalcy of Guatemala. This embraced the whole of Central America except Panama, and included a large tract in Southern Mexico, the capital being at Granada, and was divided into provinces, generally ruled by governors. This arrangement, with some changes, continued until the revolution. See GUATEMALA.

In the sixteenth and seventeenth centuries the coasts of Central America were repeatedly attacked by the buccaneers and by English freebooters. In 1665 England assumed a nominal protectorate over a portion of the eastern coast, in Nicaragua and Honduras, inhabited by Mosquito Indians. See MOSQUITOS.

Revolutionary movements began in 1811, supporting those of Mexico, but it was only in 1823 that the five states finally threw off their allegiance to Spain and formed a federal union, embracing all the region we have described except Panama. But the disorders which had lasted through the colonial times continued in the republics, and the union was dissolved in 1833. Since then the five states have continued independent. There have been frequent political revolutions in all of them, and none can be said to have a stable government. The most prosperous are Salvador, Guatemala, and Nicaragua.

In 1850 Great Britain resigned her claim to the Mosquito coast of Honduras; but she retained Belize, which had been colonized by British log-cutters in the eighteenth century.

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THE WEST INDIES.

THE WEST INDIES are so called from the belief of the early discoverers that the countries found in the fifteenth century were the western regions of India. They embrace about 900 islands, lying E. of the coast of North and Central America. The name of Antilles is made to embrace all the West Indies except the Bahamas. Another designation divides the West Indies into the Leeward islands, comprising those N. of lat. 15°, and the Windward islands, embracing those S. of that parallel. The Windward islands, or a part of them, were also named the Caribbees, and the sea which they separate from the Atlantic is called the Caribbean. The geological structure of these islands indicates both coral-formation and volcanic origin. The whole submerged region is subject to earthquakes. The rocky

coast of most of the islands abounds in reefs, although there are some good harbors. The Bahama islands embrace the northernmost chain, stretching S. E. from a point near the coast of Florida. On one of this group Columbus made his first landing. The entire West Indies embrace about 90,400 sq. miles, with about 5,500,000 inhabitants. About half the area and population belonged to Spain until 1898. Great Britain holds the dominant share in the remainder, while France, Denmark, and the Netherlands have possessions in this archipelago. Revised by A. R. SPOFFORD.

SOUTH AMERICA.

SOUTH AMERICA, the southern division of the American continent, constitutes an immense peninsula between the South Atlantic and Pacific Oceans, and is joined to the northern division only by the narrow Isthmus of Panama. It is somewhat triangular in form, rather more than 4,500 miles long on a meridian, and about 3,200 in its greatest breadth; the total area is calculated at from 6,500,000 to 7,500,000 sq. miles, divided among ten republics and three colonies. Of this immense area nearly half is included in Brazil, and almost a sixth in the Argentine Republic. For the areas of the various countries, see the table given on page 148. It must be mentioned, however, that nearly all have disputed boundaries, often involving territories of vast extent. As these tracts are very thinly settled, they do not greatly affect the statistics of population given in the table already mentioned. It is proper to state, however, that, with the exception of the Guiana colonies, no South American country has ever had a census that can be relied upon, and most of the official estimates of population are based on old lists. Of the entire population of South America, probably not more than 500,000 belong to independent Indian tribes.

General Topography.—South America has the longest range of mountains, and, next to the Himalayas, the highest peaks in the world, as well as the largest rivers. It may be described as a plateau with a raised edge of mountains; three wide valleys or depressions, meeting above, divide the plateau into three main parts; the rivers flowing from these valleys find an exit through three great gaps in the mountain wall, two to the northeast and the other to the southeast; hence nearly all the drainage is to the Atlantic.

Mountains.—On the W. the Andes follow the coast from Cape Horn almost to the Isthmus of Panama; sometimes close to the Pacific, sometimes separated from it by a strip of low land from 50 to more than 100 miles wide. The mountains themselves vary in width from about 20 miles at the southern end to 250 miles in Bolivia, and 300 or 400 miles in Peru and Ecuador. Generally the main mass is from 8,000 to 12,000 feet high, rising abruptly from the low lands; this is capped by two, three, or more parallel ranges, called Cordilleras, and the latter are often connected by transverse ridges or knots. In these Cordilleras are many peaks rising above 20,000 feet. (See **ANDES**.) Between the Cordilleras there are plains and valleys varying in elevation from 6,000 to 10,000 feet. Quito, in Ecuador, lies in one of these, and is 9,520 feet above the level of the sea. In Bolivia a very extensive inclosed valley is occupied by Lake Titicaca and the Desaguadero river. (See **BOLIVIA** and **TRINCACA**.) In Colombia the Andes divide into three branches. The eastern one crosses Colombia and Venezuela in a nearly northeasterly direction, passes to the S. and E. of Lake Maracaybo, then curves along the whole northern coast of Venezuela to the Boca del Drago, opposite Trinidad. These northern mountains are the Maritime Andes of Venezuela, having an average height of 4,000 to 5,000 feet, but with peaks much higher. On the eastern side of the continent we find another, but much lower, mountain system, that of Brazil, also bordering the coast, but entirely unconnected with the first. It really stretches from the Plata to Cape São Roque, but has a mountainous form only from S. lat. 31° to the river São Francisco. (See **BRAZIL**.) The highest point is Itatiaia, near Rio de Janeiro, about 9,000 feet. A branch runs N. and divides into two, separating the valleys of the São Francisco, Tocantins, and Araguaia, and all three of these from the Paraná. None of the Brazilian mountains are active or recent volcanoes, and none attain the limit of perpetual snow. Guiana and the adjacent parts of Brazil form a table-land, but in the interior there seems to be an E. and W. line of true mountains, with peaks over 6,000 feet high. Humboldt and others supposed that the Guiana highlands were a branch of the Andes, parting from the main range in about N. lat. 3° or 4°, and crossing the Orinoco at the falls of that river; but this has not been proved.

South America is thus surrounded in great part by mountain-ranges, highest on the W. On the eastern side the southern end of the frame is broken between Uruguay and Cape Horn. This gives an outlet to the Paraná river-system. The northeastern side of the continent presents two other great breaks between Cape São Roque and Guiana, and between Guiana and Venezuela; through these breaks flow the Amazon and the Orinoco.

Plateaus.—Within this mountain frame the continent is a great plateau, more or less cut up by river-valleys and divided into three parts by the broad lowlands of the Orinoco, Amazon, Madeira, Paraguay, and lower Paraná. These parts are (1) a strip bordering the eastern slope of the Andes, broadest in Bolivia; it is much broken by spurs of the Andes, and its limits can not be easily defined. (2) The great plateau of Brazil, including most of that country and Paraguay and limited by the lowlands of the Amazon, Madeira, and Paraguay rivers. (3) The Guiana plateau, with its central core of mountains, extending westward to the Rio Negro and Cassiquiari and southward nearly to the Amazon. The average height of all these plateaus is probably about 2,700 feet, but it must not be supposed that they are either level or flat. Commonly they present long slopes or undulating lands; in parts of Bolivia, Brazil, and Guiana they appear to attain nearly 4,000 feet altitude, and in others they sink to only 800 or 1,000 feet. Indeed, the Brazilian plateau where it approaches the Amazon is only 500 feet above the sea. Everywhere they are cut through by the valleys of rivers, and these valleys nearly always have steep or even precipitous sides. The numerous mountain-chains represented on our maps are simply the edges of the plateaus where they abut on the river-valleys. The Brazilian plateau is partly divided by the branch of the coast range already mentioned.

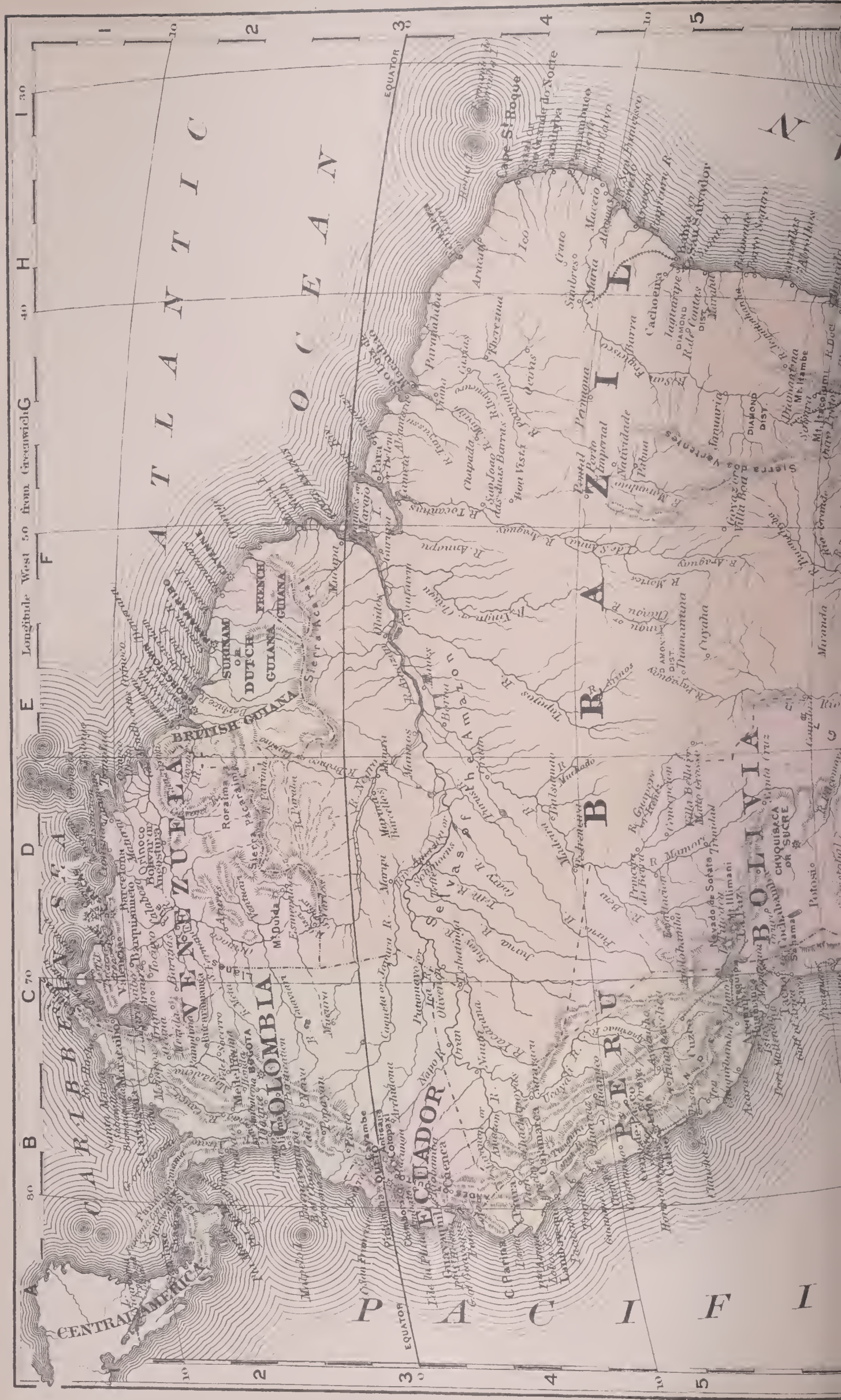
River-plains.—The great river-plains of the Amazon, Paraná, and Orinoco are a distinctive feature of the continent, being vast, level depressions, widest above, where they run into each other; the Amazonian depression is actually joined to the Orinoco by the Rio Negro and Cassiquiari; the Madeira, a branch of the Amazon, is separated from the Paraguay only by a low and narrow ridge. (See **CASSIQUIARI**, **MADEIRA**, and **PARAGUAY**.) The flood-plains, especially of the Amazon and Paraguay, are of vast extent.

The Argentine territory consists mainly of low, flat plains, the pampas, which are physically a part of the Paraná depression. Southward they are open to the Atlantic coast and extend into Patagonia. The llanos of the north are included in the Orinoco depression.

Rivers.—The Amazon, though not the longest river in the world, is by far the largest, the outflow from it being more than double that of the Mississippi; it is navigable for almost its whole length, and with its great tributaries forms an inland waterway of unequalled value. (See **AMAZON**.) The Paraná with the Paraguay—its real continuation—is navigable for 2,500 miles; the Orinoco to about 700, where it is obstructed by falls. The other large South American rivers are properly highland streams, without extensive flood-plains or expanded upper valleys. We may mention here the Uruguay, which meets the Paraná at its mouth, the São Francisco and Paranahyba in Brazil; the Tocantins, generally considered an affluent of the Amazon, but really receiving water from that river and discharging into the sea by a broad estuary, the Pará; and the Magdalena in Colombia. The upper Paraná is properly a branch of the lower Paraná and Paraguay, and is almost entirely a highland river. These, as well as the great affluents of the Amazon, will be described under their respective names.

Lakes.—The largest of these in South America is Lake Titicaca in Bolivia, with an area of about 3,200 sq. miles; it is probably the highest large lake in the world, being 12,600 feet above the sea. The lowlands of the great rivers are dotted with numerous lakes, many of them quite large, but generally shallow. Lake Parima in Guiana, formerly supposed to be very large, is really of insignificant size. Old maps place a lake called Xaraes or Charaes at the head of the Paragnay; this seems to be nothing more than the great plains bordering that river, which are flooded every year. The so-called Lake of Maracaybo in Venezuela is a deep and almost land-locked gulf of the Caribbean Sea.

Islands.—The Straits of Magellan cut off from the southern end of the continent the large island of Tierra del Fuego, and there are numerous smaller islands about Cape Horn. The island of Marajó, at the mouth of the Amazon, is separated from the southern mainland only by a system



Longitude West 5.0 from Greenwich

30 40 50 60 70 80 90

A B C D E F G H I

ATLANTIC

OCEAN

CENTRAL AMERICA

COLOMBIA

VENEZUELA

BRITISH GUYANA
DUTCH GUYANA
FRENCH GUYANA

EQUATOR
ECUADOR

PERU

BOLIVIA

BRAZIL

PARAGUAY

URUGUAY

N

30

2

3

4

5

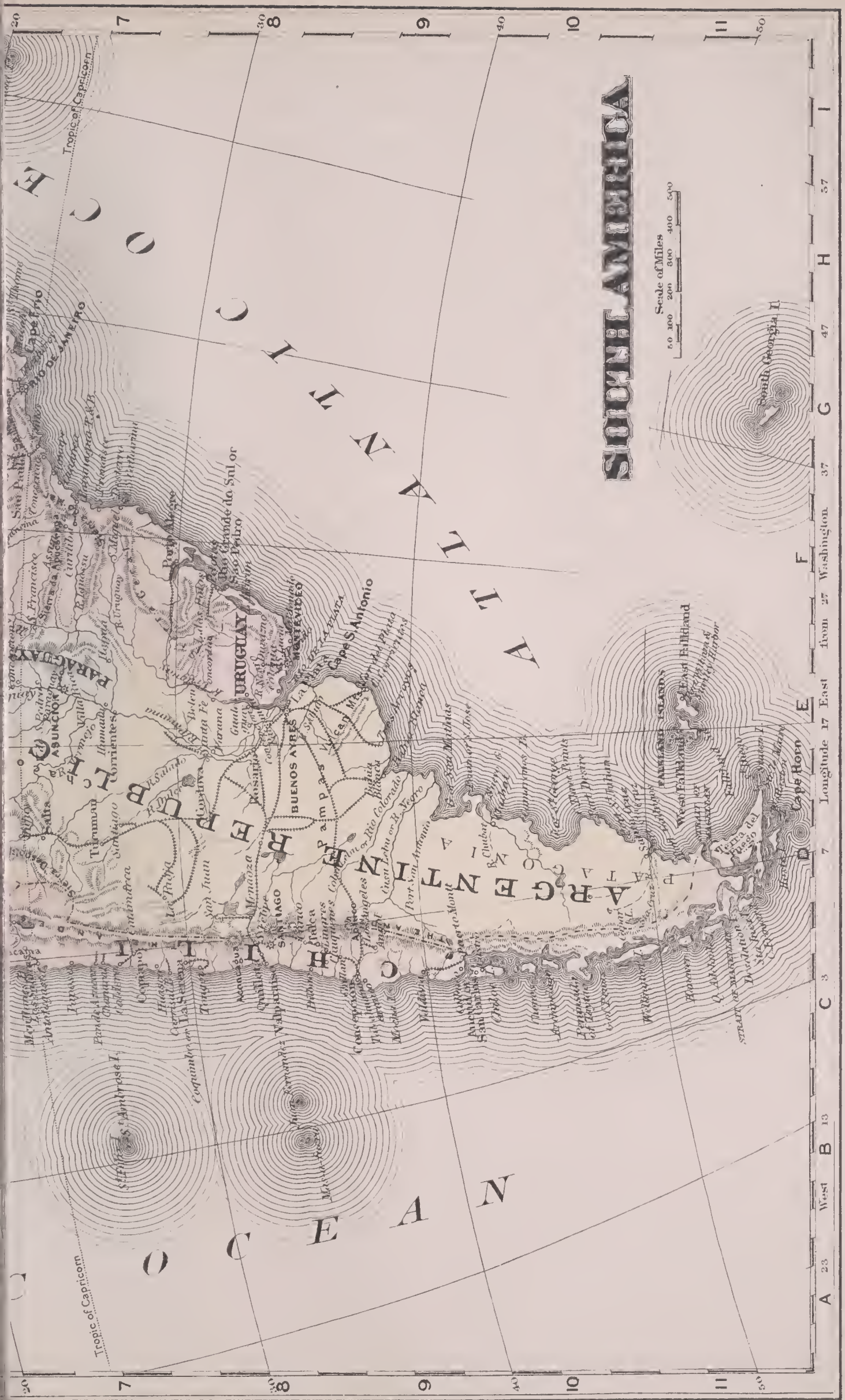
1

2

3

4

5



SOUTH AMERICA

Scale of Miles
0 100 200 300 400 500

A 23 West B 13 C 3 D 7 E 17 East F 27 Washington G 37 H 47 I 57
Longitude

of narrow channels. Of the outlying islands, Juan Fernandez and Mas a Fuera belong to Chili, the Galapagos islands are claimed by Ecuador, and on the east Fernando de Noronha is a penal colony of Brazil; all of these are small. The Falkland islands, east of the Straits of Magellan, belong to Great Britain.

Geology.—Our knowledge of the geology of South America is still too fragmentary to permit a clear general view. It seems certain that the oldest mountains are those of the Brazilian coast range; the forces which raised these have long ceased to be felt, but traces of ancient volcanoes have lately been discovered in them, and these probably had a part in their formation. They date from the Silurian at least, and probably from the Eozoic age. The Andes, in great part, have been raised since the palæozoic and probably since the cretaceous period; it may be surmised that the newest portions are about the volcanic group of Ecuador.

The plateaus are composed mainly of horizontal or little inclined strata with local disturbances. Devonian and carboniferous rocks seem to be widely spread, as they are reported from the Amazon, Central and Southern Brazil, Bolivia, Colombia, Venezuela, and Guiana. Cretaceous deposits also seem to be extensive. The pampas are great stretches of clay and sand-rocks, largely fresh-water deposits brought down from the Paraguay and the Paraná; buried in them are remains of the quarternary and tertiary animals of South America, and numerous species have been described from these as well as from the caves of Brazil.

Probably the great valleys of the Orinoco, Amazon, and Paraná were all originally arms of the sea, which have been gradually filled in with detritus. This was certainly the case with the Amazon valley, for deposits of shells of later tertiary age have been found on the river-banks as far up as Peru. Relics of these inland seas are found in the marine character of the river-faunas; porpoises, for example, are common in both the Orinoco and the Amazon, and crabs of marine forms live far above their mouths.

Minerals.—South America is rich in metals, including gold, silver, copper, mercury, platinum, lead, and iron; the first two are the only ones that have been extensively mined. Gold occurs in nearly all parts of the Andes and on the northern coast; in the interior of Brazil rich mines have been worked, but are now mostly abandoned; that country, in fact, has given to the world more gold than California has, though the mining period was much longer. It is probable that further explorations will result in the opening of new and perhaps richer mines. The gold obtained from the Andes was mainly the spoil of the Incas, which they had accumulated during several centuries. Since 1880 rich gold workings have been developed in Guiana, and the metal is mined to some extent in nearly all the other countries. The Andean region has been most productive in silver; the richest mines being those of Potosi in Bolivia, now worked only on a small scale. Copper and mercury have been mined to some extent along the Andes and northern coast. The rich deposits of iron in South America have been almost unused, owing to the lack of coal; a low grade of bituminous coal is mined in Southern Brazil and Uruguay, and beds are reported from the Argentine, Chili, Bolivia, Colombia, and Venezuela. The diamond mines of Brazil were formerly the principal source of the world's supply, but have been nearly abandoned since the discovery of the South African fields; emeralds are mined in Colombia. Rich guano deposits are worked on islands near the Peruvian and Chilian coasts, and beds of phosphate are among the chief riches of those countries.

Climate.—The greater part of South America lies within the tropics, and almost the widest part of it is under the equator, but the heat is much tempered by various causes. The Andes, owing to their great elevation, include almost every variety of climate, from the hot, dry region of the Pacific coast and the steaming plains of the Amazon to the cold valleys and table-lands; and over these a great number of peaks rise far above the limits of perpetual snow. The Brazilian and Venezuelan mountains rise to a temperate climate, but, except at a few isolated points, they are never very cold. The gaps in the mountain-wall, which afford an outlet to the great rivers, also give ingress to the Atlantic winds, and these cool the whole continent. On the lower Amazon the trade-winds blow regularly during a great part of the year; above the junction of the Negro they form an upper current, which is felt even on the eastern slope of the Andes, as was observed by Orton. These trade-winds are surcharged with moisture from the warm South Atlantic;

rising gradually as they advance over the continent, they are cooled, and discharge the vapor in abundant rains; to the W. they mix with cold currents from the Andes, and there the rains are almost constant; 110 inches have been measured in a single year on the upper Amazon, and the climate is so damp that sugar and salt deliquesce in a few hours, gunpowder becomes useless unless kept in sealed cans, and watches are stopped by the rust. Even at the mouth of the river the so-called dry season is varied by heavy showers. Something similar to this is found on the Orinoco, but the temperature and humidity are less influenced there by the trade-winds, because they blow less directly in the course of the valley. Southward the winds which most influence the continent are those which, passing over the plains of Patagonia and the Rio de la Plata, are known as *pamperos*. These blow only at intervals, from May to September, and they are very cold. Entering the great trough of the Paraná valley, they ascend that river and the Paraguay, cross the low divide, and descend the Madeira to the Amazon. Their prevalence is always marked by a sudden lowering of temperature; on the upper Paraguay, in lat. 15°, water sometimes freezes; and even on the Madeira and Amazon fish in the rivers have been known to die of cold. These cold spells generally last two or three days; the Brazilians call them *friagens*.

The great plateaus, besides being influenced by the trade-winds and *pamperos*, are cooled by their elevation, and, westward, by descending currents from the Andes. Their climate is perhaps the most delightful in the world, free alike from the extremes of heat and cold, and watered by abundant rains, at least during a part of the year. Near Cuyabá, in the middle of the continent, the average temperature of the Brazilian plateau is about 70° F., and the extremes observed during two years (excluding the *friagens*) were 90° and 54° F. During the *friagens* there was a fall to 37° or 38°, and rarely, according to reports, the temperature is lowered to the freezing-point.

South of the Amazon valley the period of *friagens* is also the time when other winds blow most regularly, and this is the dry season (May to October), when, over most of the plateau, no rain falls. The rest of the year is characterized by greater, but never excessive, heat, calms and ascending currents and rains, most abundant in December, January, and February. In the eastern part of Brazil the rains are sometimes almost lacking during one, two, or even three or four years; these are the droughts or *seccas* which have desolated that region at intervals.

In and north of the Amazon region the seasons are reversed, but there the dry period (September to February) is much less marked, and is never free from rain. The heat, in most places, is not at all excessive; in the Amazon valley it rarely reaches 93° F., and that only for an hour or two; the nights are always cool and pleasant.

The southern part of the continent, beyond the tropics, has a true winter from May to October; snow falls abundantly on the plains of Patagonia, and even as far north as Southern Brazil.

The eastern winds, passing over the continent, discharge their last rains on the slopes of the Andes. West of that mountain wall the narrow strip of low land is dry, and in parts almost rainless. In Northern Chili and Southern Peru this region is so arid as to be nearly devoid of vegetation; this is the desert of Atacama, of limited extent, and the only true desert land in South America, except some inclosed valleys of the Andes. In Southern Chili the Pacific slope is fairly well watered, and very fertile; under and north of the equator the climate is moist, being influenced by Pacific winds.

The *pamperos* are only felt as severe storms in Patagonia, about the Plata, and northward along the eastern coast, sometimes as far as Rio de Janeiro. Aside from these, South America is singularly free from violent winds; tornadoes and hurricanes are unknown, and thunder-storms seldom do any damage. Generally speaking, the whole of South America is healthy; the exceptions are portions of the great river-valleys and their branches, where intermittent fevers sometimes prevail, and a few of the tropical coast cities, where yellow fever has become endemic; this is generally confined to the warmer months, and is rather the result of poor sanitation than of the climate.

Distribution of Plant-Life: Forests, Pampas, Llanos, and Campos.—With its generally moist climate and abundant rains, South America is well fitted to support a growth of trees; but the extent of its forests has been much overesti-

mated. The largest continuous mass and the largest forest in the world is in the Amazon basin. In the western part of that region it appears to be not less than 1,100 miles wide, and includes the flood-plains. Below the mouths of the Negro and Madeira it narrows rapidly to 100 or 200 miles, principally on the southern side, and the flood-plains of the river itself, with the island of Marajó, are mainly covered here with grass. Strips of forest follow all the branches, and there is a prolongation on the coast to Maranhão. From the Amazonian forest there is a connection along the Rio Negro to that of the Orinoco, where it surrounds the headwaters and extends on the southern side into Guiana, and along the coast to the mouth of the Amazon. Over all this ground the trees form a thick mass, laced together with immense vines, and in parts nearly impassable.

The Brazilian coast range was originally covered with forest nearly everywhere, and much of this remains; it begins in Rio Grande do Sul, is widest about Rio, and narrows rapidly to Bahia. Most of this is true tropical forest, but southward in Paraná, Santa Catharina, and Rio Grande do Sul, the higher mountains are covered with araucaria pines.

The upper Parauá basin, including most of Paraguay and portions of Brazil, has a large tract of forest, which appears to be separated from that of the coast range. Eastern Bolivia has another, skirting the plateaus and cordilleras, and extending in some places to the Paraguay. Southern Patagonia, about the Straits of Magellan, has considerable forests, principally of pine. Finally, there is a long strip on the northern coast mountains from the mouth of the Orinoco to the Isthmus of Panama; it is continuous with the forests of Central America, and on the western coast of South America there is a narrow and broken prolongation at the base of the Andes, extending to the equator. All other forests in South America are of very limited extent.

The general surface of the plateaus is more or less open and has been erroneously called prairie-land; it seems rather to be a kind of degraded forest. Trees are abundant nearly everywhere, but they are generally scattered, small and stunted, with a growth of grass between them; sometimes they are more crowded and higher, forming a kind of dry wood; or they may be almost wanting over considerable tracts. But everywhere the aspect is the same, and as different as possible from the true forest; there are no large vines; palms and other broad-leaved plants are almost wanting; the foliage is of a light green, and the trees shed their leaves during the dry season; caeti are often abundant. The grass is thick enough everywhere to afford pasturage during the rains. In Brazil and Guiana these lands are called *campos* and, where the trees are closer, *cerrados*.

The northern part of the Orinoco depression is occupied by the llanos. In some parts these are true prairies, a level stretch of tall grass without trees; in other places they are broken by bushes and even clumps of woodland. The landscape is described as very monotonous.

The Argentine Republic, except its northern part, is occupied by low, flat prairie-lands, known as pampas; except near the streams and toward the base of the Andes, these are hardly broken, even by bushes. They afford excellent pasturage and are well adapted for cultivation, but many parts are subject to floods and droughts. Southward, in Patagonia, the pampas are arid, but with proper irrigation can be used for agriculture and pasturage. The name pampas has been extended to the grass-lands which cover most of Uruguay and the southern point of Brazil. These are hilly or rolling, except near the Uruguay; they form excellent pastures. Northward, the flat pampas west of the lower Paraguay merge into the Chaco country, which occupies the northern part of the Argentine, Western Paraguay, and Southeastern Bolivia; it is a great plain with a confused mingling of grass-land, bushes, strips of wood, lakes, and swamps. Many parts are alternately flooded during the rains and baked by the sun during the dry season; large portions of it have a thin but very regular growth of tall palms, presenting a most curious appearance. This is one of the least known parts of South America, and is still occupied by roving Indians. To the N., again, the Chaco is continuous with the immense flood-plain of the upper Paraguay, a region of grass-lands which every year are transformed into a great lake.

West of the Andes the lowlands of Chili are devoid of trees, but well watered by streams and very fertile; farther N., in the deserts of Atacama and Peru, they become arid and sterile.

Botany.—The flora of tropical South America must be in-

cluded, with that of Mexico, Central America, and the West Indies, in the Neotropical region. The species are generally peculiar, and they are very numerous, both in the forests and on the open lands. Travelers have always been struck by the immense variety of trees in these tropical forests; nearly two hundred kinds have been counted on a square mile in the Amazon valley, and the list was probably incomplete. Immense vines trail over these trees, and the branches are loaded with air-plants; palms in great variety are most abundant near the rivers. Some of the trees are of immense size, the trunks 40 or 50 feet in circumference, and the tops 200 feet or more from the ground; probably the average level of forest on the Amazon or in the coast range is 110 feet. Among the important forest trees we may mention the Pará rubber-tree, found on the Amazon and its branches and the Orinoco: from it the best rubber is obtained, and the markets of the world are mainly supplied from it. In the same region is the magnificent Brazil-nut tree, 200 feet high, and the allied sapneia nut-tree, the fruit of which is much superior to the Brazil-nut, but seldom enters into commerce. Cinchona trees of several species occur along the eastern flanks of the Andes, in the upper Amazonian forest; they supply the world with Peruvian bark and quinine. Cabinet woods of rich quality and immense variety are found, but the only one extensively exported is rosewood; this occurs in nearly all the forests. Sarsaparilla, the tonka bean, vanilla, ipeacuanha, the Peruvian coea, and various medicinal plants are derived from the forest; of the campo-trees perhaps the most important is that yielding the Ceará rubber, in Eastern Brazil.

Animals.—All of South America, except the southern end, is included with the West Indies, Central America, and the greater part of Mexico in one great zoölogical region—the Neotropical. In other words, the Neotropical region occupies all of tropical America. Throughout this vast extent the animals closely resemble each other. Many species are found from one end to the other; most of the larger genera have representatives in all parts, and with rare exceptions the families are the same everywhere. On the other hand, the assemblage of animals is very peculiar. It has relations, generally distant, with Africa, the Malay Archipelago, India, and Australia; hardly any with North America, except where it has lent a few forms to the latter, such as the puma and the Carolina parrot. Nine families of mammalia, 23 of birds, 5 of reptiles, 4 of batrachia, and 3 of fishes are peculiar to the Neotropical region, and others hardly extend beyond it. South America is the true home of the edentates; in the quaternary period it possessed such immense representatives of them as the *Megatherium*, the *Chlamydothorium*, and the *Myiodon*; three of the five living families—the sloths, ant-eaters, and armadillos—are confined to it, the other two being in tropical Asia and Africa.

The Neotropical region has the richest fauna in the world, but huge quadrupeds, like those of Africa, are wanting. The largest indigenous mammalian is the tapir, with four or five closely related species, occurring from Mexico to Southern Brazil. The only very formidable quadrupeds are the jaguar and the closely related species or variety called the black tiger; the puma, much more common, is very little feared. Other spotted and gray cats are numerous in species, but generally small. Indeed, the idea that South America swarms with savage animals is entirely erroneous. The traveler is rather impressed with the fact that so few animals of any kind are seen; large herds of ruminants, such as the bisons that used to roam over North America, are quite unknown; of terrestrial animals only the peccaries, or wild hogs, go in bands, and on this account are sometimes formidable to hunters. In the great forests what strikes one most is that nearly all the animals seem to be arboreal; monkeys, sloths, the various small tiger-cats, the coatis or South American raccoons, all but one species of ant-eater, and the opossums live in trees; birds and insects, snakes, lizards, and frogs, all keep to the tree-tops. On the open lands the commonest quadrupeds are armadillos and deer; birds are most conspicuous about the river-plains, where the white herons and other waders gather in vast flocks; alligators also abound about the rivers and lakes. Of other animals the llamas of the Andes are remarkable, not only for their relationship to the camels, but because they have been domesticated from the earliest times. (See LLAMA.) The chinchillas of the south temperate region are prized for their skins; and we may mention the Brazilian wolf and a kind of bear (*Ursus spectabilis*) found in the Andes. Among these mountains also is seen the condor, the largest bird that is able to

fly, and exceeded in size only by the terrestrial ostriches. Three species of ostriches roam in small bands on the plateaus and pampas. The water-boas (*Eunectes*) are the largest South American serpents; these are by no means common, but they are formidable, attaining a length of 30 feet or more, and able to swallow a horse. The boa-constrictor and its allies, far from being dangerous, are often kept about houses to kill rats and other vermin. There are innumerable other serpents, some of them poisonous. The shores and rivers swarm with fish, among which we may mention the pirarueú (*Sudis*) of the Amazon, attaining a length of 7 feet, and forming the staple animal food of that region; the cannibal fishes (*Serra salmo*), which often attack and kill bathers; and the strange electric eels. Insects are enormously rich in species; 20,000 have been collected at one place, in a few years; 700 kinds of diurnal butterflies are known from Pará, Brazil. Among noxious species are the termites, ants, and different species of mosquitoes and sand-flies; these latter sometimes swarm in immense numbers, especially along the Paraguay and Orinoco.

Industries and Products.—The chief agricultural products are wheat in Chili and the Argentine, coffee in Brazil, sugar in Brazil and Guiana, cacao or chocolate on the Amazon and Orinoco, and in Colombia and Venezuela; the tropical regions produce corn, fruits, and vegetables abundantly, but they are little exported, and generally agriculture is at a low ebb. The principal center of the grazing industry is about the Plata, in the Argentine, Uruguay, and Southern Brazil; cattle are also bred largely on the llanos of Colombia and Venezuela, and to a less extent in Eastern Brazil, on the lower Amazon, and through the interior. Rubber is the principal export of the Amazon, parts of the product coming from Bolivia, Colombia, and Peru. South America has as yet hardly any important manufactures; the most advanced regions in this respect are the Argentine, Chili, and Southern Brazil.

Means of Communication.—Several thousand miles of railroad have been made in South America, principally in the Argentine Republic, Brazil, and Peru. Hardly any of these have yet paid interest on the capital invested, and, as they are supported directly or indirectly by the states through which they run, the financial burden has been very great. The cause of these troubles is evident. The South American countries do not furnish the heavy freights—coal, lumber, and grain—which largely support North American roads; the countries are thinly inhabited, and only a small portion of the population travel at all; and there is little demand for foreign goods, except at the coast cities. The natural means of communication is by the great rivers. With these and a better system of common roads there will be a natural and healthy growth. Much of the interior commerce is carried on by means of mule-trains, and these are in use even where railroads have been built, because they can successfully compete with the high freight tariffs. It has been proposed to unite North and South America by a grand intercontinental railway.

Ethnology.—Before the arrival of Europeans, South America was peopled by a vast number of Indian tribes, some of them powerful nations, others small agricultural communities, others again mere wandering hordes. The chief of these were the Kechuas, the Araucanians, the Abipones, the Aymaras, the Tupis, etc. See these titles and the articles ARAUCARIA and INDIANS OF SOUTH AMERICA.

History: (1) Discovery and Early Explorations.—Columbus in his third voyage reached the coast of Paria, north of the mouths of the Orinoco, Aug. 2, 1498. This was probably the first discovery of the continent. Ojeda and Alonso Niño visited the same shore soon after, and in 1500 Pinzon and Diego de Lepe explored the coast of Brazil. Shortly after, South America was discovered quite independently in a voyage which would probably have been made had Columbus never existed. The Portuguese navigator, Pedro Alvarez Cabral, was on his way to India by the route around Africa which Vasco da Gama had just opened. For some reason, probably to avoid the calms off the African coast, he chose to keep far out in the Atlantic. This brought him into the longitude of the eastern part of South America, and he struck the coast S. of Bahia, following it for some distance. Within a few years the northern and most of the eastern coast of South America was known; but it was supposed to form a part of Asia until Balboa crossed the isthmus (1513) and discovered the Pacific. (See BALBOA.) Solis and Pinzon discovered the Plata, probably in 1508; and in 1520 Magellan passed the southern point of the continent.

Explorations of the western side began at Panama, and resulted in the conquest of Peru (1527–33) and Northern Chili (1535–46). (See ALMAGRO, CHILI, PERU, and PIZARRO.) Thus by the middle of the sixteenth century the entire coast-line of South America had been explored. The conquest of Peru led to the discovery of the Amazon by Gonzalo Pizarro and its descent (1540–41) by Orellana. (See AMAZON and ORELLANA.) Cabot and Irala explored the Paraná and Paraguay (1528–43), and the latter succeeded in establishing overland communications with Peru.

During the sixteenth and seventeenth centuries many expeditions were made in search of El Dorado, the fabled king of an equally fabulous city, supposed to exist somewhere in the northern part of South America. (See EL DORADO.) These led incidentally to the exploration of large tracts in the interior of New Grenada and Venezuela, and to discoveries on the lower Orinoco. The upper part of that river was known only by vague reports until the voyage of Humboldt (1800), who passed the falls and proved the connection of the Orinoco with the Rio Negro by the Cassiquiari. (See ORINOCO.) Much of our earlier knowledge of the interior of South America is due to the Jesuit and other missionaries, and to the slave-hunting expeditions of the Portuguese and Spaniards.

(2) *Settlement, Conquest, and Colonial Period.*—The part of Brazil discovered by Pedro Alvarez Cabral in 1500 was well to the east of the Tordesillas line (see TORDESILLAS), and it was at once claimed by the Portuguese; their right was never opposed by Spain. All the rest of the coast, eastern, northern, and western, was claimed by the Spanish as lying W. of the line of demarkation. Later, both nations claimed whatever lands they had conquered in advancing inland from the coasts.

Francisco Pizarro landed at Tumbez, Peru, in 1532, and his conquest of that country may be said to have been completed when he entered Cuzco, the Inca capital (Nov. 15, 1533). Cuzco was turned into a Spanish town; Pizarro founded Lima (1535), and made it the capital of his new viceroyalty, which included what are now Ecuador and Northern Bolivia, as well as the modern Peru. Lima soon became the most important city in South America. From Peru Diego de Almagro had marched into Chili (1536), and been appointed governor of that country. Disputes about the limits of their respective territories led to wars and the death of both Almagro and Pizarro. (See PERU.) The conquest of Chili was continued by Pedro de Valdivia until 1547, and it ended in the permanent establishment of Spanish rule in that country as far S. as lat. 37°.

Meanwhile the Plata was invaded by the Spaniards. Buenos Ayres was founded (Feb. 2, 1535), and Asuncion, Paraguay (1536). At first the Platine colonies were weak, but they gained more strength with the government of Cabeza de Vaca (1540–44), and Martinez de Irala (1544–57), who made their capital at Asuncion and established inland communications with Bolivia, or Upper Peru as it was then called.

By the end of the sixteenth century the whole of South America, except Brazil, was nominally under the rule of Spain; but the settlements on the northern coast were still weak, and Guiana and Patagonia were untouched. The whole of this immense territory was under the jurisdiction of the viceroys of Peru at Lima; subordinate to these were various divisions or *audiencias*, ruled by presidents who were sometimes called captains-general or governors. Upper Peru or Bolivia had its audiencia at Chareas (the modern Chuquisaca), established in 1559 and including Paraguay. The audiencia of Chili (established 1568) was at Santiago, with a captain-general at its head. New Grenada had its audiencia after 1564, and Quito, the modern Ecuador, from 1542; that of New Andalusia (Venezuela) was erected later. The governors of Buenos Ayres, after 1580, were almost independent, and after 1777 that district, with Paraguay and Bolivia, was a viceroyalty.

From first to last the Spanish rule in South America was marked by contempt for the rights of the Indians, who were enslaved and oppressed in every possible way, notwithstanding the efforts of the Spanish Government to protect them. The only exception was in the Jesuit missions, where the priests of that order sought to establish a mild, paternal rule, protecting their charges from the rapacity of the civilians and establishing plantations and simple industries. In Paraguay the Jesuits became so powerful that they virtually ruled the country until the expulsion of their order from America in 1767. The system of paternal rule tended to

keep both Indians and whites in a childish condition, and in that respect its evils are still apparent; but it was the means of preventing the still greater evil of the entire destruction of the aborigines.

BRAZIL (*q. v.*) was first settled near Santos (1531). Incursions to the westward led to the discovery of rich mines at Cuyabá and Matto Grosso, and colonies were established there far W. of the Tordesillas line. Portugal and Brazil were subject to Spain from 1582 to 1640.

The only other European nations who attempted settlements in South America were the French, Dutch, and English. The French had short-lived establishments at Rio de Janeiro and Maranhão on the Brazilian coast, and a part of that country was held by the Dutch from 1630 to 1654. (See BRAZIL.) All three nations formed establishments in Guiana during the seventeenth century; that of the English was soon abandoned, but they took the western part of the country from the Dutch in 1796. The colonies of the three nations still exist.

(3) *Period of Revolution and of Modern States.*—As early as 1780 the oppressions of the Spaniards led to the Indian rebellion of Tupac Amarú, near Cuzco. (See TUPAC AMARÚ.) The Spanish Government, through jealousy of other nations, had restricted the commerce of its colonies, and their distance caused much inconvenience and mismanagement. The Inquisition also was a constant source of grievance. The success of the North American and French revolutions led the Spanish-Americans to believe that they also might become independent. There were local rebellions in Peru in 1811 and 1812, and in 1813 the people of Lima rose against the Inquisition and drove its officers from the city. By Napoleon's invasion of Spain and the peninsular wars the government of the American colonies was thrown into confusion; at length a decided revolution broke out in Venezuela (Apr., 1810). From the first Simon Bolívar was its leader. The viceroy was deposed and a republic established, but fresh troops arrived from Spain and the rebellion was quelled (1812), Bolívar escaping to Jamaica. About the same time there were equally unsuccessful rebellions in Chili and Bolivia; but in Buenos Ayres the Spanish officials were driven out and a national government formed (1810-13). This was the first permanently successful revolution in South America. But meanwhile the excitement had spread to all the colonies, and local rebellions were constantly taking place. Bolívar returned to Venezuela (1817), collected a small army on the Orinoco, and was declared president of the country at Angostura (1819). By the battles of Boyaca (Aug. 7, 1819) and Carabobo (June 24, 1821) he freed Venezuela and Colombia from the Spaniards, and the two countries were united as a common republic. In 1822 he freed Quito (now Ecuador), and the country was incorporated with the others under the general name of Colombia. His lieutenant, Gen. Sucre, advanced into Peru, was joined there by Santa Cruz, and the Spaniards were defeated at the battle of Pichincha.

Meanwhile fresh revolts had broken out in Chili and Bolivia, and were supported from Buenos Ayres. San Martín marched from the Argentine across the Chilean Andes (Jan., 1817), took Santiago, and declined the office of supreme dictator of Chili to which he was nominated. By the battle of Maipú (Apr. 5, 1818) the Spaniards were finally driven from Chili. The revolutionists now organized a fleet and advanced northward to aid their party in Peru, the ships being commanded by Lord Cochrane and the army by San Martín. Callao was besieged and its castle taken (Sept., 1821). San Martín drove the Spaniards before him and entered Lima, and Peru was declared independent (July 28, 1821), San Martín being named protector of that country. San Martín and Bolívar met at Guayaquil; soon after the former resigned his office and retired to private life in Europe, honored by every Spanish American.

From Peru an expedition was sent under Gen. Santa Cruz to aid the revolutionists in Bolivia. It suffered two severe reverses, but by the battle of Ayacucho, not far from Cuzco, the power of the Spaniards in South America was finally overthrown (Dec. 9, 1824). The only point which they still held was Callao Castle, which they had retaken by a mutiny of the garrison; but this was surrendered on Jan. 19, 1826.

Bolívar had been declared dictator of Lower and Upper Peru. In 1825 he decreed that Upper Peru should be an independent republic, and it received the name of Bolivia. Peru began its independent existence in 1826. In 1830 the republic of Colombia separated into the three states of

Ecuador, Venezuela, and New Grenada; the latter changed its constitution in 1857, and was thereafter known as the United States of Colombia. Uruguay began its separate existence in 1828, and Paraguay was declared independent from 1811. The subsequent histories of these countries will be treated of under their respective names.

In 1807 the Portuguese court was driven from Lisbon by the armies of Napoleon and took refuge in Brazil, only returning in 1821. The king's son, Dom Pedro, was left as regent, but the revolutionary movement which had long existed ended in the separation of Brazil from Portugal, and the establishment of an empire with the prince at its head as Pedro I. (1822). His successor, Pedro II., was forced to abdicate in 1889, and the country became a federal republic under the name of the United States of Brazil.

Negro slavery was early established in Spanish America, but the number of slaves was not large, and they were freed either during the revolution or soon after. The system was much more prominent in Brazil, where slavery was finally abolished in 1888.

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GARDINER G. HUBBARD.

America, British: See BRITISH AMERICA.

American Antiquities: See INDIANS OF CENTRAL AMERICA, INDIANS OF NORTH AMERICA, and INDIANS OF SOUTH AMERICA.

American Association for the Advancement of Science: the most important American scientific society. On April 2, 1840, the Association of American Geologists was organized in Philadelphia. Two years later, at a session held in Boston, its scope was enlarged, and it became the Association of American Geologists and Naturalists. In 1847, likewise at a Boston session, a new organization was effected, embracing all sciences, and the present name was assumed. Any person may become a member, but membership practically includes only citizens of the U. S. and Canada. From the membership are chosen fellows, and the body of fellows choose the officers. There are now about 800 fellows and 1,200 other members. The society is migratory, meeting each summer in some North American city. The meeting occupies a week, the attendance ranging from 300 to 1,000. For the purposes of its scientific sessions, the association is organized in nine sections as follows: Section A. Mathematics and Astronomy; B. Physics; C. Chemistry; D. Mechanical Science; E. Geology and Geography; F. Zoölogy; G. Botany; H. Anthropology; I. Economic Science and Statistics. These meet separately for the hearing and discussion of papers. An annual volume of proceedings is printed at Salem, Mass.

G. K. G.

American Eclectic School of Medicine: See ECLECTIC, THE AMERICAN.

American Indians: See INDIANS OF CENTRAL AMERICA, INDIANS OF NORTH AMERICA, and INDIANS OF SOUTH AMERICA.

American Indians, Languages of: See INDIANS OF CENTRAL AMERICA, INDIANS OF NORTH AMERICA, and INDIANS OF SOUTH AMERICA.

American Institute: a New York institution, the object of which is to encourage and promote domestic industry in New York State and the U. S., in agriculture, commerce, manufactures, and the arts, by bestowing rewards and other benefits on those who shall make improvements therein or excel in any of the said branches. It was organized in 1828 by a few enterprising citizens who met in a small room in Tammany Hall. A charter was granted in 1829 by the Legislature of the State of New York, under the title of The American Institute of the City of New York.

One of the principal means to accomplish its objects was the holding of exhibitions—or, as they were then called, annual fairs—in which inventors, manufacturers, and others could exhibit their various productions, and many modest men who would have remained in obscurity have made fortunes by having their skill and ingenuity brought prominently before the public by the great facilities afforded them by the American Institute. Among the things first shown at these exhibitions may be named Morse's telegraph, Colt's firearms, the sewing-machine, McCormick's reaper, Francis's metallic life-boats and car, Hoe's printing-press, and the telephone.

The first fair was held in 1828 in Masonic Hall, then standing on Broadway, nearly opposite the New York Hospital, at the head of Pearl Street. This was very successful, and after holding six fairs there it was found necessary to secure more ample accommodations. After examining various locations, Niblo's Garden was selected, notwithstanding that great doubts were expressed as to its accessibility, it being deemed by many too far out of town. The fair was, however, well patronized that year, and the exhibitions became very popular until the place was consumed by fire in 1846.

Castle Garden, on the Battery—then a fashionable resort for the citizens of New York—was next selected, and the fairs were held there every fall until 1853.

The exhibition of the industry of all nations was opened in the Crystal Palace in 1854, on Reservoir Square, in Sixth Avenue, between Fortieth and Forty-second Streets. After its close, the American Institute procured it for holding its exhibitions, which were held there in 1855, 1856, 1857, and 1858, when it was destroyed by fire on the afternoon of Oct. 5, 1858, with all its contents. Notwithstanding this disaster, the managers held an exhibition the next year in Palace Garden, in Fourteenth Street, on the site of the present armory of the Twenty-second Regiment. The institute, at great expense, made many improvements in that building, and held fairs in it for several years.

In 1863 the exhibition was held in the Academy of Music, Fourteenth Street and Irving Place.

In 1869 the institute secured the large structure on Third Avenue between Sixty-third and Sixty-fourth Streets. This building had been erected for a skating-rink; to this the institute has added three large buildings, the whole covering forty city lots, extending from Third to Second Avenue.

The exhibitions are held under the direction of a board of managers, elected annually by the members. The articles on exhibition are classified under seven departments, which are again divided into seven groups. The classifications are as follows:

1. Department of Fine Arts and Education.
2. Department of the Dwelling.
3. Department of Dress and Handicraft.
4. Department of Chemistry and Mineralogy.
5. Department of Engines and Machinery.
6. Department of Intercommunication.
7. Department of Agriculture and Horticulture.

In connection with the fairs, the American Institute has held eighteen exhibitions of live stock from 1838 to 1859; the exhibitions of 1857 and 1858 were confined to fat cattle.

The exhibitions were held for some years on the ground on which the Fifth Avenue Hotel now stands; it was then out of town. On this ground stood a famed hostelry known as Madison Cottage, kept by Corporal Thompson; this was the stopping-place for the Broadway stages.

The cattle-shows were also held on Hamilton Square and on Hamilton Park, in Third Avenue.

In addition to its valuable scientific library, consisting of about 14,000 volumes, there are four sections, viz.:

1. The Farmers' Club, under the direction of the committee on agriculture, which meets the first Tuesday of each month, at 2 P. M., at its rooms.

2. The Polytechnic, under the direction of the committee on manufactures and machinery, which discusses scientific subjects, the examination of new inventions, etc.; it meets at the same place on the third Thursday of each month, at 8 P. M.

3. The Photographic Section, under the direction of the committee on chemistry and optics, which discusses all matters in relation to photography and the action of light. This section meets at the same place on the first Tuesday of each month, at 8 P. M.

4. The Electrical Section, under the direction of the electric committee; its objects are advancement of electrical knowledge among its members. The section meets on the second Wednesday of each month, at 8 P. M.

All these meetings are open to the public.

The number of members is about 1,500. The institute is governed by a board of trustees consisting of thirteen members, of which the president, two vice-presidents, and two members are retired and elected annually. Prominent among its early friends were William Few, its first president in 1828-29; John Mason, in 1830-31; Gen. James Tallmadge, until 1846, when Mahlon Dickenson became president, holding office for two years, when Gen. Tallmadge, who had just returned from Europe, was again elected, and served in that capacity until his death in 1853.

The presidents of the institute since that date have been Robert L. Pell, James Renwick, William Hall, Horace Greeley, William B. Ogden, F. A. P. Barnard, Orestes Cleveland, Nathan C. Ely, Cyrus H. Loutrel, Thomas Rutter, and J. Trumbull Smith.

JOHN W. CHAMBERS.

Americanisms: a great and incongruous variety of peculiarities of speech in inflection, syntax, vocabulary, and pronunciation which are found to occur either locally or generally, in either the spoken or written English of the U. S., and which appear to depart from the usage of the standard English of Great Britain. The great mass of these are, however, either survivals from older English, or dialectal peculiarities inherited from the English dialects and still existing in these dialects, though not recognized by the standard language; or, finally, they are so entirely local or individual in their American use as not to be properly styled Americanisms at all, but simply represent caprices of expression, which have never established themselves as elements of a language. It is a recognized weakness of Bartlett's well-known *Dictionary of Americanisms* that it makes no attempt to discriminate between these classes, or to apply any rigid tests in determining what are really "Americanisms."

The term may be limited in one of two ways. It may be made to apply solely to those peculiarities which are the special product of American usage, as *caucus*. The question may, however, on the other hand, be regarded as one purely of standard, and the term be used to cover all those features of common standard usage in U. S. English which depart from the standard English of the British islands. This latter limitation of the term offers the most practical solution, for the question is really one of usage and standard rather than of origins. In determining the existence of a standard and what may belong to that standard, we are in nowise concerned with the *origin* of words or expressions. It is not a question of origin, but one of "good form." The observation that *to guess* in the sense of "opinari" is found in Chaucer and Gower does not prevent its being regarded as an Americanism, if it shall be determined that, while excluded from the English standard, it is in universal and accepted use in the U. S. The word *fall* for *autumn* may, in isolated instances, be found in English writers, and is undoubtedly, with some meaning or other, a good old English word, but the fact is that as a substitute for *autumn* it is not "good form" in Great Britain, and is in the U. S. *Spry*, "nimble," "active," is an Americanism, because, though found in the English dialects, it is a standard word only in the U. S.

The question of standard, it must again be remembered, concerns not what ought to be, but what is the fact. The assertion of certain purists that the usage of the educated classes in London ought to be regarded as the absolute standard for the English of the U. S. also does not alter the fact that usage in the U. S., while following in the main the general standards of Great Britain, feels itself independent within certain limits, and maintains a secondary standard of its own. This is based not upon the usage of any class or any district, but upon the common and universally recognized

usage in the chief centers and along the chief avenues of commercial activity and national life, and corresponds to the rapidly developing consciousness of nationality.

Cases of true Americanisms—i. e. of expressions which are quite universally acceptable in the U. S., at least among speakers whose usage is not recently and consciously affected by contact or instruction, but which are foreign to the standard usage in Great Britain—are the following: Different words for the same idea: Amer. *bureau*, Eng. *dressing-table*; Amer. *elevator*, Eng. *lift*; Amer. *sleigh*, Eng. *sledge*; Amer. *store*, Eng. *shop*; Amer. *fall*, Eng. *autumn* (also Amer.); Amer. *candy*, Eng. *sweets*; Amer. *cracker*, Eng. *biscuit*; Amer. *rare* (of meat), Eng. *under done*; Amer. *straight* (of drinks), Eng. *neat*; Amer. *pants* (regarded as vulgar by cultivated classes in cities), Eng. *trousers*; Amer. *sack-coal*, Eng. *jacket*; Amer. *waist*, Eng. *body*, *bodice*, etc. Especially instructive is it to note how special activities, particularly those of more modern development, have found themselves in Great Britain and the U. S. separate vocabularies; for instance, the language of railroad travel: Amer. *engineer*, Eng. *engine-driver*; Amer. *fireman*, Eng. *stoker*; Amer. *conductor*, Eng. *guard* (only in general comparable, as functions differ); Amer. *baggage-car*, Eng. *luggage-van*; Amer. *railroad*, Eng. *railway*; Amer. *car*, Eng. *carriage*; Amer. *road*, Eng. *tine*; Amer. *switch*, Eng. *points*; Amer. *to switch*, Eng. *to shunt*; Amer. *freight-train*, Eng. *goods-train*; Amer. *baggage*, Eng. *luggage*; Amer. *horse-car*, Eng. *tram-car*, etc.

Political life in the U. S. also has developed a vocabulary of its own, thus: *caucus*, *stump*, *to stump*, *fibbustler*, *federalist*, *senatoriat*, *gubernatorial*, *copperheads*, *knownothings*, *carpet-baggers*, *to gerrymander*, *to toby*, *miteage*, *wire-putter*, etc.

Differences in the use of words common to both: *Tiresome*, Eng. "dull," "annoying," Amer. "fatiguing." *Lumber*, in Great Britain means "cumbersome material"; in the U. S. it means also building material of wood. *To fix*, in Great Britain means "to fasten"; in the U. S. it also means "to repair." *Corn*, in Great Britain denotes "grain"; in the U. S. it is used to designate "maize." *To transpire*, in Great Britain is to "exhale," "become public," etc., as in the U. S., where it also means to "occur."

The subtler differences in turns of expression are even more significant than single words: Amer. *quarter of five*, Eng. *quarter to five*; Amer. *sick abed*, Eng. *itt in bed*; Amer. *back and forth*, Eng. *to and fro*; Amer. *it doesn't amount to anything*, Eng. *come to*; Amer. *fill teeth*, Eng. *stop teeth*; Amer. *have a good time*, Eng. *enjoy one's self* (also Amer.); Amer. *are you through?* Eng. *have you finished?* etc.

The study of the American dialects of English is beset with peculiar difficulty, owing to the freedom of movement and intercourse, and the mixture of population in even the original settlements; but systematic work in this field has been begun under the auspices of the recently (1889) established American Dialect Society (secretary, Prof. E. S. Sheldon, Cambridge, Mass.), which publishes its collections of material in the *Dialect Notes*. A specimen investigation of a local dialect is afforded in O. F. Emerson's *Dialect of Ithaca* (N. Y., 1891); Bartlett, J. R., *Dictionary of Americanisms* (4th ed. 1877); White, R. G., *Words and their Uses*, chap. iii. (1870); *Galaxy*, xxi. 521; xxiv. 376, 681; *Atlantic Monthly*, xli. 495, 656; xlii. 97, 342, 619, 643, and in succeeding volumes; Schele de Vere, M., *Americanisms* (1872); *Southern Review*, ix. 290, 529, (U. S.) *Americanisms*, a Study of Words and Manners; Primer, S., *The Huguenot Element in Charleston's Provincialisms*, *Phonetische Studien*, iii. 139; *The Pronunciation near Fredericksburg, Va.*, *Proceedings Am. Phil. Assoc.* (1889); *Dialectical Studies in West Virginia*, *Colorado College Studies*, vol. i.; Norton, L., *Political Americanisms* (1891); Lowell, J. R., *Biglow Papers* (1848, 1864); Lounsbury, T. R., *The English Language in America*, *International Review*, viii. 472, 596; Smith, C. F., *On Southernisms*, *Transac. Am. Phil. Assoc.*, 1883; Carruth, W. H., *Dialect Word-list*, *Kansas Univ. Quarterly*, i. 95 ff.; Farmer, J. S., *Americanisms, Old and New; a Dictionary of Words, Phrases, and Colloquialisms peculiar to the United States, British America, and the West Indies* (Lond. 1889). BENJ. IDE WHEELER.

American Languages: See INDIAN LANGUAGES OF AMERICA.

American Party: See KNOWNOTHINGS.

American Plants: this term is applied in Great Britain to *Rhododendrons*, *Azateas*, and other related Ericaceous plants. It also includes hardy flowering shrubs growing in peaty soil.

C. E. B.

American River: in the north central part of California, formed by the union of its North and South Forks in the western part of El Dorado County; it flows in a S. W. direction, and empties into the Sacramento river a short distance above Sacramento city. Gold is found along the banks of this river and its forks.

American Sunday-school Union: organized at Philadelphia, May 25, 1824. It was, however, the immediate successor of the Philadelphia Sunday and Adult School Union, which was organized in 1817, and had auxiliary "unions," or branches, in eleven of the States, when, in 1824, it transferred its capital and schools to the new national organization. A still earlier organization, to the work of which the new national society practically succeeded, was the First Day or Sunday-school Society of Philadelphia, started in 1790. The American Sunday-school Union is under the direction of thirty-six managers, of whom at least twenty-four must reside in Philadelphia and its vicinity. All these managers are laymen, and they are selected from various Christian denominations. The union is not a union of denominations, but of individual Christians of different denominations. The object of the union was, at its formation, "to concentrate the efforts of Sabbath-school societies in the different parts of our country, to strengthen the hands of the friends of pious instruction on the Lord's Day, to disseminate useful information, circulate moral and religious publications in every part of the land, and to endeavor to plant a Sunday-school wherever there is a population." Various denominational Sunday-school societies have resulted from the work of the union, but it has continued its operations without interruption, and its aim still is to improve existing Sunday-schools, and to organize new ones. Its plan is to publish books and papers suited to the wants of Sunday-schools, and to send out missionaries, lay and clerical, of various denominations, to organize new Sunday-schools wherever there is a needy population. No Sunday-schools are under the control of the union, but its missionaries watch and help as they have opportunity the pioneer schools they have organized. Many of these schools have proved the foundation of Christian churches. Indeed, a large share of all the Protestant churches organized in the newer States within the past fifty years have had their beginning in Union Sunday-schools. The union has been the parent of most of the distinctive agencies and methods of the American Sunday-school system. Sunday-school libraries, question-books, periodicals, teachers' helps, conventions, plans for teacher-training, schemes of limited lessons uniform throughout the country, were originated by or first gained prominence through the agency of the union or of its officers and managers. Moreover, its work created or stimulated a demand in these departments which has greatly increased the supply in them all. Its list of separate publications exceeds 2,000. The value of these, circulated by sale and donation, up to Mar. 1, 1892, amounts to more than \$10,000,000. Up to the same date its missionaries had organized 89,380 Sunday-schools, including, at the time of their organization, 534,704 teachers and 3,677,709 scholars. In addition to this, its missionaries have visited and helped many thousands of existing schools, including several millions of scholars.

HENRY CLAY TRUMBULL.

American University, THE: a post-graduate institution at Washington, D. C., under the direction of the Methodist Episcopal Church; was chartered in the District of Columbia, May 28, 1891. A site of 90 acres, at the N. W. terminus of Massachusetts Avenue extended, is the gift of the citizens of Washington. Its board of trustees, numbering fifty, includes as *ex-officio* members the President, the Vice-President, the Chief Justice of the Supreme Court of the U. S., and the Speaker of the House of Representatives. The Methodist Episcopal Church, by the action of the General Conference, May 25, 1892, accepted the patronage of this institution. Endowment will be made and faculty organized with distinct purpose to open professional and post-graduate departments for advanced studies and original research. Only those who have taken a degree will be received as students. Bishop John F. Hurst, D. D., LL. D., is chancellor.

A. OSBORN.

Amer'icus: city; capital of Sumter co., Ga. (for location of county, see map of Georgia, ref. 5-G); on railroad: 70 miles S. S. W. of Macon; has a female college and a high school for boys, and is situated in a cotton and sugar-cane raising district. Pop. (1880) 3,635; (1890) 6,398; (1900) 7,674.

Americus Vespuccius: See VESPUCCI.

Ameri'ola: a city of ancient Latium; one of those which were conquered by the elder Tarquin. It was among the "Prisci Latini," and was doubtless one of the thirty cities of the League. Its site is not definitely known.

A'mersfort, or **A'mersfoort**: a town and port of the Netherlands; province of Utrecht; on the river Eem, 12 miles N. E. of Utrecht (see map of Holland and Belgium, ref. 5-G). It has a Jansenist seminary, a Latin school, and manufactures of cotton and woolen stuffs. Tobacco, grain, and dried herrings are exported from this town. It received municipal privileges in 1249, and was taken by the Archduke Maximilian in 1483 and by the French in 1672 and 1695. Pop. (1879) 13,704; (1890) 15,694.

Ames: city; Story co., Ia.; on Chi. and N. W. Ry. (for location, see map of Iowa, ref. 5-G); the seat of the State Agricultural College. Pop. (1880) 1,153; (1890) 1,276; (1900) 2,422.

EDITOR OF "INTELLIGENCER."

Ames, ADELBERT: soldier; b. at Rockland, Me., Oct. 31, 1835; graduated at West Point 1861; lieutenant-colonel Twenty-fourth Infantry July 28, 1866, and brigadier-general U. S. Vols. May 20, 1863. Brevetted major-general Mar. 13, 1865, for gallant and meritorious services in the field. Since the war was made provisional governor of Mississippi June 15, 1868, in command of fourth military district, department of Mississippi, 1869. Resigned Feb. 23, 1870; U. S. Senator from Mississippi 1870-73; Governor of State of Mississippi 1874-76.

Ames, CHARLES GORDON: Unitarian preacher and editor; b. at Dorchester, Mass., Oct. 3, 1828; studied and taught for three years in Grange Seminary, Ohio; was for ten years a Free Baptist preacher at Minneapolis; organized Unitarian churches in Illinois, California, and Pennsylvania; held pastorates at Albany, N. Y., Germantown, Pa., and Boston, Mass., and became in 1889 pastor of the Church of the Disciples, Boston. Was editor of the *Minneapolis Republican*, the first Republican paper in the Northwest, in 1854, and the *Christian Register*, 1877-80; has preached and lectured in twenty States, and published numerous tracts, essays, and articles. His *George Eliot's Two Marriages* ran through four editions. He also edited *The Ethics of George Eliot*, and wrote the introduction to that book. Has been deeply interested in all social and philanthropic questions.

JOHN W. CHADWICK.

Ames, EDWARD RAYMOND, D. D., LL. D.: Bishop of the Methodist Episcopal Church; b. at Athens, O., May 20, 1806. He was educated at Ohio University; was tutor at McKendree College 1823-29; began to preach in 1830, and was appointed a bishop in 1852. From 1861 he resided in Baltimore. D. at Baltimore, Md., April 25, 1879.

Ames, FISHER, LL. D.: orator and statesman; b. at Dedham, Mass., Apr. 9, 1758. He graduated at Harvard College in 1774, after which he studied law in the office of William Tudor, of Boston, and was admitted to the bar in 1781. In several political essays which he wrote for the newspapers of Boston about 1785 he displayed practical wisdom and literary ability of a high order. He was a member of the convention of Massachusetts which in 1788 ratified the Federal Constitution, and he advocated its adoption in an eloquent speech. Having identified himself with the Federal party, he was elected to Congress in 1789 by the voters of the district which included Boston. He supported the administration of Washington, spoke frequently in Congress, and soon acquired a national reputation as an orator of the foremost rank. Among the most memorable of his parliamentary efforts was a powerful speech in support of Jay's treaty with Great Britain, April, 1796, which has been preserved. At the close of this speech an opponent of the treaty moved to postpone the vote on the question, giving as a reason that the members were too much excited to make a just and rational decision. After he had served four terms in Congress he retired to private life in 1797, on account of his delicate health. He married Frances Worthington, of Springfield, in 1792. In 1799 he pronounced a eulogy on Washington before the Legislature of Massachusetts. He was elected president of Harvard College in 1804, but he declined that position. He died at Dedham, Mass., July 4, 1808, leaving several sons. His character was eminently pure and honorable. He was distinguished for his wit, his colloquial powers, and his brilliant imagination. His orations abound in happy metaphors and illustrations. His works, consisting of orations, essays, and letters, were published by his son, Seth Ames, in 2 vols., 1854.

Amesbury: on railroad; Essex co., Mass. (for location of county, see map of Massachusetts, ref. 1-I); 40 miles by rail N. of Boston. There are two electric railroads, one via East Salisbury to Newburyport, 5 miles distant, and another, 5 miles long, to Merrimac. There is also a branch railroad connecting with the Eastern R. R. Here are extensive manufactures of flannels, carriages, boots and shoes, cassimeres, broadcloths, etc. Amesbury was the residence of the poet Whittier. The township has been united since the 1870 census. Pop. of township (1880) 3,355; (1890) 9,798; (1900) 9,473

EDITOR OF "AMESBURY DAILY."

Am'ethyst [Gr. ἀμέθυστος, remedy against drunkenness; ἀ-, not + μέδυσκειν, intoxicate]: a purple variety of rock-crystal or quartz, colored by manganese, so named from its reputed virtue of preventing intoxication. It is found in Brazil, Ceylon, India, and many other places, and is worn in the form of seals and ornamental articles. The Oriental amethyst is a variety of spinel, and is a more valuable gem than the common amethyst.

Amha'ra: the central division of Abyssinia; capital, Gondar. See ABYSSINIA.

Amhar'ic Lan'guage [from the province of Amhara]: the chief language of Abyssinia, since the extinction of the ETHIOPIC LANGUAGE (*q. v.*). It is spoken by the majority of the population in the countries between the rivers Tacazze and Abai, and in Shoa and Argubba, while in the countries in the N. E. of Abyssinia, N. of the Tacazze, the Tigré language predominates. Among the Semitic languages, the Amharic is nearest related, both grammatically and lexicographically, to the Ethiopic, but is by no means a new form of the Ethiopic, but rather a descendant of the Old Amharic, which is closely allied to the Ethiopic. Although the Amharic has retained many peculiarities of the Old Semitic, it still represents a later stage of development of the southern Semitic than does the Ethiopic. In all its phonetic relations the Amharic has degenerated very much, while many of its grammatical forms have been abolished, and have been only in part replaced by new forms. After the Amharic language had been used for many centuries by the people, and after the extinction of the Ethiopic, it became a written language, the Ethiopic alphabet being employed, while for the sounds peculiar to the Amharic new characters were introduced by a modification of the Ethiopic characters. Although the Amharic can not be called a literary language in the true sense of the word, still many works have been written in it within the last three centuries, partly translations and explanations of biblical and other Ethiopic books and vocabularies, partly short historical works, dogmatical and ethical compendia, formulæ for confession, etc., for the people, partly medical and magical treatises, and, recently, translations of European books. In the Ethiopic-Amharic books of the history of the native kings some of the older Amharic poems are given. But of these works very little is known in Europe. Up to the present time only missionary works have been printed. The Amharic has been treated grammatically and lexicographically by Ludolf (1698); more completely by Isenberg (*Lexicon*, 1841; *Grammar*, 1842); and very fully, from the modern linguistic point of view, by Franz Praetorius (*Grammar*, 1879), and Antoine d'Abbadie (*Dictionary*, 1881). For fuller information, see the works of Praetorius and d'Abbadie. See SEMITIC LANGUAGES. Revised by C. H. Toy.

Am'herst: a town and seaport of Burma, capital of a district of the same name, 30 miles S. S. W. of Maulmain (see map of S. India, ref. 4-M). It was founded by the British in 1826, and named in honor of the Governor-General of India, who projected it. Large teak forests abound in its neighborhood, and the timber is exported in considerable quantities. The harbor, though large and deep, is difficult of access, and is exposed to the S. W. monsoon. Pop. about 30,000.

Amherst: capital of Cumberland co., Nova Scotia, Canada (see map of Quebec, ref. 2-B), on Intercolonial R. R., near the N. E. end of the Bay of Fundy; is about midway between Halifax, Nova Scotia, and St. John, New Brunswick, and is in an agricultural, lumber, coal-mining, manufacturing, and ship-building district. Pop. (1881) 2,274; (1891) 3,781.

Amherst: on Central Mass. and New Lond. and N. R. Rs.; in Hampshire co., Mass. (for location of county, see map of Massachusetts, ref. 3-E); 85 miles N. of New London, and 82 miles W. of Boston. It is the seat of Amherst College and of the Massachusetts Agricultural College. (See AMHERST COLLEGE.) The town has excellent schools, including

a high school. It has also paper and planing mills, manufactures of leather, children's wagons, palm-leaf hats, and planes. Amherst is one of the most healthful towns in Massachusetts. The village is situated upon an elevation which affords a beautiful view of the fertile and picturesque valley of the Connecticut and of the surrounding mountains—the Holyoke range to the S. W., and on the N. Mettawampe, Sugar Loaf, and others. Pop. of township (1880) 4,298; (1890) 4,512; (1900) 5,028. EDITOR OF "RECORD."

Amherst, JEFFERY (called **Lord Amherst**): British general; b. at Riverhead, in Kent, Jan. 29, 1717. He entered the army in 1731, and became aide-de-camp to Gen. Ligonier in 1741; served with him in the battles of Dettingen, Fontenoy, and Rocoux. In 1756 he became a colonel of infantry; went to America in 1758, and served against France in the inter-colonial war; commanded the troops at the siege of Louisbourg, a famous fortress built by the French upon the eastern coast of Cape Breton island; the town was destroyed by the bombardment, and, with the garrison and the French fleet, surrendered July 26, 1758; became commander-in-chief of all the forces in America, Sept. 30, 1758; completed the conquest of Canada from the French by the capture of Montreal Sept. 8, 1760; was made Knight of the Bath in 1761; Governor of Virginia in 1763; was dismissed from the army, but restored in 1768; became governor of Guernsey 1770; lieutenant-general of ordnance in 1772; Baron Amherst of Holmesdale 1776; commander-in-chief in England 1778-82; Baron Amherst of Montreal 1788; again commander-in-chief in England in 1793-95; became field marshal 1796. D. at Montreal, his seat in Kent, England, Aug. 3, 1797.

Amherst, WILLIAM PITT, First Earl of: nephew of the preceding; b. in England, Jan. 14, 1773. He was sent as an ambassador extraordinary to China in 1816, and reached Peking, but he failed to effect the object of his mission (which was to improve the commercial relations between that empire and Great Britain), as he refused to comply with the degrading ceremonies which Chinese etiquette prescribed, and was not admitted into the presence of the emperor. He was shipwrecked in Gaspar Strait on his return to England, but escaped by boat to Batavia, and continued his voyage, stopping at the island of St. Helena on his way, where he had a number of interviews with the Emperor Napoleon. He was Governor-General of India in 1823-26, and became an earl in 1826. D. at Knole Park, Kent, Mar. 13, 1857.—His son, WILLIAM PITT (b. 1805, d. 1886), succeeded him as second earl.

Amherstburg: Essex co., Ontario, Canada, on railroad and the Detroit river, 2 miles from its entrance into Lake Erie; 18 miles S. of Detroit, Mich., and 225 miles W. S. W. of Toronto (see map of Ontario, ref. 6-A). It is one of the oldest towns in Ontario, and during the war of 1812 between Great Britain and the U. S. it was dismantled by Gen. Proctor, of the British army, Sept. 26, 1813, and destroyed by Gen. Harrison of the U. S. forces, Oct. 2, 1813. It was named in honor of Lord Amherst, and has a large city-hall, 4 schools, 6 churches, water-works, and electric lights (both owned by the municipality), and some manufactures, and is the principal coaling-station on the Detroit river. Pop. (1881) 2,672; (1891) 2,279. EDITOR OF "ECHO."

Amherst College: one of the leading colleges in the U. S.; in Amherst, Hampshire co., Mass. It was founded in 1821, and in its general catalogue, in 1900, it had 4,000 alumni, of whom 3,000 were supposed to be living. Of the whole number of its graduates, 1,123 were ministers and 111 missionaries in foreign lands; 208 served in the civil war and 28 died in the service. The college edifices, 12 in number, have been erected at a cost of \$400,000. The pecuniary value of the scientific and archaeological collections can not be estimated at less than \$125,000, and the whole property of the institution, including permanent funds, professorships, scholarships, prizes, etc., is nearly \$2,000,000. All this is the gift of private charity and munificence, with the exception of about \$50,000 granted by the State. The donors have been chiefly the Christian men and women of Massachusetts. The Hitchcock Ichnological Cabinet, the Adams Collection in Conchology, the Shepard Meteoric Collection, and the Mather Art Collection, are widely known as of unsurpassed value and excellence. The Pratt Gymnasium, with its accompanying system of exercise and instruction, constitutes a feature peculiar to this institution; all the students, unless excused for special reasons, are required to exercise half an hour daily, chiefly in the light gymnastics, under the direction of a professor who is an educated physi-

cian, and who has charge of their health and physical culture. The Pratt Field for ball-playing and other athletic exercises gives Amherst an equipment for modern outdoor athletics in advance of any other college. The faculty of Amherst College consists of 34 persons, including 1 lecturer, 3 instructors, and a librarian with his assistant. The number of students in 1900, all in four classes of the regular college course, was 397. The annual income is about \$100,000. The presidents have been Rev. Z. Swift Moore, D. D. (1821-23); Rev. Heman Humphrey, D. D. (1823-45); Rev. Edward Hitchcock, D. D., LL. D. (1845-54); Rev. William A. Stearns, D. D., LL. D. (1854-76); Rev. Julius H. Seelye, D. D., LL. D. (1876-90); Merrill E. Gates, LL. D., L. H. D. (1890-99); and George Harris, D. D., LL. D.

The Massachusetts Agricultural College, although the offspring of Amherst College, and situated in the same place for the purpose of securing the advantage of its scientific treasures, has no organic connection with it, having a separate faculty and a distinct board of trustees, elected by the State Legislature. It was opened for students in the fall of 1867, and held its first commencement, with the graduation of its first class, in the summer of 1871. It has three college halls, a fine stone chapel and library building, two boarding-houses, the Durfee Plant-house, a large military building, and a botanic museum, besides the buildings pertaining to the farm, which consists of over 300 acres. The students work on the farm a certain number of hours each week, under the direction of the superintendent and the professor of agriculture. They also receive regular military exercise and drill under the professor of military science and tactics. The real estate of the college cost over \$200,000. Its permanent funds, derived from the sale of lands given by Congress, from grants by the State, and from private donations, amount to half a million. The faculty, as exhibited in the catalogue of 1890, consists of 14 persons, including the president, Henry H. Goodell, LL. D., 11 professors, 1 lecturer on farm law, and a farm superintendent. There were then 160 students—16 resident graduates, 20 seniors, 27 juniors, 35 sophomores, and 62 freshmen. See *History of Amherst College*, by Prof. W. S. Tyler, D. D., LL. D. (1872).

W. S. TYLER.

Amherst, or Tonti Island: an island in the eastern end of Lake Ontario, near the Canadian side, at the mouth of the Bay of Quinte. Pop. about 1,200. Amherst is also the name of one of the Magdalen islands in the Gulf of St. Lawrence; of a group of islands lying W. of the S. W. extremity of Korea; and of some islands off the coast of Arakan, a division of Burma. M. W. II.

Amia: a genus of fishes found in the fresh waters of North America; interesting from their relationship to the ancient fossil fishes, and remarkable for the cellular structure of the air-bladder, which somewhat resembles the lung of a reptile. One species is known (*Amia calva*) as the "dog-fish" or "bow-fin," and is worthless as food.

Amian'thus [Gr. *ἀμιανθος*, free from defilement; *ἀ-*, not + *μιαίνω*, defile. The h is due to false association with *ἄνθος*, flower]: a delicate and fibrous form of serpentine, so called because cloth made of it can be purified by fire. It is sometimes called mountain-flax. The cloths in which the ancients wrapped the bodies that were burned on the funeral pyre were sometimes made of amianthus.

Am'ice, or Amic'tus: an upper garment worn by the Romans over the tunic; also a linen vestment worn over the shoulders of Roman Catholic priests during the celebration of the mass. By the Sarum use (English), not only the higher clergy but those in minor orders were required at special seasons to be vested in both alb and amice. Formerly placed on the monarch's head at the coronation. King Edward VI. was the last to use it on this occasion.

Amici, *ā-mee'ehēe*, GIOVANNI BATTISTA: an Italian optician and savant; b. at Modena, Mar. 25, 1784. He was skillful in the fabrication of mirrors and lenses for telescopes and microscopes. He was for many years director of the Observatory of Florence, where he gained distinction as an observer. He wrote on double stars and other topics of astronomy. The achromatic microscope which he constructed was considered a valuable improvement. D. at Florence, Apr. 10, 1863.

Amicis, *ā-mee'ehēe*, EDMONDO, de: Italian writer; b. at Oneglia, Oct. 21, 1848; educated in the military college at Modena. He took part in expeditions against the Sicilian brigands, and then in the war of 1866 against Austria. His

first literary successes were some military sketches published in 1868 and thereafter, *La Vita Militare* (1869). A little later he traveled extensively, and showed himself a master in the art of describing the life and natural aspects of foreign countries and cities. His works in this manner have been much admired, and translated into many modern languages. They are: *La Spagna* (1873); *Ricordi di Londra* (1874); *Olanda* (1874); *Marocco* (1876); *Ricordi di Parigi* (1878); *Costantinopoli* (1878). In his work *Il Romanzo d'un Maestro* (1889), he has given a striking account of the condition of popular education in Italy.

A. R. MARSH.

Amiel, ämëe-el', HENRI FRÉDÉRIC: Genevese poet and thinker; b. at Geneva, Sept. 27, 1821. Educated in Geneva, he subsequently spent several years in study at Heidelberg and Berlin, and in travel in Italy, Germany, Scandinavia, and Holland. In 1849 he was appointed Professor of Æsthetics and French Literature in the Academy of Geneva; in 1854, Professor of Moral Philosophy. A brilliant career was now expected of him, but to the surprise and regret of his friends his life gradually slipped away with the production of no more than a few essays and slight volumes of poems: *Grains de Mil* (1854); *Il Penseroso* (1858); *La Part du Rêve* (1863); and *Jour à Jour* (1880). When he died, however, it was found that he had left a private journal of enormous extent (17,000 folio pages of manuscript), in which he had written down for years his meditations and experiences. In 1882 the first volume of extracts from this *Journal Intime* was published, and was at once recognized by all Europe as a very remarkable book. Thus after his death Amiel attained to fame—the fame of one of the best interpreters of the spiritual and intellectual doubts and anxieties which vex the noblest minds in our time. In 1884 a second volume of extracts appeared, and deepened this impression. See the *Journal Intime*, translated by Mrs. Humphry Ward (London, 1889); *Henri Frédéric Amiel, étude biographique*, par Berthe Vadier (Paris, 1886). D. at Geneva, May 11, 1881.

A. R. MARSH.

Amiens (anc. *Samarobri'va* and *Ambia'ni*): an ancient and important town of Northern France; capital of the department of Somme, on the river Somme, and on the Paris and Boulogne R. R., 81 miles by rail N. of Paris (see map of France, ref. 2-F). It was once very strongly fortified, and still has a citadel. It is the seat of a bishop, and contains a magnificent Gothic cathedral, 415 feet long, 182 feet wide, which was founded in 1220. This is one of the six or seven most important Gothic cathedrals of France, ranking with both of Chartres, Paris, Bourges, Rouen, and Reims. It contains the most remarkable set of choir-stalls, in carved oak, existing. Among its other fine edifices are the Hôtel de Ville, Château d'Eau, and the library, containing 60,000 volumes. Here are extensive manufactures of cotton velvet, serges, plush, and other cotton and woolen stuffs. The river, which is here divided into many canals, affords water-power for mills and manufactories. Amiens was the native place of Peter the Hermit and of Delambre. An important treaty, called "the Peace of Amiens," was signed here by the French and British in March, 1802. On Nov. 27, 1870, the German General Manteuffel obtained here a great victory over the French army of the Loire, and soon after the Germans took possession of the town. Pop. (1896) 88,731.

Revised by RUSSELL STURGIS.

Amite, am-cet': a river rising in the S. W. part of Mississippi; enters Louisiana, flows southward to Ascension parish, where it turns toward the E. and falls into Lake Maurepas. Length about 100 miles.

Amite City: capital of Tangipahoa parish, La. (for location of parish, see map of Louisiana, ref. 9-F); on the Illinois Central R. R. and the Tangipahoa river, 68 miles N. N. W. of New Orleans; has a court-house, 5 churches, 2 schools, and a weekly newspaper. Extensive truck-farming is carried on in the neighborhood. Pop. (1880) 1,120; (1890) 1,510; (1900) 1,547. EDITOR OF "THE FLORIDA PARISHES."

Amityville: summer resort near Babylon, Suffolk co., N. Y. (for location of county, see map of New York, ref. 8-C); on Long Island R. R., 31 miles E. of New York city, and half a mile from the south shore of Long Island. Pop. (1880) 1,063; (1890) 2,293; (1900) 2,038.

Am'leth, or **Ham'leth**: an ancient Prince of Jutland, who is considered a fabulous personage by some writers. He is said to have lived about 150 B. C. His story is related by Saxo Grammaticus, whose narrative was formerly considered the foundation of Shakspeare's *Hamlet*. But Saxo Gram-

maticus was not translated into English when Shakspeare wrote his play, and the differences between the historical narrative and the tragedy give irrefragable evidence that the writer of the latter has known the former only at second hand—probably through the novel of Belleforest, which just at that time was translated from French into English.

Am'ling, KARL GUSTAV: designer and engraver; b. at Nuremberg, Bavaria, about 1650; worked at Munich, Bavaria; was patronized by Maximilian II., and very successful in portraits. He was considered the best German engraver of his time. D. in 1701.

Amling, WOLFGANG: b. at Minnerstadt, Franconia, in 1542; educated at the universities of Tübingen, Wittenberg, and Jena; became rector of the school of Zerbst in 1566, minister at Koswig in 1573, and soon after minister at St. Nicolai in Zerbst. He strongly opposed the *Formula Concordiæ*, and wrote the *Confessio Anhaltina*. D. May 18, 1606.

Amlweh, am'look: a seaport and parliamentary borough of North Wales; is on the north coast of the island of Anglesey, 15 miles N. W. of Beaumaris (see map of England, ref. 7-D). It owes its prosperity to the Parys and Mona copper mines. Pop. about 5,000.

Am'man, or **Am'mon** (the ancient *Rabbah*, the capital of the Ammonites): a ruined city of Syria, in the pashalic of Damascus; picturesquely situated on the Zurka, an affluent of the Jordan, 55 miles E. N. E. of Jerusalem. Here was an important city in ancient times, originally named Rabbah, which was besieged and taken by the army of King David. (See 2 Sam. xi. and xii.) After it had been once ruined it was rebuilt by Ptolemy Philadelphus, and called Philadelphia. It has extensive ancient remains. As late as 300 A. D. it was a remarkable city, having a magnificent theater and temples. It was one of the cities of the Decapolis.

Amman, JOHANN CONRAD, M. D.: Swiss physician; b. at Schaffhausen in 1669; practiced at Haarlem and Amsterdam in Holland. He acquired distinction by his successful efforts to teach the deaf and dumb to speak, and wrote on that subject an essay called *Surdus Loquens* (the Deaf Speaking, Amsterdam, 1692; Eng. trans. 1694). D. near Leyden, 1724.

Amman, JOST or JUSTUS: Swiss engraver and designer; b. at Zurich in 1539. He removed about 1560 to Nuremberg, where he worked for many years and illustrated numerous books with his designs. He engraved on copper and on wood. Among his works are *Portraits of the Kings of France from Pharamond to Henry III.* (1576), and woodcuts of "Reinecke Fuchs." D. at Nuremberg in 1591. See his biography, by C. Becker (Leipzig, 1854).

Ammana'ti, **Ammana'te**, or **Ammana'to**, BARTOLOMMEO: Italian sculptor and architect; b. at Settignano, near Florence, June 18, 1511; was a pupil of Sansovino. He was patronized by Pope Julius III., who employed him to adorn the Capitol (in Rome) with sculptures. He completed the Pitti palace of Florence. Among his best works are a bridge called Ponte della Trinità at Florence, and three statues which adorn the tomb of Sannazar at Naples. D. in Florence, Apr. 22, 1592.

Am'men, DANIEL: rear-admiral, U. S. N.; b. in Brown co., O., May 15, 1820; entered the navy as a midshipman July 7, 1836. During the latter part of 1861 and all of 1862 he commanded the gunboat Seneea in the South Atlantic blockading squadron; he bore a conspicuous part in the battle of Port Royal, Nov. 7, 1861. He engaged afterward in all the operations of Dupont's command on the coasts of Georgia and Florida; was commanding officer of the monitor Patapseo in the engagement with Fort McAllister, Mar. 3, 1863; in the ironclad attack on Fort Sumter, Apr. 7, 1863; in both attacks on Fort Fisher, Dec., 1864, and Jan., 1865; in 1866 and 1867 a member of the board assembled to examine volunteer officers for admission into the regular navy; in 1869 appointed chief of the bureau of yards and docks, and on Oct. 1, 1871, chief of bureau of navigation; retired June 4, 1878. Author of *Country Homes and their Improvement*; *The Old Navy and the New*, etc. He designed the Ammen life-raft. Congress, by the act of Mar. 2, 1889, authorized the construction of a twin screw, armor-plated, harbor-defense ram (the Katahdin) upon the design of Admiral Ammen. She is 251 feet long, 43.5 feet beam, mean draft 15 feet, displacement 2,183 tons. D. near Baltimore, Md., July 11, 1898.

Ammen, JACOB: soldier and teacher; b. in Botetourt co., Va., Jan. 7, 1808; graduated at West Point 1831; and be-

came, July 16, 1862, brigadier-general U. S. Vols. During the civil war he was captain and lieutenant-colonel of the Twelfth Ohio Vols., colonel of the Twenty-fourth, and brigadier-general U. S. Vols. D. at Lockport, O., Feb. 6, 1894.

Am'mergau Mys'tery (Ger. *Ammergau Passionsspiel*): the representation of our Saviour's Passion which since 1634 has taken place every ten years at the village of Ober-Ammergau (*q. v.*), in Bavaria. The custom originated in a vow made by the inhabitants on their deliverance from the plague to celebrate the Passion tragedy every tenth year. The last representation took place in 1900. The text of the Passion-play is given by W. T. Stead (London, 1890).

Am'meter or **Ampère'meter**: an instrument for the measurement of heavy electric currents. The ammeter is distinguished from the current-meter (see **ELECTRIC-METER**) in that it serves to indicate the amount of current at any given instant, whereas the other sums up total electric quantity for an interval of time. The ammeter indicates the rate of flow in ampères, the current-meter records in ampère-hours, or in other convenient units of electrical quantity. The ammeter is usually a **GALVANOMETER** (*q. v.*), or electro-dynamometer, in the construction of which particular attention has been paid to questions of portability, rapidity of action, legibility, and freedom from outside influences, both magnetic and mechanical. For details concerning the construction of ammeters, of which there are many forms, see Kittler, *Handbuch der Elektrotechnik* (Bd. i. p. 254); *La Lumière électrique*, vols. ii., iii., vi., ix., xi., xiv., etc.; *The Electrician*, vols. xii., xiii.; and various other articles in the electrical journals.

E. L. NICHOLS.

Am'mianus Marell'ianus: an eminent Roman historian; b. at Antioch; was of Greek extraction. He served in the army in his youth (about 350 A. D.), and in the expedition which the Emperor Julian conducted against Persia. Having abandoned the military profession, he settled at Rome, and there composed in Latin his *History of the Roman Empire* in thirty-one books, of which the first thirteen are lost. The entire work comprised the period from 96 A. D. to 378 A. D., the extant portion only the years 353-378. His history is highly prized for its impartiality and other merits. Best edition by V. Gardthausen (Leipzig, 1874-75); English translation of Wagner and Erfurdt ed. by Phil. Holland (London, 1609); also by C. D. Yonge in Bohn's Classical Library (1862). D. about 395 A. D.

Revised by M. WARREN.

Ammira'to, Scipione: Italian historian; b. at Lecce, in the kingdom of Naples, Sept. 27, 1531. He became a resident of Florence in 1569, and was patronized by the Grand Duke Cosimo. In 1596 he obtained a prebend in the cathedral of Florence. He wrote, besides other works, a *Discourse on Cornelius Tacitus* (1594), and a *History of Florence* (*Istorie Fiorentine*, 2 vols., 1600-41), which is regarded by some critics as the most accurate work on that subject. He has been styled the modern Livy. D. in Florence, Jan. 30, 1601.

Ammody'tes [Gr. ἀμμοδύτης, sand-burrower; ἄμμος, sand + δύτης, diver, from δύνειν, get into]: a Linnæan genus of apodal fishes, characterized by a compressed head narrower than the body, and both elongated. The sand-eel is an example of this genus.

Am'mon (or more correctly *Amon*, the concealed): the Egyptian name of the deity whose principal place of worship was Thebes. The Greeks and Romans called him Zeus or Jupiter Ammon (Gr. Ἄμμων). He was sometimes represented in the form of a ram. There was a great temple of Ammon in the oasis of Siwah or Ammonium in the Libyan desert, wherein was a famous oracle, and another at Thebes, which city was called No (Jer. xlvi. 25; Ezek. xxx. 14-16) by the ancient Hebrews. Alexander the Great visited the temple of Ammon in the oasis (B. C. 331), and assumed the title of the son of Ammon. Remains of this temple still exist.

Revised by S. M. JACKSON.

Ammon, Christoph Friedrich, von: German Protestant theologian and pulpit orator; b. at Baireuth, Jan. 16, 1766. He became Professor of Theology at Göttingen in 1794, obtained a chair at Erlangen in 1804, and removed in 1813 to Dresden, where he was appointed court-preacher to the King of Saxony. He was a man of great and varied erudition, and belonged to the Rationalist school in theology. His most important work is *Fortbildung des Christenthums zur Weltreligion* (4 vols., 1833-35; 2d ed. 1836-40). D. at Dresden, May 21, 1850. See his biography (Leipzig, 1850).

Revised by S. M. JACKSON.

Am'monia, or Volatile Alkali: an important chemical compound in the form of a transparent, colorless, and pungent gas, consisting of nitrogen and hydrogen. Its symbol is NH₃. Priestley, who first obtained it in a separate state, called it *alkaline air*. The name *ammonia* is derived from *sal-ammoniac*. This name was first applied to common salt found in the Libyan desert in the neighborhood of the temple of Jupiter Ammon. A confusion of terms afterward led to the application of the name to ammonium chloride. It is now obtained as a by-product by the distillation of bituminous coal in making gas, and from refuse animal matter in preparing bone-black, etc. It combines with acids to form salts. As it supplies to plants the nitrogen they require, it is one of the most important ingredients in manures. (See **GUANO**.) A solution of this gas in water is used in medicine, and is called spirits of hartshorn or *liquor ammonia*. One volume of water will dissolve or absorb 500 volumes of ammonia. Liquid ammonia has been employed as a motive-power by Tellier, and for the production of artificial cold by Carré. (See **ICE**.) This gas can also be liquefied by pressure and cold, and then becomes a colorless liquid, with the properties of ammonia much intensified. The smelling-salt, or volatile salt of hartshorn, used as a restorative in faintness is a carbonate of ammonia. Ammonic sulphate, (NH₄)₂SO₄, is manufactured in large quantities by boiling "gas-liquor" with lime, and conducting the ammoniacal gas which is liberated into sulphuric acid. On evaporating the solution, the sulphate is obtained as a white salt. It is extensively used in the manufacture of alum in place of potassic sulphate, as a constituent of artificial fertilizers, and for the preparation of other ammoniacal salts. Ammonic nitrate is used for the preparation of nitrogen monoxide (N₂O), laughing-gas. Ammonic chloride, NH₄Cl, has long been known as *sal-ammoniac*.

Revised by IRA REMSEN.

Am'moniae: a gum-resin used in medicine. It is imported from Africa and India, and is obtained from the *Dore'ma ammoniacum*, an umbelliferous plant containing a milky juice, which by drying is converted into this gum. It is used as an expectorant, and sometimes applied externally as a plaster.

Ammonites [from *Ammon* + suffix *-ite* (Gr. -ίτης), as in *meteorites, augite*, etc. The fossil was called *cornu Ammonis*, from a supposed resemblance to the horns of Jupiter Ammon]: a genus of extinct mollusks belonging to the order *Cephalopoda*, and one of the most striking features in the fauna of the Mesozoic era. The ammonites were discoid, chambered, spiral shells, sometimes 4 feet in diameter, and often beautifully ornamented exteriorly. The internal structure was similar to that of the *Nautilus*, except that the siphon was external, and the septa (partitions between the chambers) were arched outward, and were convoluted at their margins, so that their intersection with the walls of the shell produced beautiful foliated figures. The ammonites began in the carboniferous period, were immensely multiplied in the Triassic, Jurassic, and Cretaceous ages, and became entirely extinct at the close of the last. More than 500 species have been described, and they are found in the Mesozoic strata of all parts of the world. Beautiful ammonites occur in the cretaceous rocks of the country bordering the upper Missouri, in the Indian Territory, and in Texas. The old genus *Ammonites* has been lately much subdivided by Prof. Alph. Hyatt, Prof. von Hauer, and others. See *Proc. Bost. Soc. Nat. Hist.* (1883), and **AMMONOIDEA**.

Revised by H. S. WILLIAMS.

Am'monites: an ancient Semitic tribe or nation, descendants of Ben-Ammi, a son of Lot (Gen. xix. 38). They inhabited the east side of the Jordan, between the rivers Arnon and Jabbok, and adjoining the northern part of Moab. Their chief city was Rabbah. (See **AMMAN**.) They frequently waged war against the Israelites, and were conquered by Jephthah (Judges xi. 33), and afterward by Saul, David, and other later kings (1 Sam. xi., 2 Sam. xii., 2 Chron. xx., 2 Chron. xxvii.). They opposed the rebuilding of the walls of Jerusalem (Neh. ii. 10). They gradually became absorbed with the general Arab population. About 164 B. C. they were defeated by Judas Maccabæus. They are called "the children of Ammon" in the Old Testament.

Revised by S. M. JACKSON.

Am'monium: a hypothetical metal, (NH₄), which is supposed to exist in the salts of ammonia, and to be composed of one volume of nitrogen and four of hydrogen. It is the analogue of potassium and sodium, but has never been obtained in a separate state; a supposed amalgam of ammoni-

um, however, may be formed by the action of the galvanic battery on a globule of mercury surrounded by a solution of ammonia, and by the action of sodium amalgam on a solution of ammonium chloride.

Ammono'num, or **Am'mon**: the ancient name of an oasis in the Libyan desert, about 300 miles W. S. W. of Cairo. It is now called El Siwah. Here were a celebrated oracle and temple of Jupiter Ammon, in a grove of palms; also royal palaces, and the "Fountain of the Sun," the water of which was cold at noon and warm at midnight. The ruins of the temple may still be seen.

Ammono'nius, surnamed **SACCAS**: a Greek philosopher; b. in Alexandria; was the founder of the school called Neo-Platonic about 193 A. D. He held that the philosophy of Aristotle is substantially the same as that of Plato, a view that came to be indorsed later by the Schoolmen and more recently by the German philosophers. Though born of Christian parents, he went over to paganism. Among his pupils were Longinus, Origen, and Plotinus. He left no writings, and died about 241 A. D. Revised by W. T. HARRIS.

Ammonoidea: a sub-order of extinct cephalopodous mollusca, represented in the latter periods of the Palaeozoic and throughout the Mesozoic ages by numerous genera and families of fossil shells. The nearest living relative of this extinct group is the Nautilus, and it is a comparison of the ammonoid shell with that of the Nautilus which has led naturalists to separate the ammonoids as a distinct sub-order from the Nautiloidea, of which the living Nautilus is the type. In both sub-orders there is developed an external chambered shell, the animal at any particular stage of its growth inhabiting the outer chamber. Behind this, which is called the living or body chamber, is a series of gradually decreasing chambers, the whole series forming an elongated cone, which is either straight or curved, or is spirally coiled to form a helicoidal or discoid shell. The chambers are filled with air or a similar gas, and are connected from the initial to the outer body chamber by a hollow tube called a *siphon* or *siphuncle*. The air-space formed by the chambers is supposed to serve as a float to buoy up the animal in the water. In the Ammonoidea the siphuncle is situated near the outer or inner wall of the shell. In the Nautiloidea the siphuncle is generally central, or nearly so. The partitions forming the chambers are called *septa*; the margins of the septa, where they are attached to the outer wall of the shell, are called *sutures*. These sutures are straight or simply arched in the Nautiloidea; in the Ammonoidea the sutures are variously convoluted. The form of the shell, and of the living-chamber in its various aspects; the surface markings, which are often very complicated and beautiful; the relative size and relations to each other of the separate whorls of the spiral shells; the number and size of the chambers; and particularly the nature and degree of complication of the convolutions of the suture, have furnished palaeontologists with the means of exhaustive study of the successive modification of the Ammonoidea in geological time. Upon the above characters the representatives of the sub-order have been classified into 4,000 species; according to the statistics of Von Sutner (Zittel, *Paleontologie*, vol. i. pt. ii. p. 483), distributed in fifteen families and ninety-four genera, or (if we recognize the genera into which Hyatt subdivides the families *Goniatitidae* and *Clymenidae*) the total number of genera would exceed 130. The shell of most of the Ammonoidea is in the form of a more or less closely coiled discoid spiral; this was characteristic of the earlier forms, and of the genera up to the eretaceous. In the cretaceous, which was the last period of the existence of these organisms, there were several genera which may be described as differing from the typical forms by being unrolled to various degrees. In *Macroscaphites*, the last whorl is straightened out. In *Crioceras*, the whole shell is coiled so that the separate whorls do not touch. In *Ancyloceras*, the whorls are separate, but the last half is straightened out and recurved near the end. In *Hamites*, the tube is recurved two or three times. In *Turritites*, the coils are laterally drawn out, forming a long spiral helicoidal shell. In *Baculites*, the shell is quite straight. This unrolling of the ammonite coil is regarded as evidence of retrograde development; the earlier Palaeozoic Nautiloids are either straight, curved, or loosely coiled forms (*Orthoceras*, *Cyrtoceras*, *Gyroceras*, and *Nautilus*). The details of the sutural convolutions have been minutely studied and classified by palaeontologists. Classifications with definite nomenclature have been proposed by several authors. Those of Von Buch and Sandberger are the best known. It has been

observed that the complexity of the convolutions increases with the development of the individual; that in series of closely related species those occurring later geologically are more completely convoluted; and, in general, the species with simpler sutures were earlier to appear, and their dominance, both in number of individuals and in variety of form, took place at an earlier geological period than that of the forms with more differentiated sutures. On account of the close relationship existing between these progressive modifications of the Ammonoidea and the chronological order of their appearance, this sub-order has been used as a beautiful illustration of the law of evolution. Several definite stages of elaboration of the suture lines may be recognized: (1) The Nautilian type, in which the suture is straight or simply arched (*Nautilus*, *Orthoceras*); (2) the Goniatite type, in which the suture is simply lobed or notched by the oscillation of the line forward and backward—the forward bends are called saddles, the backward bends lobes; (3) secondarily lobed type, as in *Ceratites*, in which the secondary lobation is confined to the "lobes" in *Helicites* where the secondary lobation affects only the "saddles," or in *Mendlicottia* where the whole extent of the primary lobes and saddles is more or less affected by the secondary lobation; (4) the tertiarily lobed type, or Ammonite type, in which the secondary lobes are again lobed, forming an elaborate foliation of the suture—this is the characteristic suture of the Ammonites; (5) the Pinacoceran type, in which tertiary lobes are again indented, forming a quaternary lobation of the suture line. The *Pinacoceras* has the most elaborately convoluted suture of all the Ammonites. It is observed that the first appearance of each of these types of suture lines is chronologically in the order in which they are named above. When the suture line is physically considered, it is seen to consist of the fluted edge of the septum forming the separating partition between the chambers of the shell; and the law expressed in all this elaborate variety of sutures may be simply defined in the following terms: In the successive geological stages the circumferential dimension of the septum is gradually increased in proportion to the diameter, and thus it becomes evident that the observed order of sequence is the only order of sequence which could naturally take place.

H. S. WILLIAMS.

Ammonoosuc, Lower: a river of New Hampshire, rises in Coos County, near Mt. Washington, and flowing southwestward, through Grafton County, enters the Connecticut river. It is about 100 miles long.

Ammonoosuc, Upper: a river of Coos co., N. H., which empties into the Connecticut at Northumberland. It is about 75 miles long.

Ammunition: cannon-balls, shells, bullets, fuses, cartridges, grenades, gunpowder, and all the projectiles and explosive substances used in war. The ammunition of field-artillery consists of shot, loaded shells, ease-shot, shrapnel, cartridges, priming-tubes, matches, and rockets. An infantry soldier generally carries sixty rounds in his cartridge-box.

Amnesia: See MEMORY.

Am'nesty [from Gr. ἀμνηστία, oblivion; ἀ-, not + μνᾶσθαι, remember]: an act of oblivion of past misconduct granted by a government to those who have been guilty of some offense. It is usually granted to whole communities or classes of individuals who have taken part, or are supposed to have participated, in some movement against lawful authority; it may be granted either before or after conviction, and its effect is entirely to efface the crime and cause it to be forgotten by the law. An instance is an act of amnesty in England in 20 Geo. II. c. 52, called "an act for the king's most gracious general and free pardon." This subject has excited much interest in the U. S., owing to a provision in the fourteenth amendment to the Constitution creating certain disqualifications as to holding office by persons who have participated in rebellion, and at the same time allowing their removal by a special vote of the Congress. Such a removal is in the nature of an act of amnesty.

Amœba, a-mee'ba: a genus of one-celled organisms of the branch *Protozoa*. The term is also used as a common name applied to members of the genus *Amœba* and allied forms. An amœba consists of naked protoplasm, and has the power of locomotion by means of a streaming motion of the protoplasm which often forms projections over its surface, called pseudopodia. It can ingest food by means of the same motion, possesses a nucleus, and usually a con-

tractile vacuole. Several species have been described. It is of especial interest from the fact that it is often selected in treatises on biological subjects for illustration of the processes of nutrition, motion, sensation, reproduction, etc., in a very simple form, all performed by a single cell, which is not greatly differentiated and specialized. The organism is found in moist places, ponds, ditch-water, and swamps.

DAVID S. JORDAN.

Amol', or **Amul**: a city of Persia: province of Masanderan; on the river Heraz; about 12 miles from its entrance into the Caspian Sea, and 85 miles N. E. of Teheran (see map of Persia and Arabia, ref. 2-G). A bridge of twelve arches crosses the river here. Pop. estimated at from 35,000 to 40,000.

Amoor: same as AMUR.

Amoret'ti, CARLO: Italian naturalist and writer; b. at Oneghia, near Genoa, Mar. 13, 1741. He produced a good biography of Leonardo da Vinci (1784), and a work on the natural history and geography of Lakes Como, Maggiore, and Lugano, called *A Journey from Milan to the Three Lakes* (1794). In 1797 he became librarian of the Ambrosian Library of Milan. D. at Milan, Mar. 24, 1816.

Amor'gos, or **Amor'go**: a fertile island in the Archipelago, 18 miles S. E. of Naxos; belongs to the kingdom of Greece (for location, see map of Greece, ref. 17-M). It is 13 miles long and 6 miles wide, and contains a small town called Amorgos. The surface is mountainous. The poet Simonides was born here. It has a good harbor; lat. of E. end, 36° 54' N., lon. 26° 6' E. Pop. about 3,700.

Am'orites (i. e. mountaineers): a powerful nation of Canaan that occupied the country on both sides of the Jordan in the time of Moses, and resisted the Israelites in their march toward the Promised Land. Moses defeated their two kings, Sihon and Og, who reigned at Heshbon and Bashan respectively. Og is said to have been the last "remnant of giants" (Deuteronomy iii. 11). The Amorites were afterward subdued by Joshua, and their territory divided between the tribes of Reuben and Gad, but he was not able to exterminate them. They appear to have been long hostile to the Israelites, but in Solomon's time were reduced to a tributary condition.

A'mos: one of the minor Hebrew prophets, who was a contemporary of Isaiah; about 785 B. C. He was originally a herdsman and a gatherer of sycamore fruit in Tekoa, a town 12 miles S. S. E. of Jerusalem. He denounces in vigorous and eloquent terms the prevalent corruption and oppression, using many images taken from rural and pastoral life. His prophecies seem to have all been given in one year, and his plain speaking caused the charge of conspiracy against the government because he alienated the people.

Amo'tion [Lat. *amo'tio*, from *a*, away + *move're*, *mo'tum*, move]: in law, the removal of an officer of a corporation from his office. It differs from disfranchisement, which refers to the removal of a member. Amotion may accordingly take place without disfranchisement.

Amoy, a-moi' [a local pronunciation of *Hia-mun*, the Chinese name]: a seaport-town of China, on an island of the same name, in the province of Fuh-Kien, and on the strait of Formosa; lat. 24° 28' N., lon. 118° 4' E. (see map of China, ref. 8-K). It is situated at the mouth of the river on which stands the large city of Chang-Chow-Foo. Amoy is an open or treaty port and one of the chief commercial towns of China. It was taken by the British in 1841, and has been open to the trade of all nations since 1843. Among the articles of import are cotton, cotton goods, iron, sugar, camphor, and pepper. The chief articles of export are tea, sugar, porcelain, silks, and paper. Pop. 96,000.

Ampel'idæ: See VINE FAMILY.

Ampel'ius, LU'CIUS: a Roman writer of uncertain date, probably of the second or third century, whose brief work, entitled *Liber Memorialis*, is a curious miscellany of astronomy, geography, mythology, and historical events, classified under different heads, often based upon good sources. Best edition by Woelfflin (Leipzig, 1879). M. WARREN.

Ampelop'sis [from the Gr. *ἄμπελος*, a vine + *ᾠψις*, appearance]: a genus of creeping, vine-like, woody plants (of the family *Vitaceæ*), to which the Virginia creeper or American woodbine (*Ampelopsis quinquefolia*) belongs. This is one of the most beautiful of our hardy creeping ornamental plants. It is better adapted to the climate of America than the ivy, and is also more rapid in its growth

and has handsomer foliage. The leaves are deciduous, but they die in a blaze of crimson glory when touched by frost.

Ampère, āñ'pār', ANDRÉ MARIE: French philosopher and mathematician; b. at Lyons, Jan. 22, 1775. He produced in 1802 an interesting essay *On the Mathematical Theory of Games of Chance*. He became inspector-general of the University (1808), Professor of Analysis in the Polytechnic School in Paris (1809), chevalier of the Legion of Honor (1809), a member of the Institute (1814), and Professor of Physics in the College of France (1824). Having made important discoveries in electro-magnetism, he published in 1822 a *Collection of Observations on Electro-Dynamics*, a work which displays remarkable sagacity. "The vast field of physical science," says Arago, "perhaps never presented so brilliant a discovery, conceived, verified, and completed with such rapidity." He further explained his discoveries in this department of science, to which he gave the name of electro-dynamics, in his *Theory of Electro-Dynamic Phenomena Deduced from Experiments* (1826). Among his other works are treatises on optics and an *Essay on the Philosophy of the Sciences*, etc. (1834). He was a man of genial disposition, and noted for simplicity of character. D. in Marseilles, June 10, 1836.

Ampère, JEAN JACQUES ANTOINE: an accomplished scholar and *littérateur*, son of André Marie Ampère; b. at Lyons, Aug. 12, 1800. He enjoyed in his youth the society of Madame Récamier, and devoted much attention to English and German literature. In 1833 he succeeded Andrieux as Professor of French Literature at the College of France. He became a member of the Academy of Inscriptions in 1842, and a member of the French Academy in 1847. He traveled extensively in Egypt, the Levant, Scandinavia, and America. On the establishment of the empire he removed to Italy. His chief works are *Littérature, Voyages et Poésies* (1833); *Grèce, Rome et Dante* (1848); *Promenades en Amérique* (1855); and especially *l'Histoire littéraire de la France avant le XII^e. Siècle* (1839); *l'Introduction à l'histoire de la littérature française au moyen âge* (1841); and *l'Histoire romaine à Rome* (4 t., 1856-64). D. in Pau, Mar. 27, 1864. Revised by A. R. MARSH.

Ampere (in electricity): the practical unit of current-strength; named after André Marie Ampère, the French physicist. It is an exact tenth of the C. G. S. unit of absolute current-strength. The ampère is the amount of current which will be generated in a conductor, the resistance of which is one ohm, when the difference of potential between the ends of the conductor is one volt. Previous to 1881 a practical unit, similarly defined, was in use among electricians, under various names. It was frequently called the "weber." The International Electrical Congress which met at Paris in that year systematized the practical units in electricity, and gave to the unit of current the official name of the ampère. E. L. NICHOLS.

Ampere-me'ter: See AMMETER.

Ampere-turns (in electricity): the product of the amount of current flowing in a coil or helix, measured in ampères, into the number of turns of wire of which the coil is composed. As this product is a factor in the measurement of the magnetic field produced by the coil in question, it is an important and much-used quantity in applied electricity.

Amphib'ia [Gr. *ἀμφίβια*, neut. plur. of *ἀμφίβιος*, living in both; *ἀμφί*, on both sides + *βίος*, life]: a term originally applied to all animals that live both on the land and in the water, and variously used by the earlier systematists. It is now limited to a class of vertebrates intermediate between fishes and reptiles, and including the salamanders, frogs, toads, and their allies. They are cold-blooded animals, having the skin usually without plates or scales, and the young provided with gills during part or all of their lives. In common with fishes, they fail to form during their development the amnion and allantois, the embryonic membranes characteristic of the reptiles, birds, and mammals.

Most amphibians pass through a metamorphosis like that of the frog, which emerges from the egg as a tadpole, when it is fishlike in form and breathes by gills, being truly aquatic; subsequently the tail and gills disappear, legs and lungs are developed, and the mature animal, though perhaps inhabiting the water, is an air-breather. In some amphibians the first or embryonic condition continues unchanged through life, as in *Necturus*, etc., the water-puppy or water-dog of the Western rivers. The largest of these aquatic carnivorous salamanders is *Megalobatrachus*, which inhabits the

lakes of Japan, and attains a length of 3 feet. Though now regarded as dull and disgusting creatures, this latter group of amphibians once stood at the head of all then existing members of the zoölogical series. The amphibians first appeared in the carboniferous age, and the lagoons in the coal-marshes swarmed with aquatic salamanders, some of which were 6 feet in length, very active and predaceous, and the monarchs of the animal world of that age. More than twenty species of amphibians have been obtained by Dr. Newberry from the cannel coal of one mine in Ohio. The amphibians had their golden age in the Trias, when *Labyrinthodon*, with a body as large as that of an ox and teeth 4 inches long, ruled the animal kingdom. In the succeeding age (Jurassic) the scepter passed from the amphibians to the true reptiles.

Revised by DAVID S. JORDAN.

Am'phibole [from Gr. ἀμφίβολος, hitting on both sides, ambiguous; ἀμφί, on both sides + βάλλειν, throw]: a name given by Haüy to hornblende, on account of its resemblance to augite. See HORNBLENDE.

Amphie'tyon (Gr. Ἀμφικτύων): an ancient and perhaps fabulous hero and King of Attica, supposed to have been a son of Deucalion.

Amphietyon'ic Conn'cil: a celebrated congress or politico-religious court of the confederated tribes of ancient Greece, which met twice every year at Thermopylæ. It was composed of the deputies of twelve tribes, viz.: Thessalians, Bœotians, Dorians (or Spartans), Ionians (or Athenians), Locrians, Dolopians, Magnetes, Malians, Achæans, Phocians, Ænians, and Perrhæbians, who each sent one or two members. The predominance of northern and Pelasgic tribes proves the great antiquity of this institution, which in course of time declined, and in the age of Demosthenes had lost its authority. The members of this council bound themselves by an oath that "they would not destroy any Amphietyonic city nor cut off its streams in war or peace." One great object of the council was the protection of the temple at Delphi. See Tittmann's *Ueber den Bund der Amphiktyonen* (1852).

Amphi'on: in Greek mythology, the son of Zeus and Antiope and twin brother of Zethus. The brothers were found and reared by a shepherd, and Amphion became skilled in music by the gift of the gods, and Zethus became a shepherd. Meanwhile Antiope was cruelly treated by their uncle Lycus, King of Thebes, and his wife Dirce, and when the brothers discovered their parentage they marched against the city, put Lycus to death, and bound Dirce to a wild bull. This punishment of Dirce is represented in the group of statuary called the FARNESE BULL (*q. v.*), discovered in the baths of Caracalla, and now in the museum at Naples. According to the poetic legend, he availed himself of his skill in music to build the walls of Thebes, and the stones, attracted by the sound of his lyre, moved and arranged themselves in the proper position. Amphion married NIOBE (*q. v.*), and according to tradition killed himself in grief at the slaying of his children by Apollo and Artemis. F. S. ALLEN.

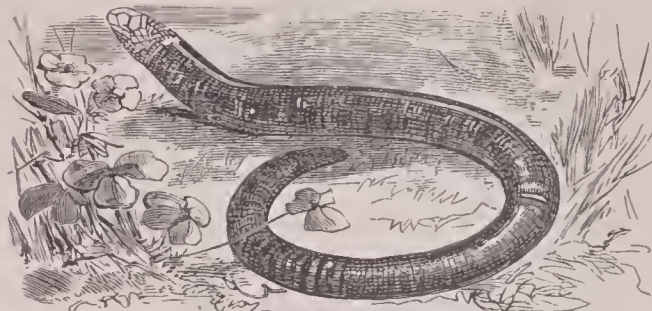
Amphioxus: See LEPTOCARDII.

Amphip'oda [from Gr. ἀμφί, both + πούς (gen. ποδός), foot]: an order of small crustacea, for the most part marine, the most familiar members of which are the "sand-fleas" and "beach-fleas" found so abundantly among decaying seaweed, or burrowing in the sand of our beaches. Other forms live attached to the skin of whales, and still others are found in the genital pouches of the jellyfishes with which they are commensal. Some European species are very destructive, burrowing in the hulls of ships and in the piles of wharves, in the manner of the teredo. In all, the body is laterally compressed, the abdominal region is elongated, and the anterior and posterior feet are dissimilar, the former being frequently adapted for seizing or swimming, while the latter are directed backward and used in leaping. The gills are attached to the bases of the thoracic legs. DAVID S. JORDAN.

Amphip'olis: an ancient and important city of Thrace or Macedonia, was founded by an Athenian colony about 437 B. C. It was situated at the mouth of the river Strymon, which here enters the *Strymonicus Sin'us*, the modern Gulf of Contessa. The waters of the river are said to have once surrounded the town (whence the name). In the Middle Ages it was called Popolia. Its site is now occupied by a small Turkish town called Yenikeui.

Amphisbæ'nidæ [Gr. ἀμφίσβαινα, from ἀμφί, at both ends + βάλειν, go]: a family of lizards with an elongated serpentiform body and a blunt tail. Limbs are generally absent, a pair of small front legs being found in the genus

Chirotes only. The head and tail are sufficiently similar in appearance to have suggested the name. About two dozen species inhabit the warm portions of both hemispheres.



Amphisbæna fuliginosa.

They burrow in the earth in search of larvæ, and have rudimentary eyes.

Revised by D. S. JORDAN.

Amphis'sa: a town of ancient Greece, in Loeris, was situated 7 miles from Delphi, on the site of the modern town of *Salona*. The town was destroyed B. C. 338 by Philip of Macedon, but was rebuilt. Here was a temple of Athena, containing an image of the goddess.

Amphithe'ater [Lat. *amphitheatrum*, from Gr. ἀμφιθέατρον; ἀμφί, on both sides + θέατρον, theater]: a spacious and uncovered edifice of an elliptical or circular form, in which the ancient Romans witnessed the exhibition of public games and the combats of gladiators and wild beasts. It was constructed so that all the spectators could behold the performance, which was given in an open level space called the arena, surrounded on all sides by tiers of seats, which rose higher as they receded from the arena. The most famous of these edifices was the Flavian Amphitheater, or Colosseum of Rome, which was built by the Emperors Vespasian and Titus, finished about 80 A. D., and is still standing. It is about 620 feet long, 513 feet wide, and 157 feet high. The longest diameter of the arena was 287 feet. It is said to have had seats for 80,000 spectators, and standing-room for 20,000 more. The exterior was adorned by three rows of columns—Doric, Ionic, and Corinthian. The Colosseum is regarded by many as the most august and imposing ruin in the world.

Amphithe'rium [from ἀμφί, on both sides + θηρίον, wild beast]: a genus of fossil insectivorous mammalia found in the oölitic strata in Oxfordshire, England. It presents many points of analogy with the living marsupial genus *Myrmecobius*.

Amphitri'te: in the Greek mythology, a Nereid, a goddess of the sea, the wife of Neptune and the mother of Triton. She is represented sitting in a ear of shells drawn by tritons, or on a dolphin.

Amphit'ryon: in classic mythology, a son of Alcæus. Having accidentally killed his uncle Electryon, he was banished from Mycenæ. He married Alcmena, who was the mother of Hercules.

Am'phora [Lat., from Gr. ἀφορεύς for *ἀμφι-φορεύς; ἀμφί, on both sides + φέρειν, carry, with reference to its two handles]: a vase with two handles which was used by the ancient Greeks and Romans to hold wine and oil. It was also a liquid measure, containing about 8½ gal. among the Greeks and 6 among the Romans.

Am'plitude: in astronomy, is the angular distance of a heavenly body, when it rises or sets, from the E. or W. points of the horizon. The amplitude of a fixed star remains the same all the year, but that of the sun changes daily, and on a given day varies according to the latitude of the observer.

Ampu'dia, PEDRO, de: a Mexican officer who obtained the rank of general in 1840. He fought against the Texans in 1842, and commanded the Mexican troops which defended Monterey in 1846 against Gen. Taylor, to whom he surrendered in September of that year.

Ampul'la: a Roman vessel of glass or earthenware, used for holding oil, wine, etc.; was nearly globular in form. Many of these are preserved in the collections of antiquaries. In the Catholic Church an ampulla is a vessel which contains wine for the sacrament. *Ampulla Remensis* (in Fr. *la Sainte Ampoule*) was a famous vessel of holy oil which, according to tradition, was brought from heaven by a dove, and was used to anoint Clovis when he was crowned at Rheims in 496 A. D.

Ampulla'ria [Lat. *ampullarius*, from *ampulla*, a flask]: a genus of gasteropod mollusks, called apple-shells, idol-



Ampullaria dubia.

shells, pond-snails, etc. Fifty or more species are known, mostly tropical, and all inhabiting fresh water and mud, though some are occasionally found in salt and brackish waters. They are remarkable for their tenacious hold on life, many being able to live away from the water for years. One species is occasionally found alive in hollow logs of mahogany and logwood from Honduras. The *Ampullaria dubia* is brought from the Nile.

Amputa'tion [Lat. *amputatio*; *am-* (*amb-*), about + *puta've*, prune]: in surgery, the removal, by operation, of any part of the body or limbs on account of disease or injury, such as would endanger life if the part were allowed to remain. The term of late denotes more especially such removal of a limb, but is still sometimes used for the excision of a tumor or gland.

Amputations are properly resorted to not only after severe and very dangerous injuries, but in such diseases as gangrene, cancer, etc., which are without rational prospect of cure by other means. In general, cases where the chances of cure will probably be much increased by this operation afford legitimate subjects for its exercise. This rule would include some cases of intractable ulcers of the leg, of aneurism, and of diseased bones and joints. Incurable and unsightly deformities, where they put the patient to great inconvenience, may in some circumstances be removed by the knife. An amputation in which a bone is cut off is said to be "in the continuity." An amputation at a joint, when no bones are divided, is in "the contiguity"; the latter operation is not often performed, though it has had recent advocates. Amputations are chiefly either "flap" or "circular" operations. The "flap" operation, in some of its many modifications, is probably the most frequently employed. One, two, or even three flaps have been employed, the size, shape, and thickness of these flaps of skin and flesh varying with circumstances. In general, they ought to be large enough to cover amply the end of the stump, and not so large as to be redundant after the wound shall have healed. The flap amputation, practiced by certain mediæval surgeons, and revived by Lowdham, of England, nearly 200 years ago, was made general by Liston, and has since his time been variously improved and modified.

"Circular amputation" is performed by first dividing the skin and superficial fascia by a sweep of the knife around the limb, dissecting up the skin for 2 or 3 inches, and at that part dividing the muscles down to the bone. The flesh is removed from the bone to allow the saw to be applied.

The danger attending amputation is generally in proportion to the nearness of the operation to the trunk, as well as

to the size of the limb. Thus amputation at the hip joint is the most doubtful of all in its results; but even this, in some cases, especially in military surgery, may improve the chances of life under severe injury. Amputations at the joints are by most surgeons considered as more serious than in the continuity of the limbs. Of the foot alone several different modes of amputation are in use, as Lisfranc's, Chopart's, Syme's, and Pirogoff's amputations. Revised by WILLIAM PEPPER.

Amri'ta, sometimes incorrectly written **Amreeta** [Sansk. *amṛta-s*, immortal; *a-*, not + *mṛta-s*, dead: Gr. *ἄμβροτος*. The vowel *-i-* represents an earlier method of English transliteration]: in Hindu mythology, the water of immortality, which is said to have been obtained by the churning of the ocean. The term amrita or amrit is sometimes given to the food as well as the drink of the gods, and likewise to any delicious drink.

Amritsar, *ūm-rit'sūr* (i. e. Amrita Saras, fount of immortality): a city of Northern India; capital of a division and district of the same name; and commercial center of the Punjaub. It is on the railroad, 40 miles E. of Lahore, and 330 miles N. W. of Delhi (see map of N. India, ref. 3-D). This city is the center of the Sikh religion and learning. It owes its importance to a reservoir for religious purposes which Ram Das, one of the great spiritual guides of the Sikhs, caused to be made here in 1581, and which has become an object of pilgrimage and veneration. This reservoir still remains, and on an island in its center there is a celebrated temple, supporting a large body of priests. The city also carries on an extensive trade with Central Asia, and manufactures imitations of Kashmir shawls and silks. Pop. (1891) 136,500. The district has an area of 1,574 sq. miles, and a population of 900,000. The division, including this district, Sialkot, and Gurdaspur, extends northward to the Himalayas, and lies between the Chenab and Bias rivers. Area, 5,354 sq. miles. Pop. 2,750,000. It is not well watered, and extensive irrigation is necessary. The population is about one-half Mohammedans, one-fourth Hindu, and only one-eighth Sikhs. M. W. H.

Am'rou Ben el As (more correctly Amr ibn-al 'Assi): a famous Arabian warrior; b. about 600 A. D.; at first opposed Mohammed, but became a zealous proselyte; aided in the conquest of Syria; conquered Egypt, of which he became emir, taking Alexandria in 640 A. D., and Tripoli three years later. He became an opponent of Ali. He was a man of energy and prudence. D., as Governor of Egypt, 664.

Ams'dorf, NIKOLAUS, von: a Reformer; b. in Saxony, probably at Torgau, Dec. 3, 1483. He accompanied Luther to the Diet of Worms in 1521, assisted in the translation of the Old Testament; introduced the Reformation into Magdeburg, where he was pastor, 1524-42; became Bishop of Naumburg, 1542, and Superintendent of Eisenach, 1548. After Luther's death, he was prominent in opposing certain tendencies of Melancthon. (See ADIAPHORITES.) An extravagant expression of Amsdorf, that "good works are injurious to salvation," was the occasion of the discussion in the *Formula of Concord*, Art. iv. D. at Eisenach, May 14, 1565.

Revised by HENRY E. JACOBS.

Ams'ler, SAMUEL: skillful engraver; b. at Schinznach, Switzerland, Dec. 17, 1791. He became Professor of Engraving in the Academy of Fine Arts in Munich. He engraved many of the works of Raphael and Thorwaldsen, and reproduced the former with peculiar fidelity. Among his best works are the *Triumph of Alexander the Great*, after Thorwaldsen; a *Holy Family* and a *Burial of Christ*, both after Raphael; also a *Christ*, after Dannecker. D. at Munich, May 18, 1849.

Am'sterdam, formerly **Amstelredamme**, or **Amstel-damme** (the dike or dam of the Amstel; in Latin, *Amstelodanum*): an important commercial city and capital of the kingdom of Holland; situated at the junction of the Amstel with the Y, and near the Zuyder Zee, through which it has access to the ocean; lat. 52° 29' N., lon. 4° 53' E. (see map of Holland and Belgium, ref. 5-F). It is the largest city of Holland and its constitutional capital, but the royal court is at The Hague. Amsterdam stands on flat, marshy ground, into which piles, 50 feet long, are driven to form a foundation for the houses, which are mostly built of brick. The city is divided into ninety islands by a number of canals, which are crossed by 280 bridges. A part of the old ramparts have been pulled down, and twenty-eight windmills for grinding grain have been erected on the bastions. The principal streets are the Heerengracht, Keizergracht, and Prin-

zensgracht, each of which is about 2 miles long, and describes a semicircle. Canals occupy the middle of these streets, which are scarcely surpassed in elegance by those of any capital in Europe. Among the grand public buildings of this metropolis is the palace or town-hall, a stone edifice 282 feet long and 235 feet wide, resting on 13,659 piles, driven into the ground to the depth of 70 feet. This palace contains a remarkable hall 120 feet long, 60 feet wide, and 100 feet high, lined with white Italian marble. The city has a beautiful justiciary hall, a modern building of Grecian architecture. The most beautiful church of Amsterdam is the Nieuwe Kerk (founded in 1408), 350 feet long and 210 wide. This Nieuwe Kerk and the Oude Kerk, which has a remarkable organ, belong to the Reformed Church. Much of the water-supply of Amsterdam now comes from the sand dunes of the coast. Amsterdam is liberally supplied with hospitals and other charitable institutions. Among the important educational and literary institutions are the Athenæum Illustre, which has a botanic garden, a school of anatomy, and chairs of art, law, medicine, and theology; the city Latin school; the Royal Academy of Fine Arts, founded in 1820; the Arti et Amicitie society of painters; the naval school; the Royal Dutch Institution for science, literature, and art; the antiquarian society; and the society of literature and fine arts, called Felix Meritis. The museum at the Trippenhuis contains the finest collection in Europe of pictures of the Dutch school, among which are the *Banquet of the Arquebussiers*, by Van der Helst, and *The Night Watch*, and the so-called "Syndics," by Rembrandt. There is also an admirable collection of engravings. There are also in the city several smaller collections, public and private, so that this city must be visited by all who wish to study Dutch painting.

The chief manufactures are tobacco, soap, canvas, glass, jewelry, cordage, machinery, steam-engines, etc. Its commerce is more important than its manufactures. That great trade which in the sixteenth century placed Amsterdam at the head of the commercial cities of Europe gradually declined, partly from the rise of other ports, but principally from the difficulties of navigation caused by the silting up of the Zuyder Zee, and, above all, the Pampus Bar. Large vessels were obliged to discharge their cargoes outside, and were then floated over the bar by means of *camels*, which, when the water was pumped out of them, raised the vessel with them. To remedy this, the North Holland Canal was cut to the Helder, a distance of 51 miles. It is 124 feet broad at the surface and 31 feet at the bottom, and is available for vessels drawing 18 feet of water. But even this great highway is now inadequate, and moreover is obstructed in winter by ice. To maintain the rank of Amsterdam as one of the great commercial *entrepôts* of Europe, one of the most remarkable engineering works of modern times was commenced in 1863, and is now completed—the *direct* connection of the port of Amsterdam with the North Sea, 15 miles distant, by a canal terminating in an artificial harbor on that sea. This has made Amsterdam practically a seaport. Diamond-cutting is almost exclusively carried on here. See CANALS.

Amsterdam is the terminus of numerous railways. The chief articles of export are butter, cheese, sugar, coffee, oil, spices, colors, etc.

Amsterdam was founded about 1250, before which it was a mere fishing-village, with a castle, the residence of the lords of Amstel. It was fortified in 1482, and became a part of the United Provinces in 1578, after which its commerce and population rapidly increased. Between 1630 and 1750 it was the foremost commercial city of Europe. Pop. (1867) 267,627; (1885) 372,325; (1891) 417,539.

Revised by MARK W. HARRINGTON.

Amsterdam: city, on Mohawk river, Montgomery co., N. Y. (for location of county, see map of New York, ref. 4-I); on N. Y. Central R. R.; 33 miles N. W. of Albany. It has about 40 manufactories (carpets, knit goods, brooms, steel springs, paper, etc.), 3 daily newspapers, numerous churches, and an electric railroad. Its streets are lighted by electricity, and it has an academy, private schools, Roman Catholic institute, etc. Excellent water-supply, fine system of drainage, and well-paved streets. Pop. (1870) 5,426; (1880) 9,466; (1890) 17,336; (1900) 20,929. EDITOR OF "DEMOCRAT."

Amsterdam Treaty: a treaty concluded by France, Russia, and Prussia, Aug. 4, 1717. The mediation of France was accepted between the Czar and the King of Prussia on one side, and Sweden on the other. Russia also abandoned the

invasion of Mecklenburg, and France agreed not to renew a treaty of subsidies with Sweden.

Amu', or Amu Dar'ya: See OXUS.

Am'ulet: an object worn on the person as a charm, and supposed to have power to protect the wearer against evil spirits, sickness, and other real or imaginary evils. Amulets were worn by the ancient Egyptians, Greeks, and Jews. The Greeks and Romans wore a variety of gems and small figures of heroes, deities, and animals. Amulets were also used by the early Christians, but that form of superstition was condemned by the Council of Laodicea about A. D. 360. They are common among the Turks at the present day. An astrological amulet called a talisman was highly prized by the Arabs.

Amunategui, ää-moo-naa'täy-gëe, MIGUEL LUIS: Chilian publicist and *littérateur*; b. Jan. 11, 1828; educated in the University at Santiago, where he attracted the attention of the eminent Andrés Bello. In 1848 he helped Bello in his *Historia de Grecia y Roma*, and was thenceforth his close friend. Much of his life was passed in writing for Chilian periodicals, but several of his books remain among the most serious productions of his country. Such are *Biografias de Americanos* (1854); *Los Precursores de la Independencia* (1870-72); *Vida de Don Andrés Bello* (1876). D. in 1888. A. R. MARSH.

Amur': a province of Russia; in Eastern Siberia: N. of the Amur river, S. of the Yablonoi and Stanovoi Mountains, and W. of the Coast Province; the boundary between it and the last being about the meridian of 135° E. Westward it extends to the mouth of the Shilka river. It comprises the basin of the Seya and Bureya rivers, with some smaller tributaries of the Amur. Area, 172,848 sq. miles. Pop. (1886) 63,221. In a broader sense, the Amur country includes all the Russian territory from Lake Baikal to the Okhotsk Sea, S. of the Stanovoi Mountains. As thus defined it takes in the Russian provinces of Transbaikal, Amur, the Coast Province, and Saghalien, an area of 1,150,000 sq. miles, with a population of 700,000. In climate and character this country is not unlike New England and Quebec, while the southern end of the Coast Province has about the climate of New Jersey and Pennsylvania. Agriculture is generally possible and in places would be very successful. Minerals abound, and a few Americans have found their way there in search of gold. The settlements at present are mostly penal ones. M. W. H.

Amur River: a river of Eastern Asia: for most of its course the boundary between the Russian and Chinese possessions, formed in about lon. 122° E. by the union of the Shilka and Argun. It soon breaks through the Chingan Mountains and takes a general southeasterly course until lon. 135° is reached, when it turns northward and empties into the Okhotsk Sea opposite the northern end of Saghalien at the town of Nicolayevsk, at which point it forms a considerable delta. The chief tributaries are the Seya, Bureya, and Angun. Length, 2,800 miles; area of basin, 520,000 sq. miles. M. W. H.

Amur'ath, or Mu'rad I.: Sultan of the Turks; b. in 1319; succeeded Orkhan, his father, in 1359; took Adrianople in 1361; and waged with success long and bloody wars, chiefly with the Christians; in what is now European Turkey. He was assassinated June 15, 1389.

Amurath II.: succeeded his father, Mohammed I., in 1421; attacked Constantinople in 1423; contended with varying success for many years against the Hungarians under Hunyady, and against Scanderbeg. He gained a great victory at Kosovo in 1448. D. Feb. 9, 1451.

Amurath III.: one of the most cruel of the sultans; b. in 1545; came to the sultanate in 1574. His reign was marked by long wars with Austria and Persia, and with the janizaries at home. D. Jan. 17, 1595.

Amurath (Murad) IV.: Sultan of Turkey; b. about 1610; succeeded his uncle Mustafa in 1623. He had a passionate temper, which was rendered more violent and dangerous by habitual drunkenness. He amused himself by shooting from his palace windows at passers-by in the streets. The most important event of his reign was the capture of Bagdad by his army in 1638. D. Feb. 9, 1640.

Amussat, ää'moos'saa', JEAN ZULÉMA: French surgeon and writer; b. at St. Maixent, in Deux-Sèvres, Nov. 21, 1796. He invented and improved several surgical instruments, and published some able professional treatises, among which are

Researches into the Nervous System (1825), and a *Memoir on the Torsion of Arteries* (1829), which obtained a prize of the Institute. D. in Paris, May 13, 1856.

Amyclæ: an ancient town of Laconia, on the Eurotas, 20 stadia S. E. of Sparta, in a district noted for the abundance of its trees and its fertility; famous in the heroic or legendary age as the abode of Tyndarus and Leda and Castor and Pollux, who were called *Amyclæi Fratres* (Amyclæan Brothers). This town was conquered by the Spartans about 775 B. C.

Amygdaloid [from Gr. ἀμυγδάλη, almond + εἶδος, form]: having the form of an almond; applied in geology to certain volcanic rocks in which once existed oval cavities or cells now filled with nodules of some crystalline mineral deposited from an infiltrated solution. The nodules are composed of agate, chalcedony, calcareous spar, etc. The cavities they occupy were formed as bubbles by steam or other gas while the rock was in a molten condition.

Amygdalus [from Gr. ἀμύγδαλος, ἀμυγδαλή, almond-tree]: a genus of plants of the order *Rosaceæ*, consists of trees whose fruit is a drupe. It comprises the almond (*Amygdalus communis*) and the peach (*Amygdalus Per'sica*).

Amyl (C₅H₁₁): a compound radical belonging to the alcohol series, exists in amylic alcohol, C₅H₁₁.O.H, or fusel oil. It forms a series of compound ethers (see **ETHERS**), some of which are used as substitutes for the essences of natural fruits. The nitrite of amyl is an ethereal liquid of agreeable odor, which has been recently brought to the attention of medical practitioners on account of its peculiar action on the circulation. A few drops inhaled causes a sudden acceleration of the pulse and flushing of the face.

Amyot, JACQUES: b. at Melun, France, Oct. 30, 1513; taught Latin and Greek at the University of Paris; visited Italy; became tutor to the two youngest sons of Henry II.; was made grand almoner under Charles IX., and finally Bishop of Auxerre, where he died Feb. 6, 1593. He published a number of translations of Greek authors, which are highly esteemed for the excellent French in which they are written. These are the *Theagenes and Chariclea* of Heliodorus (1547); seven books of *Diodorus Siculus* (1554); the *Daphnis and Chloe* of Longus (1559); *Plutarch's Lives* (1559); *Plutarch's Morals* (1574). Of these, incomparably the most famous is the translation of *Plutarch's Lives*, which made Amyot one of the most noted writers of France. The English version of Amyot's French, by Sir Thomas North (1575), was extraordinarily popular among the Elizabethans, and was used by Shakspeare as a source for several of his plays. A. R. MARSH.

Amyot, JOSEPH: French Jesuit missionary; b. at Toulon in 1718. He sailed to China in 1750, was invited to Peking by the emperor, and passed the rest of his life there. He learned the Chinese language, from which he translated several works into French, and compiled a *Mantchoo-Tartar-French Dictionary* (Paris, 3 vols., 1789-90). Few European authors have done so much to illustrate the history and customs of China. He wrote a large portion of the *Memoirs Concerning the History, Sciences, Arts, and Customs of the Chinese* (16 vols., 1776-1814). D. in Peking in 1794.

Anabant'idæ [from Gr. ἀναβάς, -βάντος, partic. of ἀναβαίνειν, go up, climb]: a family of spiny-rayed fishes, with the superior branchials of the gill-arches laminated and developed into a superbranchial organ which retains water sufficient to moisten the gills for a considerable time, and with more or less spines in the dorsal and anal fins. Species are found in Southeastern Asia and Africa. One, the *Anabas scandens*, found in India, etc., is especially remarkable for a limited power of climbing. Unlike the eel, which passes over only moist ground, the anabas takes its journey over hard, dry, and dusty roads, and frequently up steep ascents heated with the burning beams of the noonday sun, and does not seem to feel any serious inconvenience from these. It is even asserted by some writers that this fish is able to climb a tree.



Anabas scandens: climbing perch.

Anabaptists: a widely disseminated religious community that arose in the period of the Protestant Reformation, and

still exists in many parts of Europe and North America under the designation of **MENNONITES** (*q. v.*).

The name, derived from ἀναβαπτίζειν, signifies *rebaptizers*. It was bestowed by their opponents, and was never acknowledged by the brethren of the party. The injustice of the name is now generally conceded. The brotherhood denied that they were chargeable with rebaptizing, on the ground that persons who had received the rite in unconscious infancy had never been baptized at all. Influenced perhaps by the powerful example of Prof. Cornelius, German authorities have now adopted a custom which allows the correctness of the Anabaptist contention. Instead of writing them down as "Wiedertäufer" it has become common to designate them simply as "Täufer," and their church as "die täuferische Kirche." That custom has introduced an amount of confusion among English authorities. The word "Täufer" is frequently translated Baptists, and "täuferische Kirche" as Baptist Church. The two things are distinct and should be held apart. The Mennonites, who are the Anabaptists of modern times, have never failed to insist upon the distinction, and to keep themselves separated from the Baptists. See **BAPTISTS**.

The Reformation period is allowed by all authorities to have been exceedingly unsettled and perilous. Deep and widespread dissatisfaction prevailed in more than one rank of society in Germany. The peasants were in a particularly restless frame of mind. One of several outbreaks that had occurred during the earlier years of the sixteenth century was enacted by them in the year 1525, under the leadership of Thomas Münzer. Almost as a matter of course it ended disastrously. The peasant movement was of a social and political sort. There were no Anabaptists engaged in this movement. Münzer, it is conceded, wrote against infant baptism, but neither himself nor his followers went to the extent of rebaptizing. The Anabaptist movement originated at Zurich, Switzerland, between Jan. 18 and 25, 1525. For more than a year dissatisfaction had been growing against some of the methods and measures of Zwingli, the Reformer of Switzerland. In particular the Anabaptist leaders objected to the use he made of the civil government in carrying forward his work, and to the relations of his Church to the government. Besides, though Zwingli was decidedly more literalistic than Luther in the interpretation of Scripture, he retained infant baptism, for which in their estimation there appeared to be no biblical authority. The matters at issue were brought to trial in a formal discussion held in the presence of the city council on Jan. 18, 1525. Zwingli was successful; the city council ordered the Anabaptists to retract or to leave the canton within seven days. During this period, just before their departure, the brethren took the step which gave them the name they have borne for almost the entire period since the Reformation; at an assembly in the house of Felix Manz they instituted adult baptism, and most of the leaders submitted to it.

The significance of that step can hardly be correctly estimated at this distance of time. In the estimation of their opponents, and possibly of a portion of the brethren, it unchurched and unchristianized both Zwingli and his followers. The Church in Zurich, however, was so closely intertwined with the state that a blow at the Church was at the same moment a blow at the state, and an act of rebellion against all constituted authority. There is no reason to suppose that the leaders intended to assume any such extreme position. Their aims were chiefly religious, not political or social; there is every reason to conclude they were estimable and sober men. But they were the victims of circumstances which it was out of their power, and perhaps of any human power, to control. On the heels of this daring act came the peasants' rebellion and the enormities enacted by Münzer. Suspicion was already active against the brethren as being on the side of anarchy. Even under the most favorable conditions it would have been difficult for them to allay the apprehensions of their opponents and to quiet the public mind. The catastrophe at Frankenhäusen on the 15th of May, in which the peasants were defeated and scattered, robbed all parties of reason. Zwingli and his adherents became unalterably convinced that the brethren were in league with disorder, and that it was the duty of every friend of Church and state to use every resource to put them down.

The form of baptism adopted when the movement was instituted appears to have been by sprinkling or pouring, and with comparatively few exceptions that form was observed wherever the party was established. In Switzerland,

in portions of Swabia, and in Poland there were some who were in favor of immersion; but instances were comparatively infrequent. Sprinkling and pouring had supplanted immersion in every section of Germany, except Pomerania, before this time, and the brethren fell into the current fashion, apparently almost without reflection. It is suggested that what little immersion was observed among them may have been due to the influence of Johann Denck. Sprinkling and pouring are believed to have prevailed without exception among the Melchiorites in Holland and Lower Germany. The Mennonites have never followed any other mode.

The connection between the brethren and older reforming parties that existed before the Reformation has been much discussed. The leaders of the movement in Switzerland were aware of no such connection; it was also the custom of the advocates of adult baptism to speak of these leaders as the "founders of Baptism" for more than a century after their decease. Finally, however, in a work published in 1647, the claim was first advanced that the Waldensians were their progenitors. That claim has been often repeated, but has never been established. The failure to establish it does not prove that it is not true; it is possible that additional information may one day be obtained. It is a significant circumstance, however, that modern Mennonite scholars, notably de Hoop Scheffer of Amsterdam, appear to have decided against the notion of any kind of succession. On the other hand, Dr. Ludwig Keller, of Münster, zealously defends that notion, and has written largely to exhibit the correctness of his position.

The principal leader among the "founders of Baptism" in Switzerland was Conrad Grebel, a person of fine learning, noble family, and, on the whole, of admirable spirit. Worthy to stand at his side was his fellow-townsmen of Zurich, Felix Manz, a competent Hebraist and a splendid character. George Blaurock, formerly a monk, gave the impulse which led to the introduction of adult baptism. William Reublin, a man of good fame and real worth, was another fellow-laborer. He had the honor of procuring the adhesion of Balthazar Hubmeier, the famous pastor of Waldshut, who shortly became one of the leading figures in the movement.

First Stage of the Anabaptist Movement.—Having described the beginnings of the brotherhood in Switzerland, it is now in order to describe the earliest fortunes which it encountered. Zwingli was sensible—perhaps too sensible—of the perils of the situation. He was a man of superb courage, but the example of the peasants under Münzer had disturbed his poise. He sounded the alarm. The anarchists had just showed their hand in Germany; Switzerland was nourishing a party of the same sort, and she might shortly suffer a similar fate. Seriously, there was no real cause for alarm; he was seized with the wild panic which prevailed in so many quarters. In his eyes the mark of adult baptism was nothing better than the red flag. The men who showed that mark were men of peace; one of their leading articles provided against war and the bearing of arms. The reformer could not trust their pretensions. The reflection that they had denied to him and his the blessings of Christianity and of the Church of God led him to fear that they were bent upon the overthrow of every social barrier. It is difficult to predict what might have been the issue of the matter if the brethren had not resorted to adult baptism, deferring the baptism of their adherents until they had attained to adult age, and then baptizing them for the first and only time. Zwingli himself was opposed to infant baptism, until such time as he fancied the standard of revolution was being reared in the land by his opponents. Upon the command of Melchior Hofmann, adult baptism was suspended for a period of almost two years in Holland, during which time the cause advanced greatly.

In the month that succeeded the peasants' overthrow at Frankenhausen, Vadian, of St. Gall, began the attack on the brethren of that city. He, too, did not favor infant baptism; but he attacked rebaptism as disorganizing and politically dangerous. His adversaries were forced to yield. Before the year was out there was scarcely a corner of Switzerland where their presence was not forbidden. But they that were scattered abroad went everywhere preaching the word. During the years 1526 and 1527 the most extraordinary triumphs were achieved. The brotherhood was established in almost every quarter of Germany, from Hesse to Livonia. They penetrated into Austria, Moravia, and Bavaria, and the new evangel spread like wild-fire. This great success, however, brought with it great perils. Many revolu-

tionary and dangerous elements were attracted by the mark of adult baptism, and it was plain the leaders would find it difficult to control them. But besides these dangerous classes were won a number of men who would have adorned any cause or Church—as Sattler, Kautz, and Rinck. The unexampled success of these two years proved a sad misfortune. The wildest alarm was experienced, lest they should swallow up all forms of religion and of social order. The sword of persecution was unsheathed and claimed thousands of victims. In a surprisingly short time all of the leaders were in their graves, and the desolated Church was left a prey to violent and unclean men who had crowded into it. The voice of prophecy began to be heard, and there was none to quench the evil spirit. False doctrine was proclaimed almost without opposition. Mystical enthusiasm rose to an unexampled pitch and turned into shocking uncleanness. Speculative heretics claimed the highest seats in the synagogue. By the beginning of 1529 the cause of the brotherhood was lost—ground to powder between the millstones.

Second Stage of the Anabaptist Movement.—In this hour of their exhaustion Melchior Hofmann appears on the scene. He came to Strassburg as a confessor of Zwinglianism from the Low Countries. The Zwinglian Church there was found to be in a critical situation, and Hofmann, uniting with the party of the brotherhood, hoped to capture Strassburg for the Anabaptists. He shortly returned to the Low Countries to acquaint his old friends of his new doctrine. They received him and it with open arms. From the middle of 1530 the brotherhood had gained a large following in the Netherlands and the regions adjacent. These came to Strassburg, which Hofmann had declared to be the New Jerusalem, in the hope of capturing a stronghold for their faith. Instead of capturing Strassburg, Hofmann was captured by it; the city council put him in prison in 1533 and kept him there ten years.

During his confinement the movement he had instigated fell into the hands of even less worthy leaders among his adherents in Holland. Hofmann's weakest point had been the prophecies, but he always employed his ingenuity in the labor of interpreting those prophecies he found in the Scriptures. Jan Matthys, of Haarlem, who succeeded him, was also a prophet, but he had little use for the Scriptures; his most casual conceits were understood to be inspired of God. The evil spirit which Luther had exorcised from Wittenburg returned with seven spirits worse than itself. In the beginning of 1534 possession was gained of Münster in Westphalia, which thereupon took from Strassburg the honor of being the New Jerusalem. A theocracy was established and Matthys sent forth his apostles to convert the world. The place was shortly besieged by the Bishop of Münster, and Matthys was slain in a sally to which he invited a small company of his friends, with a promise that one should put a thousand and two should put ten thousand to flight. He was succeeded by Jan Beukels, of Leyden, who introduced polygamy and had daily revelations. The enormities which he perpetrated gave a shock to the civilized world. The city was carried by storm in 1535, and the second stage of the movement came to an end.

Third Stage of the Anabaptist Movement.—After the overthrow of the theocracy at Münster, Menno Simons came to the helm. His brother was an Anabaptist, and had been killed in one of the engagements of the party in Holland; but Menno kept his position as pastor of the Catholic church at Witmarsum until Jan., 1536. Becoming identified with the now scattered and persecuted brethren, he spent the remainder of his life in devotion to their interests. In the course of time nearly all the brotherhood in any portion of Europe fell under his influence, and most of them were called by his name. Owing to the persecution which was carried on against them from 1635 to 1710 by the Swiss Government, they were almost exterminated in the country of their birth, where at present not more than ten or twelve of their churches can be found. They are still somewhat numerous in Elsass, the Bavarian Palatinate, Baden, Württemberg, Hesse, Nassau, and on the lower Rhine. Several churches exist in East Frisia, Hamburg, and seventeen in Lithuania. Poland numbers six, Galicia and Bavaria one each. In France they still hold forth the word at various points in the Vosges Mountains. Large numbers are met with in Russia, and about 50,000 in Holland. In the U. S. there are twelve different branches of the brotherhood represented in more than half the States, and numbering 41,541 communicants, according to the census of 1890. The number in Canada is estimated at about 10,000.

Doctrines.—No history of doctrines, as held by the brotherhood, has yet been composed. In general, it appears that their tendency was not toward dogmatical development; their main exertions were given to affairs of practical morality in the departments of ecclesiastical, civil, and social life. The tenet by which they became most widely known was the rejection of infant baptism and the practice of adult baptism. To keep the Church pure they employed strenuous discipline, and often resorted to excommunication. The Lord's Supper was observed; through the influence of Carlstadt they were induced to surrender the Roman Catholic notion touching the bodily presence of Christ in the elements, and to adopt the conception of Zwingli, which in the beginning they had opposed. Their separation from the world was often so strict as to excite the suspicion of their contemporaries. All differences between communicants with regard to property were to be settled by the Church. The notion that this was an invasion of the rights of the state in the interest of a theocracy was encouraged by the circumstance that they refused to bear the sword and to hold any kind of civil office. It was also forbidden to take an oath in courts of justice. In addition to these matters of mainly external concern, it may be said that their general type of doctrine is understood to be Arminian. So far as is known, the brethren all opposed Luther's doctrine of justification by faith, insisted upon the freedom of the will, and denounced predestination. This did not place them in sympathy with the Roman Catholics, however; it was their business to resist the Roman Catholics as strenuously as they set themselves against the reformers. Melchior Hofmann added as much to the creed of the brethren as he received from them; it was he who introduced the notion that our Lord took not his flesh from the Virgin, but that the word became flesh without the co-operation of human agency. This view prevailed in Holland, and as the English Anabaptists came from that country, it may be observed among them.

The Church Constitution was not uniform. In Moravia there was a somewhat elaborate hierarchy; elsewhere they seem to have employed only elders, often called bishops, and deacons. Community of goods, which did not prevail elsewhere, was established in Moravia.

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Anaba'ra: a river of Siberia, on the boundary between Yeniseisk and Irkutsk; rises about lat. 69° N., and lon. 107° E., flows northward about 300 miles, and enters the Arctic Ocean in lat. 72° 40' N., lon. 112° 30' E.

Anab'asis [Gr. ἀνάβασις, ascent; ἀνά, up + βαίνειν, go]: a Greek word signifying an "ascent," a march from a lower into a higher region. In medicine it is sometimes applied to the increase of a disease or paroxysm. It is also the title of two Greek historical works: (1) Xenophon's account of the expedition of Cyrus the Younger against his brother Artaxerxes Mnemon, King of Persia, 401 B. C., and of the retreat of the ten thousand Greeks who had served in the army of Cyrus. (2) Arrian's *Anabasis*, in which are recorded the expeditions of Alexander the Great into Persia and India.

An'ableps [from Gr. ἀναβλέπειν, look up; ἀνά, up + βλέπειν, look]: a genus of haplomis fishes, characterized by a remarkable projection of the eyes from the sides of the head,

and by the pupil being incompletely divided into two by a pair of lobes projecting from each side of the iris, which, together with the division of the eye into an upper and lower portion by a band of integument, gives the fish the appearance of having two eyes on each side. Several species are found along the sandy coasts and in the fresh waters of tropical America. Revised by D. S. JORDAN.

Anacanthi'ni [from Gr. ἀνάκανθος, without spine; ἀν-, not + ἄκανθα, thorn]: an order of fishes distinguished by an ossified endoskeleton, the surface covered in some cases with cycloid, in others with ctenoid, scales; fins supported by flexible or jointed rays; ventrals beneath the pectorals, or wanting; swimming-bladder without air-duct. This order includes the cod and many other edible fishes.

Anacardia'ceæ: See SUMACH FAMILY.

Anach'aris canadensis (now called *Elodea canadensis*): a herbaceous plant of the family *Hydrocharidaceæ*; a native of North America, growing in ponds and slow streams, in which it is entirely submerged. It has a much-branched and slender stem, and is remarkable for the rapidity of its growth. It is naturalized in Great Britain, where it suddenly appeared in such abundance as to obstruct the navigation of the Trent, Derwent, and other rivers. It was first observed in Great Britain about 1842. It causes no such trouble in the U. S.

Anachar'sis (Gr. Ἀνάχαρσις): Scythian philosopher who lived about 600 B. C., and was a friend of Solon. He was the only "barbarian" admitted to the privilege of a citizen of Athens, and was by some reckoned among the Seven Wise Men of Greece. On his return to Scythia he was put to death, because he practiced some Greek religious rites. Some of his pithy sayings have been preserved by Diogenes Laertius and others. The name of Anacharsis has been made familiar to modern readers by the popular work of J. J. Barthélemy, whose work entitled *Voyage du jeune Anacharsis en Grèce* (1788) represents the life and customs of the ancient Greeks.

Anach'ronism [Gr. ἀναχρονισμός, from ἀνά, up + χρόνος, time]: an error in chronology; an inversion or disturbance of the order of time. The use of cannon in Shakspeare's *King John* is an anachronism, as cannon were not employed in England until a hundred years or more after his reign. Painters who represent ancient patriarchs in modern costumes are censured for anachronism.

Anacle'tus: an anti-pope, was elected by a party of cardinals in 1130 as a rival pope to Innocent II., who was recognized by the majority of European powers. Anacletus was supported by the Romans. D. in Rome, Jan. 25, 1138.

Anacon'da (*Eunectes murinus*): a large serpent allied to the *Boa constrictor*; a native of tropical America, especially of Brazil and Guiana. It sometimes grows to the length of 30 feet, and is the largest serpent of America. It passes much of the time in the water, preferring the shallow parts of a lake or stream. Among the generic characters that distinguish it from the boa are the small size and position of its nostrils, which open at the upper part of the end of the muzzle, and are directed upward. It is not venomous. Its food consists of lizards and other small animals. The natives make use of its skin for shoes and its flesh for food. See BOA. Revised by D. S. JORDAN.

Anaconda: city, Deer Lodge co., Montana (for location of county, see map of Montana, ref. 6-E); on the Montana Union R. R.; 27 miles from Butte. Has 5 schools, with 21 teachers; 4 churches—Methodist Episcopal, Roman Catholic, Presbyterian, and Christian. There is also preaching in German, Swedish, and Scandinavian. The principal industry is copper smelting, the smelters of the Anaconda Mining Co. being located here, employing about 1,500 men and treating exclusively the ores of the Anaconda group of mines in Butte. The town dates from 1884, when the smelting-works were erected. Pop. (1890) 3,975; (1900) 9,453. EDITOR OF "STANDARD."

Anacor'tes: town, Skagit co., Wash. (for location of county, see map of Washington, ref. 2-C); on Seattle and Northern R. R. and Puget Sound, 15 miles N. of La Couter and 95 miles N. of Seattle; has saw-mills, sash and door factory, and is a shipping-point for coal and iron. It is in an agricultural, lumbering, and fishing district, and wheat, coal, and iron market. Pop. (1890) 1,131; (1900) 1,476.

Anac'reon (Ἀνακρέων): Greek lyric poet; b. at Teos, in Ionia, about 560 B. C. He emigrated from Teos when that

town was taken by the Persians, about 540, and passed many years at the court of Polycrates of Samos. After the death of Polycrates, 522 B. C., he became a resident of Athens, to which he was invited by Hipparchus. Love and wine were his favorite themes; but love and wine do not exhaust the significance of Anacreon, who was capable of vigorous and biting satire. D. in 476 B. C. According to tradition he was choked to death by a grape-stone. Some fragments of his poems are extant (see Bergk's *Poetae Lyrici Græci*), but the character of his own work has been obscured, and his high position as a poet lowered by the *Anacreontea*, light, toying, graceful versicles of a late period.

Revised by B. L. GILDERSLEEVE.

An'adir, or **Anadyr**: a river of Siberia; near the extreme N. E. part of Asia; rises near the Arctic Circle, and after a very winding course enters the Gulf of Anadir. Length about 450 miles. The Gulf of Anadir is in Siberia, near the N. E. extremity of Asia, and is a large inlet of Bering Sea. It is separated from the Arctic Ocean by a peninsula about 150 miles wide.

Anadyom'ene [Gr. *ἀναδυομένη* (sc. Ἀφροδίτη), partic. of *ἀναδύεσθαι*, rise up from; *ἀνά*, up + *δύεσθαι*, enter]: a surname given to Venus; also the name of a masterpiece of Apelles representing Venus rising from the sea and wringing her flowing hair with her fingers. This picture was purchased by the people of Cos, who sold it to the Emperor Augustus for 100 talents, or more than \$100,000 of our money.

Anæmia, a-nee'mi-a [Gr. *ἀναιμία*; *ἀν-*, without + *αἷμα* blood]: a morbid condition in which the blood is lessened in quantity or impoverished in quality. The former is unusual, but may occur, as after profuse bleeding. Even here, however, the quality soon becomes impaired, since the tissues pour their fluids into the depleted vessels and thus dilute the remaining blood. Impoverishment in the quality of the blood consists of decrease in the number of the red corpuscles, or of the coloring-matter or hæmoglobin contained in them (see BLOOD). Anæmias may be classed as of two kinds: secondary or symptomatic, and primary. Secondary anæmias are such as arise in the course of consumption, cancer, suppurations, diseases of the stomach, and the like, in which there is systemic weakening from constant wasting discharges or from interference with the action of important organs. The second class, or primary anæmias, includes such cases as are not dependent upon other diseases, but in which the degradation of the blood seems to result from derangement of the blood-forming organs. Much remains to be learned in regard to these cases. Among these primary anæmias may be named *progressive pernicious anæmia*, a serious form in which the anæmia grows more and more severe until death closes the case, *chlorosis* (q. v.), and *leukæmia*.

The symptoms of anæmia are most diverse, but among the more characteristic may be named pallor, debility, wasting of the tissues, and indigestion. There is tendency to depressing perspiration, urine of low specific gravity, fluttering palpitations of the heart, and many other indications of weakness. In the late stages dropsical swelling of the feet may be noted.

The treatment consists of nourishing diet with treatment directed to the stomach to secure proper assimilation; fresh air, and due exercise. Of medicines, two deserve mention, viz., iron and arsenic. Iron is in many cases of anæmia almost a specific, and in others arsenic is extremely useful.

WILLIAM PEPPER.

Anæsthe'sia [Gr. *ἀναισθησία*, insensibility; *ἀν-*, not + *αἰσθέσθαι*, perceive]: in medical language, when used to designate a symptom, denotes a diminution or a complete loss of the sense of feeling, either general or much more frequently local. In this sense it is opposed to the term hyperæsthesia, which denotes an exaltation or excess of sensibility. Both these conditions are symptoms of disease of the nervous system. When feeling proper is abolished while pain exists, it is called "anæsthesia dolorosa"; when both pain and the sense of touch are absent, it is "analgesia." But of late the term commonly denotes a total or partial, local or general, suspension of all the senses as the result of the application or inhalation of some chemical agent. Local anæsthesia is produced by the rapid evaporation of some highly volatile substance, like ether or rhigolene, and consequent chilling of the part to be affected. The local application of certain drugs, such as aconitine, and notably cocaine, will also produce a degree of anæsthesia. General anæsthesia is, however, by far the most common result of this kind to which the physician directs his efforts. The Chinese have

used preparations of hemp for this purpose for many centuries. The *Arabian Nights* contain numerous allusions to a similar use of this drug. Mandragora, opium, and many other soporifics were used by the ancients as anæsthetics, though such use is dangerous from the profound effects produced. Surgical operations in later times have been successfully performed while the patient was in the mesmeric sleep or condition of "hypnotism." Such a condition is, however, usually regarded as a diseased one, and its production is outside the province of the physician. The anæsthetics generally in use are common or ethylic ether, chloroform, and nitrous oxide gas, each of which is administered by inhalation. There is some reason to believe that the anæsthetic property of ether was not unknown in the sixteenth century, soon after the discovery of this agent by the alchemists. Several physicians in the eighteenth century recommended the use of ether by inhalation for the relief of pain. Sir Humphry Davy in 1800 observed the anæsthetic effect of nitrous oxide, and proposed its use in surgery, but it was not till 1844 that Horace Wells, a dentist of Hartford, Conn., successfully employed this gas for the prevention of pain in removing teeth. The subject, however, fell for the time into undeserved neglect, though at present this gas is extensively employed in dentistry and other surgical operations.

Between 1816 and 1846 several American physicians proposed the use of ether as an anæsthetic. In October of the latter year Dr. W. T. G. Morton, of Boston (who had successfully used ether in dentistry), administered it to a patient in the Massachusetts General Hospital during a surgical operation by the late Dr. Warren. In Nov., 1847, Sir J. Y. Simpson, of Edinburgh, first announced chloroform as an anæsthetic, it having been used for the relief of difficult breathing by Ives, of New Haven, Conn., in 1832, and its anæsthetic effect upon the lower animals having been shown by Flourens ten months before Simpson's experiments. The use of both ether and chloroform has spread rapidly since the above discoveries. Various other agents (amylene, amyl hydride, carbon bichloride, Dutch liquid, methylene bichloride, ethyl bromide, etc.) have been proposed, but for the most part they have turned out to be more dangerous than the older and better known anæsthetics.

With regard to the relative superiority of the various agents used, opinions differ. It is claimed by some that ether is much safer than chloroform, while other practitioners of eminence assert that chloroform is pleasanter, cheaper, and more speedy in its effect, and equally safe if the requisite skill is employed in administration. The principal objections to nitrous oxide are that it is not easily portable, and that its effects are very transitory. Experiments tend to show that ether produces anæsthesia by causing carbonic dioxide poisoning, while chloroform appears to act by producing anæmia of the brain.

Revised by R. PARK.

Anæsthet'ies: certain preparations having the property of producing ANÆSTHESIA (q. v.).

Ana'gni (anc. *Anagnia*): an episcopal town of Italy, situated 37 miles E. S. E. of Rome (see map of Italy, ref. 6-E). It was the birthplace of several popes, among whom were Innocent III., Boniface VIII., and Gregory IX. Anagnia was nearly as old as Rome, was the chief city of the Hernici, and was an important place during the whole period of the ancient Roman history. Vergil mentions it as the wealthy Anagnia. Here are some of the finest cyclopean walls in existence. Pop. 8,156.

An'agram [as if from a Gr. **ἀνάγραμμα*; *ἀνά-*, again, anew + *γράμμα*, writing; cf. *ἀναγραμματίζειν*, transpose letters]: a word or sentence formed by the transposition of the letters of some word, phrase, or sentence. The most perfect or proper anagram, called palindrome, is formed by reading backward—i. e. reversing the order of the letters—as "evil," *live*. The making of anagrams was a fashionable exercise of ingenuity in the sixteenth and seventeenth centuries, as well as in the Dark or Middle Ages. A very curious specimen of anagram is the transmutation of Pilate's question, *Quid est Veritas* (What is truth?) into *Est Vir qui adest* (It is the Man who is present). Dr. Burney made the felicitous discovery that the Latin sentence *Honor est a Nilo* (Honor is (or comes) from the Nile) is concealed in the name of Horatio Nelson. The opponents of the Dutch theologian Jacobus Arminius transformed his name into *Vani Orbis Amicus* (A friend of the vain world). Among recent examples of the anagram are—Florence Nightingale, "Flit on, cheering angel"; Sir Robert Peel, "Terrible poser"; French Revolution, "Violence, run forth."

An'ahem: town: in Orange co., Cal. (for location of county, see map of California, ref. 12-F); on Southern Pacific R. R.: in the center of the largest valley in California. It is 28 miles S. of Los Angeles, is 12 miles from the sea, and is the headquarters of the wine interest of Southern California. It produces over 1,000,000 gal. of wine annually. Pop. (1870) 881; (1880) 833; (1890) 1,273; (1900) 1,456.

Anahnac': a Mexican word used vaguely or in various senses; sometimes applied to the great central table-land or plateau of Mexico, which comprises more than half of the Mexican republic, and lies between lat. 15° and 30° N., and lon. 95° and 110° W. It is elevated from 6,000 to 9,000 feet above the level of the sea, contains several lakes, and is bounded, especially on the W., by chains of high mountains. From this plateau rise several high volcanoes, one of which, Popocatepetl, has an altitude of 17,784 feet.

An'akim: the ancient race of giants who lived in the south of Palestine at the time of the exodus of the Israelites. They are called "the children of Anak" in Num. xiii. 28. "Joshua destroyed them utterly with their cities," but a remnant of them was left in Gaza, in Gath, and in Ashdod (Joshua xi. 21, 22).

Anal'cime, or Anal'cite [from Gr. *ἀν-*, not + *ἄλκιμος*, strong]: a hydrated silicate of soda and alumina, generally occurring in twenty-four-sided crystals, which are sometimes transparent. By friction it becomes *feebly* electrified, whence its name. It is found in the trap-rocks of Ireland, Scotland, Nova Scotia, and Lake Superior.

Analem'ma [Lat. *anatemma*, support of sun-dial, sun-dial, from Gr. *ἀνάλημμα*, prop. to *ἀναλαβεῖν*, restore]: in geometry, the projection of a sphere upon the plane of a meridian, the eye being supposed to be placed at an infinitely distant point of the radius perpendicular to that plane. In this projection (which is also called *orthographic*) all small circles whose planes are parallel to that of projection are represented by concentric circles of the same magnitude as the originals; all circles in planes perpendicular to that of projection are seen as chords or diameters of the meridian circle, and all other circles of the sphere are projected into ellipses.

Anal Glands: in comparative anatomy, organs for secreting substances which, though not always so, are generally repulsive, and are used in some cases by the animal for the purpose of defense. They present every grade of glandular structure, nearly always opening into the termination of the intestine near the anus. The sweet fluid ejected by the aphides, and of which the ants are so fond, is the product of secreting tubules opening on the posterior part of the body; and the singular defensive acrid vapors discharged explosively by the insects called "bombardiers" are likewise the products of anal glands. In the mollusks the most remarkable example of these glands is presented by certain cephalopods, such as the cuttle-fish, in which there is sometimes a single and sometimes a bilobed or trilobed cyst, that secretes an inky fluid which these animals eject to blacken the water around them, for the purpose of concealment in time of danger. In reptiles the anal bags are either single, double, or triple, and in many species, as in frogs and tortoises, are developed to a great size, and serve for aquatic respiration. In birds the anal follicles consist of a single cavity, which is termed the *bursa Fabricii*. In quadrupeds the anal follicles generally consist of two sacciform cavities, each having an opening near the verge of the anus. In the skunk (*Mephitis mephitis*) the secretion of these glands furnishes to the animal its principal means of defense. In the civet (*Viverra civetta*) and the beaver (*Castor fiber*) the secretions from the anal glands have long been an article of commerce; the former is sometimes employed, when combined with other substances, as a perfume; the latter, under the name of castor, is used in medicine.

Revised by D. S. JORDAN.

Anal'ogy: *in language*, a term adopted from the usage of the ancient Greek grammarians, and freely used in the recent literature of language-history, to cover in the widest sense all those changes in the outer form of language which arise from association. All changes in the outer form of language, apart from the borrowing of material from other languages, are to be referred either to the operation of the laws of sound or to the principle of association. The changes by which primitive Germanic *stainaz* appears in Gothic as *stains*, in Old English as *stān*, in English as *stone*, in German as *stein*, are due to the regular operation of phonetic laws.

Every like-conditioned Germanic *ai*, if unhindered or undeflected in its development by the influence of association, will become *ā* in Old English, and *ō* in Modern English. Thus Gothic *haims*, Old English *hām*, Modern English *home*; *aips*—*āp*—*oath*; *draib*—*drāv*—*drove* (pret.); *hlaifs*—*htāf*—*loaf*; *mail*—*māl*—*mole*; *snaiws*—*snāw*—*snow*; *gait̥s*—*gāt*—*goat*, etc.

In striking contrast to this class of changes in word-form stand those which represent the influence of other words of the same idea-group. Consciously or unconsciously all our ideas exist in some connection with other ideas. The natural instinct of speech is to express the like by the like. The action of the laws of sound tends to produce a diversity which the unifying tendency of association continually operates to correct. The laws of sound beget the diversity Lat. *arbos-arboris*, which analogy corrects to *arbor-arboris*. The office of analogy therefore in the development of language is the maintenance and re-establishment of the groups which the phonetic laws tend to disrupt, as well as the formation of new groups. It tends to eliminate purposeless variety. The folk has no use for the wealth of form-material which mixture of dialects and the action of the phonetic laws have produced, and with which tradition offers to endow it. The phenomena of analogy are in the last analysis due to the unconscious effort of the mind in its quest for unity to reduce the apparently incongruous elements of speech to systems and groups, and to put simplicity in the place of complexity. It seeks continually to endow the dead conventionalities of speech-material with life by infusing meaning into them. In this process, however, reflection is not involved; still less the historical sense of the philologist. For example, the French *femelle* would naturally appear in English as **fēmēl*, but the contrast with *male* evidently directed the folk-consciousness to read into the syllable *fē-* the value of a distinguishing element, so that the word-pair *male*: *fe-male* was created. A reference to our common language-sense will probably show that in the word *cutlet* we connect a meaning "little" with the syllable *-let*, and have falsely read into the first syllable the meaning of the verb *to cut*, though the word is really derived from Latin *costa*, "a rib."

The results of the operation of analogy can be understood and consistently classified only on the basis of the psychological activities which produce them. It will be found that the groupings of words which give rise to them always represent some real or supposed affinities of meaning or value, and never occur on the basis merely of outward likeness or resemblance of form.

Thus words of the same general class of meanings are often so grouped that the common idea is gained a representation in some part or element of their outward form. Thus the pronunciation of *February* as *Febryary* betrays a grouping with *January*, which has seized upon a characteristic ending, *-uary*. French *été* was originally feminine (cf. Lat. *astatem*), but grouping with *hiver*, m., and *printemps*, m., has made it masculine. In Sanskrit the word *pāti-s*, "lord," when used in the sense "husband," betrays its grouping with the common words of relationship like *pitár*, "father," *mātár*, "mother," *bhrátár*, "brother," when in some of its ease-endings it follows their standard; thus genit. *patyúr*, like *pitár*, though its regular genitive would be *pátēs*. Latin *ille* for *olle* follows *iste*, *ipse*, *is*.

In the same way a grouping according to likeness of value or function is shown in the leveling between like moods, tenses, cases, etc. Thus the older *sleep*: *slēp*; *weep*: *wēp* has been replaced by the commoner type *steep*: *stēpt*, etc. The influence of the type Latin *tribui*: *tribūtus*; *minui*: *minūtus* changed in vulgar Latin *visus* to **vidūtus*; cf. Italian *veduto* and French *vu*; so *ventus* to **venūtus*, French *venu*; *habitus* to *habūtus* > French *eu*. The older forms survive only in words which have been removed from the stress of the system, and isolated by a special substantive use, as French *dette* < Latin *debīta*, whereas *dū* < **debūtus*; so French *vente* < *vendīta*, but *vendu* < **vendūtus*.

Contrast of signification often forms a tie between words, as when Latin *sinister* becomes *senexter* under influence of *dexter*, and *meridialis* becomes *meridionatis* under influence of *septentrionatis*. English *mīster* (Mr.) for *master* has its *i* from *mīstress*.

Likeness of signification groups together different cases, moods, etc., of the same word, and interposes a resistance to the disintegrating work of the phonetic laws. Thus the older diversity *ἀνέρες*—*ἀνδρῶν* yields to the leveling *ἄνδρες*—*ἀνδρῶν*. While *shelves* is the usual plural of *shelf*, *roofs* is the plural of *roof*. Both *wharfs* and *wharves* are in use.

The preterite *was*—*waren* has become in standard German *war*—*waren*. A similar extension of the *r* from the plural is found in English *wan't* = *wor not* for *was not*. A similar influence is exerted between derivatives and their primitives. Thus the vulgar *threble* has its *th* from *three*; *agréable* has its accent from *agréé*. The vulgar *fur* for *far* is due to *further*.

It is entirely possible for a likeness of form *deceptively* to suggest a likeness of signification, and a grouping made upon the basis of this presumed likeness of meaning or value may bring about a change in the form. The English *belfry* should be *berfry* (Old French *berfroi*), but the first syllable was changed in deference to a supposed connection with *bell*. German *beispiel*, "example," has originally nothing to do with *spiel*, "play." It should be *beispiel* (*spel*, "story," cf. English *gospel*). Such changes as these are called "folk-etymologies." See Palmer, *Folk-Etymology* (London, 1882); Andresen, *Ueber deutsche Volksetymologie* (Heilbronn, 4th ed. 1883); Keller, *Lateinische Volksetymologie und Verwandtes* (Leipzig, 1891).

Graphic analogies, or the merely orthographical effects of analogy, are to be clearly distinguished from the foregoing. They are mostly due to pedantry, and our own language affords an unfortunately large list of examples. Thus the *scissors* (Middle English *sisoures*) is due to learned comparison with Latin *scindere* or its derivatives; *debt* (Middle English *dette*) and *doubt* (Middle English *doute*) have adopted their *b* as a mere decoration from Latin *debere* and *dubitare*; *victuals* has borrowed a false livery from Latin *victus*, but its Middle English form, *vitailles*, has been duly continued in the pronunciation *vittles*; cf. Middle English *battailles* > Modern English *battles*.

See Paul, *Principles of the History of Language* (translated from German), chap. v.; Strong-Logeuan-Wheeler, *Introduction to the Study of the History of Language* (1891), chap. v.; Henry, *Étude sur l'analogie* (1883); Wheeler, *Analogy and the Scope of its Application in Language* (1887); Bloomfield, On Adaptation of Suffixes, *Amer. Jour. of Philol.*, xii, pp. 1 ff.

BENJ. IDE WHEELER.

Analogy and Homology: in the comparative anatomy and physiology of plants, *analogy* refers to similarity of function, and *homology* to similarity of structure. Thus spores and seeds are analogous, both being functionally reproductive bodies; while leaves and stamens are homologous, both being structurally phyllomes.

C. E. B.

Analysis [in Gr., literally a loosing, from *ἀναλύειν*, to resolve into elements, from *ἀνα*, back, and *λύειν*, to loose]: the resolution of a whole into its parts.

Analysis, Chemical: the identification and separation of the elements of chemical compounds or mixtures of any sort. When conducted simply with reference to determining what elements exist in any substance it is termed *qualitative analysis*. When the absolute or relative quantities of the elements are ascertained it is *quantitative analysis*. The theory of qualitative chemical analysis is to put the substance to be analyzed under such conditions and associations as shall cause all its various elements, one after another, to present certain characteristic phenomena or to enter into certain recognizable combinations, and is based on the grand truth that each chemical element has constant and absolute peculiarities which it carries into its compounds. Thus the fact that silver and mercury are the only elements whose compounds with chlorine are insoluble in dilute nitric acid is taken advantage of to separate these two metals from all others. Any nitric solution of metals which is not made milky or turbid on the addition of hydrochloric acid does not, and can not, contain silver or sub-salts of mercury. Again, any nitric solution wherein hydrochloric acid produces a white milkiness or a white curdy separation, or a fine, dazzling white powder, which neither dilute hydrochloric acid, dilute nitric acid, nor hot water will clear up, must contain either silver or mercury, or both. In case such a white separation—or "precipitate," as the chemist technically terms it—is formed by hydrochloric acid in a solution of metals, the liquid, together with the suspended precipitate, is poured upon a filter (a conical cup folded from a circle of paper specially prepared for the purpose) sustained in a glass funnel. The liquid, which retains all the other elements in solution, passes the pores of the paper, but the precipitate of silver chloride and mercurous chloride remains upon it. The filter is next repeatedly filled with water until the acid liquid has been washed out from the precipitate and the pores of the paper, and we have then all the silver and all the mercury that existed in the form of sub-salts in the filter, and all the

other elements in the "filtrate," as the liquid which has passed through is designated.

The substances which are employed to bring about those chemical changes which serve the purposes of chemical analysis are called *reagents*, and the chemical processes themselves are termed *reactions*, for the reason that at least two substances must always be involved in chemical transformations, and that both act and are reacted upon. Thus the hydrochloric acid employed in our separation of silver and mercury from all other metals is a reagent, and the precipitation is the evidence of a reaction.

Chemical reactions have been known and employed to identify certain bodies from the earliest times. Pliny described the use of paper dyed in nutgalls for detecting iron sulphate when mixed with verdigris as an adulteration. The reaction is a blackening of the paper (formation of ink). In many cases it is easy to recognize a substance by simply applying in this manner a single reagent, which is then called a test. Thus copper in its solutions is tested by a bit of clean iron wire, which precipitates it as a red powder. A clean piece of copper is a test for mercury in solution, the latter metal forming a silvery coating on the former. Lime-water is a test for carbonic acid gas, making with it a white precipitate of carbonate of lime. Hydrochloric acid is a test for ammonia, as the vapors of the two, when brought together, produce a white cloud. But there are circumstances under which such simple tests fail to give unequivocal answers to the chemical inquirer, and it is needful to frame a system of operations which takes account of all possible contingencies, and which enables the analyst not only to prove with certainty that such and such elements exist in any substance he analyzes, but also gives him equal assurance that nothing else is present in it—a system, in short, which can lead him to a complete knowledge of the composition of any body. Such systems of procedure, more or less satisfactory, have been devised out of the collective experience of chemists, and their details are found in our treatises on qualitative chemical analysis. In respect to the elements and compounds of mineral or inorganic chemistry, a very perfect plan has been elaborated, which has received in all essential points the sanction of universal usage.

This system of analysis applies to all the metals and their oxides, and to all their compounds with mineral elements or acids. It supposes that the elements, etc., are in a state of solution either in water or an appropriate acid, and gives directions for obtaining such solutions. The substance is first subjected to a "preliminary examination," which often leads to the detection of some of its ingredients, or demonstrates the absence of certain elements, and furnishes useful hints as to the mode of solution and subsequent procedure. The actual examination begins with the application of four "general reagents," which serve to dissect the substance into six "groups," as regards its bases or metallic oxides.

The solution being in nitric acid, the first reagent is hydrochloric acid, which precipitates the first group—viz., silver and mercury (the latter from mercurous salts). The acid filtrate from these chlorides is submitted to a stream of sulphuretted hydrogen gas, which precipitates the second and third groups, consisting of twelve metals together, as sulphides. These are collected and washed upon a filter, and upon them is poured sulphide of ammonium. This dissolves and carries through the filter the sulphides of the second group—viz., arsenic, antimony, tin, gold, platinum, molybdenum, and tungsten, while the sulphides of mercury (from mercuric salts), lead, bismuth, copper, and cadmium, constituting the third group, remain undissolved.

The filtrate from the precipitate by sulphuretted hydrogen is next taken in hand, made alkaline by ammonia, and sulphide of ammonium is added to it. This throws down, as hydroxides or phosphates, aluminium, chromium, glucinum, and the cerium metals; as phosphates, calcium, barium, strontium, and magnesium; and as sulphides, nickel, cobalt, manganese, zinc, iron, uranium, thallium, and indium—making a fourth group.

To the ammoniacal liquid, separated by a filter from the last precipitate, is added carbonate of ammonium, whereby the fifth group—viz., barium, calcium, and strontium—are precipitated as carbonates.

Lastly, the liquid filtered from the above carbonates may contain the alkalis and magnesium.

The resolution of these groups is accomplished by further application of appropriate reagents. Each group is treated after a certain order which experience has taught. To illus-

trate: the white precipitate obtained by hydrochloric acid, already described, may contain silver chloride or mercurous chloride, or both. To complete its examination we employ the deportment of these chlorides toward ammonia-water, which easily dissolves silver chloride to a clear liquid, but converts white mercurous chloride into a black substance that remains undissolved. It is only needful then to pour dilute ammonia upon the white content of the filter; and if it blacken, the presence of mercury is demonstrated. The ammonia-water that passes the filter is dropped into excess of dilute nitric acid; the separation of a white, curdy substance is evidence of silver.

After thus isolating the two metals we may apply further confirmatory tests. Thus the black mercury compound remaining in the filter may be mixed with carbonate of sodium, dried, introduced into a small glass flask, and heated to redness, when metallic mercury will distil off and gather on the cold part of the vessel in brilliant globules. So, too, the white curds of silver chloride separated by nitric acid from the ammoniacal solution may be gathered and washed on a filter, the latter burned, the precipitate and ashes mixed with moist carbonate of sodium into a pellet, and heated strongly on charcoal by aid of a jeweler's blowpipe. The silver is thus reduced to the metallic state, and may be found, even when present in extremely minute quantity, by cutting out the charcoal to a little depth around the spot where the pellet was placed, grinding it in a smooth mortar of porcelain or agate, and carefully washing away the coal-powder by a gentle flow of water. The flattened silver particles will reveal themselves by their luster.

The detection of acids is accomplished in another portion of the substance by the use of other reagents, after the same general plan.

In quantitative chemical analysis it is needful to convert each element of a substance into some form or compound which will admit of complete separation from all the others, and also of accurate weighing or measuring. In many cases an element must be separated in one form, and converted into another for weighing. Silver may be both separated and weighed as chloride or as metal, while zinc must be separated as carbonate or sulphide, but can only be weighed accurately as oxide. Many of the reactions employed in qualitative analysis also serve in quantitative estimations; the latter branch of analysis has, however, a multitude of processes peculiar to itself.

In many cases the determination of the quantity of an element or ingredient consists in the collection of a precipitate on a filter, washing, drying, burning away the paper at a red heat, and weighing the ignited residue. This requires a delicate balance, accurate weights, vessels of glass, porcelain, and platinum, which are unalterable by acids and by heat, and great nicety of manipulation. It also requires a perfect knowledge of the deportment of the precipitate toward all the reagents and solvents with which it must have contact, and a certainty that it can be obtained of perfectly definite and known chemical composition. Our present stock of this kind of knowledge is the fruit of a multitude of the most painstaking experiments, and every day the labor of skilled investigators is adding to its variety and extent.

To certain branches or general modes of analysis technical names are applied. Thus "blowpipe analysis" designates a system of operations carried on mainly by aid of the blowpipe, which serves for identifying a large share of the elements, and even for quantitatively estimating the precious metals, as well as lead, copper, nickel, and some others. "Spectral analysis," which furnishes the most sensitive tests for the presence of the alkali metals, is based on the fact that the light proceeding from a flame in which the vapor of any substance is intensely heated, manifests, when viewed there by a prism, lines or bands of color whose position and number are characteristic. "Volumetric analysis" is a branch of quantitative analysis, in which measured volumes of solutions of determined strength are employed in reactions whose completion is indicated by some change of color or other marked phenomenon. "Organic analysis" is either ultimate or proximate. The former signifies the estimation of carbon, hydrogen, nitrogen, and the other elements of organic compounds. Proximate organic analysis is the separation of organic compounds from each other, as is done, for example, in determining the proportions of water, oil, starch, etc., in seeds. "Assaying" is the term usually applied to the estimation of the valuable metals, or ingredients of an ore or other commercial article.

Some of the most striking discoveries of science have been

steps in the development of chemical analysis. The recognition of oxygen, chlorine, barium, and manganese were results of Scheele's analysis of the mineral "wad" or pyrolusite. Among the first fruits of quantitative analysis was the discovery of the laws of definite and multiple combining proportions. Those philosophers who, like Bergmann and Dalton, were the first to announce, and those who, like Berzelius, Dumas, and Stas, have done most to establish, these laws have been eminent for their skill in analytical chemistry.

The utility of chemical analysis manifests itself in a multitude of directions. By it the values of bullion, coinage, and plate are established; ores of all the metals are worked and sold on the chemist's report of their analysis. The same is true of a host of commercial articles, such as various alkalies, acids, salts, medicines, dyestuffs, fertilizers, etc. Chemical analysis furnishes the consumers of these and many other articles a protection against the dishonesty or ignorance of producers or dealers. The physician often gathers decisive diagnostic hints from the analysis of urine; the advocate relies upon chemical analysis for the detection of poisons which can be employed in the perpetration of murder.

There are indeed limits to the application of chemical analysis. It is not difficult to make mixtures some of whose constituents no chemist can identify with the knowledge now at his disposal. The composition of a large number of drugs, such as vegetable extracts, is nearly or quite unknown; and the "analysis" of a "compound sirup," or "bitters" containing the virtues of a dozen vegetable remedies is impossible.

The successful pursuit of analytical chemistry requires a long course of the most patient and conscientious experimental work; it is therefore an admirable disciplinary study, and is recognized as such in the higher schools of Europe and this country.

Extended treatises on chemical analysis are Rose's *Handbuch der Analytischen Chemie*; Fresenius's *Qualitative Analysis*, and the same author's *Quantitative Analysis*; Bunsen's *Gasometric Methods*; Hoppe-Seyler's *Handbuch der Physiologisch- und Pathologisch-Chemischen Analyse*; Mohr's *Titrimethode*; Post's *Chemisch-Technische Analyse*. The *Zeitschrift für Analytische Chemie*, edited by Fresenius, and now (1892) in its thirty-first volume, is a nearly complete repertory of all that is currently published on the subject.

S. W. JOHNSON.

Analysis: in *elementary geometry*, a method of finding the demonstration of propositions, and testing their truth, by examining what consequences flow from them and what propositions may lead to them. In the case of a problem, it may first be supposed to be resolved, and then the consequences resulting from that solution may be deduced until we arrive at something known, which may serve as a starting-point for the actual solution. In modern language, the term analysis is applied to that branch of mathematics which treats of continuously variable quantities by the symbolic notation of algebra. It includes, in a general way, both the higher algebra and the differential and integral calculus. The distinction between algebra and analysis is, however, not sharply defined. Sometimes the former term is confined to quantities growing out of the fundamental operations of addition, subtraction, multiplication, division, and the extraction of roots; while under analysis is included the relations of quantities which can not be expressed by any finite number of algebraic operations, and in which infinitesimals or limits have to be used.

From this application of the word analysis come the expressions "analytic geometry," "analytic mechanics," etc., which mean geometry, mechanics, etc., treated by algebraic symbols and methods.

S. NEWCOMB.

Analysis, Proximate Organic: an important branch of chemical analysis which seeks to separate and determine the *proximate* constituents of vegetable and animal matter and of products therefrom; that is, instead of separating *ultimately* the elementary constituents from each other, it is the function of proximate analysis to set apart by themselves the different important definite *compounds* which make up the immense variety of mixtures occurring in animal and vegetable structures, and the various tissues and juices thereof. This field of investigation, it will be seen, is of immense magnitude and importance, but of corresponding, indeed unlimited, complexity and difficulty. Nevertheless, certain general principles have been arrived at; and

a U. S. chemist, Albert B. Prescott, of the University of Michigan, has produced a systematic treatise upon the subject, to which the reader may be referred with confidence as well worthy of study. The subject, however, is one which has not received the attentive and systematic care from laboratory chemists that its importance demands; and it yet remains true that in proximate organic analysis success depends chiefly upon the original inventive talent and individual research of the chemist occupied therein, in too great a number of important cases that are constantly liable to turn up.

H. WURTZ.

Anal'ysis, Ul'timate Organic: a special branch of chemical analysis, which may also be appropriately designated the elementary analysis of hydrocarbon compounds, as a vast majority of the bodies to which it is applicable contain both carbon and hydrogen. It is founded on the general method of burning in a close apparatus a weighed quantity of the organic substance to be analyzed, which has been previously mixed with some mineral compound of oxygen capable of furnishing the latter element to the carbon and hydrogen of the organic substance. The mineral oxygen compounds mostly used are black oxide of copper and fused yellow chromate of lead. The carbonic acid gas and water (as steam) formed in this combustion are made to pass through another apparatus, or train of apparatus, containing chloride of calcium, to absorb all the water, and potash-lye, to absorb the carbonic acid gas. The tubes containing these latter two absorbents are weighed before and after the process, and the differences are the amounts of water and carbonic acid formed, from which the amounts of carbon and hydrogen in the original substance are readily computed. If oxygen is contained in the substance, it appears as the difference between the whole original weight and the sum of the carbon and hydrogen. If nitrogen be present, it has to be determined by a separate process, but it also necessitates certain precautions in the above process, to prevent the formation of oxides of nitrogen, which would be absorbed by the potash and vitiate the carbon determination. The products of combustion are therefore first passed over metallic copper heated to incandescence, which decomposes such oxides of nitrogen.

Determination of Organic Nitrogen.—The prevailing methods are two in number. By the Will-Varrentrapp method the nitrogen is converted into gaseous ammonia by ignition in admixture with a caustic alkali. A mixture of the hydrates of soda and lime, called "soda-lime," is used for the purpose. The ammonia is absorbed by an acid, and its amount determined by subsequent operations. By the Dumas-Melseus method the nitrogen is converted into its gaseous elementary form and measured in a eudiometer. Combustion with oxide of copper is generally employed in this method, with numerous essential precautions. Other modifications are employed when sulphur, phosphorus, chlorine, etc., are to be determined in organic compounds. To explain the apparatus required in these different methods, and the details, manipulations, and precautions necessary to practical success, would require a considerable treatise with numerous illustrations. For these it is necessary to refer, therefore, to the elementary textbooks of chemistry.

HENRY WURTZ.

Analysis, Volumetric: a branch of quantitative chemical analysis in which the substance to be estimated is subjected to characteristic reactions, solutions of known strength being employed for this purpose, from the quantity of which required the substance sought can be determined by aid of the fixed laws of equivalence. Volumetric processes usually require less time and less elaborate apparatus for their execution than the ordinary methods by weight; and as they afford equally, if not more, accurate results, they are particularly well adapted for technical purposes, such as the valuation of commercial products. Gay-Lussac, who first suggested this method of analysis, was impressed with the advantage of estimating silver by the use of a solution of common salt (sodium chloride); and this process will serve to illustrate one of the more simple applications of volumetric analysis. In the ordinary method of analysis a known weight of the substance containing silver is first dissolved in nitric acid; then hydrochloric acid is added, whereby insoluble argentic chloride is precipitated, which is separated from the fluid by filtration, washed, dried, fused, and weighed; and as the composition of argentic chloride is known, the amount of silver contained in the precipitate, and therefore in the original substance, can be easily calculated. It is

evident that the same result can be obtained by preparing a solution of sodium chloride of known strength, and ascertaining the quantity of this necessary to precipitate the silver completely as chloride from the nitric acid solution. This is done by slowly adding the salt solution to the silver solution, until a point is reached at which the precipitate ceases to form. The process is now stopped, and the exact number of divisions (grains or cubic centimeters) of the salt solution used ascertained by observing the graduated vessel from which it was taken; and as we know that 58.5 parts by weight of sodium chloride are exactly sufficient to convert 108 parts by weight of silver into silver chloride, and the strength of the salt solution is also known, the weight of the precipitated silver can be readily determined. The operation just described can be completed in less than half an hour, while a silver determination by the method first referred to would require at least half a day; while in regard to accuracy of result the volumetric process is also more advantageous. The liquids used in methods of this character are termed "standard solutions." The quantity of these solutions used in a determination can be ascertained either by weighing or by measuring, but the latter is usually resorted to. In order that a reaction may be applicable in volumetric determinations, it must take place quickly, and give rise to some change by which its termination can be readily detected by the eye, such as the appearance or disappearance of a color, a precipitate beginning or ceasing to form, etc. For this reason the number of processes available is limited, although many reactions that are useless in analysis by weight furnish valuable means for volumetric estimations. The apparatus used consists of a good chemical balance and several varieties of graduated glass vessels for the preparation and measuring of the solutions, in the use of which the French or metric system of weights and measures is most advantageously employed. The measuring apparatus embraces pipettes, flasks, and burettes. The pipette is simply a glass tube, having an enlarged body and a narrow stem, on which a mark is placed indicating its capacity. It is used by filling to the mark, and allowing the liquid to escape by a displacement of the finger from the upper end. The flasks used are graduated for the capacity of from $\frac{1}{10}$ liter to 5 liters. The burette, which is employed for the measurement of standard solutions, and usually has a capacity of 50 or 100 cubic cm., consists of a long glass tube of uniform caliber, having throughout its length equal divisions (cubic centimeters and fractional parts thereof). The burette of Mohr has at its lower end a caoutchouc tube, which can be opened or closed by means of a spring clamp; but as the rubber is not entirely without influence on some of the solutions used, it is in many instances advantageously replaced by a glass stopcock. The standard solution is generally prepared of such strength that it contains in each liter (1,000 cubic cm.) the whole or a fractional part of the molecular weight of the reagent employed, expressed in grammes. For instance, the molecular weight of oxalic acid, $C_2H_2O_4$, is 90. It is dibasic (see ACIDS), and one molecule is therefore equivalent to two molecules of a monobasic acid, such as hydrochloric acid. Its standard solution is prepared by dissolving in a liter of water a number of grammes equal to half its molecular weight, that is 45 grammes; each cubic cm. of this solution will contain $\frac{1}{20000}$ of the molecular weight of oxalic acid, and will exactly neutralize $\frac{1}{20000}$ of the molecular weight of an alkaline mono-carbonate, or $\frac{1}{10000}$ of the molecular weight of a caustic alkali. In the case of a substance like silver, it is more convenient to take $\frac{1}{10}$ of the atomic weight; that is, 10.8 grammes of silver are dissolved in nitric acid, and the solution is diluted to 1 liter; each cubic cm. of this liquid will then contain $\frac{1}{100000}$ of the atomic weight of silver (0.0108 gramme), and will precipitate $\frac{1}{100000}$ of the atomic weight of chlorine (0.00355 gramme) in the form of silver chloride. In the same way, normal solutions of the following acids and alkalis contain in a liter one-half or the whole of their atomic weight in grammes:

Sulphuric acid.....	gr. per liter, 49.
Hydrochloric acid.....	" " " 36.5.
Sodic carbonate.....	" " " 53.
Sodic hydrate.....	" " " 40.

A great advantage of the above system is that the solutions agree with each other, volume for volume; thus 100 cubic cm. of any of the above acid solutions will exactly neutralize 100 cubic cm. of any one of the alkaline solutions. Its convenience will be readily perceived from the following illustration: Suppose it is necessary to determine the purity of

a sample of soda-ash (impure sodic carbonate); if it were perfectly pure, 5.3 grammes would require 100 cubic cm. of one of the above normal acids for neutralization; and if this quantity is weighed out, dissolved in water, and the normal acid gradually added from a 100 cubic cm. burette until complete saturation takes place, the number of cubic cm. required will directly indicate the percentage of pure sodic carbonate present in the sample; thus if 85 cubic cm. of the acid solution were necessary, the sample contained 85 per cent. of sodic carbonate. It is, however, not always practicable to weigh out the substance composing the standard solution; in this case an approximately correct quantity is taken, and the exact strength of the solution determined by actual experiment. Processes in which the substance is brought into direct contact with the standardized solution of a reagent which combines with or decomposes it, as in the estimations of alkalies by acids, silver by sodium chloride, iron by potassic permanganate, etc., and also those determinations in which the standard solution reacts upon the substance, causing the liberation of an equivalent quantity of a representative body, which is estimated instead of the substance itself—such as the valuation of manganese ores, in which, upon boiling the substance in hydrochloric acid, an amount of chlorine equivalent to the oxygen present is evolved and its quantity determined—are called *direct* methods of volumetric analysis. Besides these, there are the *indirect* or *residual* processes, in which the amount of the substance to be analyzed is not directly estimated, but is calculated by using an excess of some agent of fixed strength, which decomposes or combines with it in a known proportion, and subsequently determining the excess used. Thus if a weighed amount of an impure sample of calcic carbonate be dissolved in a known excess of nitric acid, it is possible, by determining the amount of pure acid remaining by titrating backward with a standard alkaline solution, to ascertain the proportion of pure calcic carbonate contained in the sample examined.

Having referred to the apparatus employed in, and some of the features of, volumetric analysis, it remains to mention more particularly a few of the processes most commonly used. These may be conveniently classified into analyses by saturation, by precipitation, and by oxidation or reduction, although this division fails to embrace all of the volumetric methods resorted to. *Analysis by saturation* includes the processes of alkalimetry and acidimetry.

Alkalimetry, or the determination of the amount of alkali contained in alkaline mixtures, such as the commercial products *potash* and *soda*, etc., by volumetric methods, is based upon the fact that the alkalies and their carbonates readily form neutral salts with the strong acids which do not affect the color of litmus; whereas the smallest excess of either the alkali or the acid imparts to it a blue or red coloration. Sulphuric, oxalic, or hydrochloric acid is usually employed in the preparation of the standard acid solutions, which are best made of the strength previously prescribed. In addition to the remarks already made concerning the determination of an alkali by means of a normal acid solution a few details of the process should be added. A weighed quantity of the sample of alkali having been dissolved, the solution is distinctly colored blue by the addition of a few drops of solution of litmus. A burette is then filled to the zero point with the standard acid, and this is allowed to flow into the solution until a red coloration begins to appear. Owing to the carbonic acid liberated, this will occur before all of the alkali is saturated, and it is necessary to boil the solution in order to remove this source of error, when the blue color will reappear. The acid is then cautiously added by drops, heat again applied, and a little more acid added, until a distinct pink-red color, which does not disappear on boiling, is produced. We now know that complete neutralization has taken place, and, as the strength of the acid solution is also known, the amount of real alkali contained in the sample is readily calculated from the number of cubic centimeters used. The inconvenience occasioned by the presence of carbonic acid in the above process can be avoided by adding more acid than is really required to neutralize the alkali, and then ascertaining the excess taken by means of a normal solution of caustic alkali, and deducting it from the amount of acid used. Caustic lime, baryta, and strontia, and their carbonates, can be estimated in the same manner, the standard acid employed being the hydrochloric.

Acidimetry can be accomplished by a method precisely the reverse of that used in alkalimetry, a normal alkaline liquid being added to the solution under examination until

a blue color is imparted to the litmus. Caustic soda, either obtained directly in the pure state or prepared by the decomposition of sodic carbonate by means of lime, is usually employed as the normal alkaline solution; but a solution of 53 grammes of pure sodic carbonate in a liter of water is also often used. In special cases, as in the estimation of acetic acid (see VINEGAR), the salt formed does not possess a neutral reaction, and it is advisable first to prepare a solution of the acid of known strength, and then determine the quantity of the alkaline solution required to produce the change of color. The quantity of acid contained in numerous neutral salts, if the base is precipitated by an excess of caustic alkali or carbonate, can be estimated by first adding an excess of the standard alkaline solution, and then determining the excess used by titration with a normal acid; the amount of acid contained in many salts, the base of which is precipitated by sulphuretted hydrogen, can also be determined by titrating the filtrate from the precipitate with normal alkali.

Volumetric analysis by *precipitation* includes such determinations as that of silver, referred to in the beginning of this article. The end of reactions of this nature is frequently shown by the precipitate ceasing to form, but indications of greater precision and delicacy are often obtained by aid of a third body, with which a characteristic color is produced; thus, if, in the estimation of chlorine or chlorides by a normal silver solution, a little potassic chromate be added, the completion of the process is indicated by the formation of an orange-yellow color, proceeding from argentic chromate produced by the first drop in excess of the silver solution, and in the precipitation of phosphoric acid by uranic nitrate or acetate the end of the precipitation is indicated by a drop of the mixed solutions producing a brown color with yellow prussiate of potash. A method that has come into extensive use of late years is that devised by Volhard. This consists in dissolving in nitric acid, boiling to remove all the oxides of nitrogen, adding iron-alum, and then dropping in potassium (or ammonium) sulphocyanide, until the red color of ferric sulphocyanide remains. This method is capable of application to many different determinations.

Analysis by *oxidation or reduction* comprises numerous volumetric methods, which give very accurate results, and have to a great extent replaced the older process by weight. In these, substances which readily take up oxygen are titrated with oxidizing agents of known power; or substances which give up oxygen are deoxidized by an excess of a reducing agent, the excess of which is afterward determined by residual titration with a standard oxidizing solution. The oxidizing bodies most employed are potassic permanganate and dichromate, and iodine; the reducing agents being sulphurous acid, sodic hyposulphite, arsenious anhydride, and oxalic acid. One of the most important estimations coming under this head is the volumetric determination of iron, which is based upon the fact that when a solution of potassic permanganate is added to an acid solution of a ferrous (protoxide) salt, the latter is oxidized to a ferric salt, the purple-red color of the permanganate solution being destroyed so long as any of the ferrous salt is present; but as soon as the oxidation is completed the next additional drop of the solution imparts a distinct red coloration to the liquid. It is necessary first to reduce all iron contained in the substance examined to the ferrous state, which can be done by means of zinc and sulphuric acid. The strength or standard of the permanganate solution is also to be previously determined by reducing a known weight of pure iron to the ferrous state, and ascertaining the number of cubic cm. of the solution required to oxidize it, the value of 1 cubic cm. being noted on the bottle in which the solution is preserved. It is then only necessary to multiply the number of cubic cm. employed in an analysis by the value, or oxidizing powder, of 1 cubic cm., in order to ascertain the quantity of iron present in the substance taken. Potassic dichromate can also be employed as the oxidant, but in this case the termination of the process is not indicated in the liquid itself, but is shown by a drop of the mixture no longer producing a blue color when added to a solution of ferricyanide of potassium. Iodine often serves as an oxidizing agent by combining with the hydrogen of water to form hydriodic acid, while the oxygen liberated acts upon the oxidizable substances present, and, as the slightest excess of iodine imparts a blue color to starch, the reaction can be applied to the volumetric estimation of many bodies that readily take up oxygen, such as arsenious and sulphurous acids, etc. It is evident that these latter compounds can likewise be employed for the determination of free iodine. On the above reaction very accurate

and important volumetric processes are based, such as the estimation of oxygen in peroxides, in which, however, an indirect method is employed. Many substances containing oxygen, when boiled with hydrochloric acid, liberate a quantity of chlorine corresponding to a part or all of the oxygen present. Upon conducting the chlorine so evolved into a solution of potassic iodide, an equivalent amount of iodine is set free, which can then be estimated by adding a solution of starch-paste and titrating with a solution of sodic hyposulphite of known strength. The standard of the hyposulphite solution used is readily ascertained in the same manner by heating a *known quantity* of potassic dichromate with hydrochloric acid, conducting the evolved chlorine into a solution of potassic iodide, and estimating (in presence of starch) the number of cubic cm. of the hyposulphite solution required to reduce the iodine set free; the termination of the reaction being indicated by the disappearance of the blue color of the iodide of starch. Processes similar to that just described receive frequent practical application in the valuation of numerous articles of commerce, such as manganese, bleaching-powder, etc.

A method more curious than valuable, by which analytical determinations can be accomplished without the use of weights or standardized solutions, consists in taking a certain amount of the impure substance to be tested, balancing it with an equal weight of the pure substance, and submitting both to titration with a solution of unknown strength. It is easy to perceive that the impure substance will require for its decomposition a smaller quantity of the solution than the pure substance, and that the quantity required will be in proportion to its purity. The pure substance can, in some instances, be replaced by another of similar chemical activity (e. g. sodic carbonate by calcic carbonate, manganese dioxide by potassic dichromate, etc.). In addition to the examples cited above, volumetric processes, usually based upon the principles already mentioned, receive extensive application in the estimation of several metals (such as copper, zinc, tin, lead, and mercury) and numerous organic compounds (including sugar, tannic acid, alkaloids, the constituents of urine, water, wine, etc.).

Revised by IRA REMSEN.

Analytical Geometry: See GEOMETRY.

Anamó'sa: city and railroad junction: capital of Jones co., Ia. (for location of county, see map of Iowa, ref. 4-K); on the Wapsipinicon and Buffalo rivers; 50 miles S. W. of Dubuque. It has excellent quarries of building-stone and a State penitentiary. Pop. (1880) 2,083; (1890) 2,078; (1900) 2,891.

Ananas'sa Sati'va: See PINEAPPLE.

Anapa': a seaport and fortified town of Russian Circassia; on the north shore of the Black Sea; near the mouth of the Kuban (see map of Russia, ref. 11-D). The harbor is not safe in stormy weather. The town has been by turns the property of Turks and Russians, and now belongs to the latter. Pop. 5,357.

Anapæ'stic Meter (Gr. ἀνάπαιστος): originally a marching measure. The anapaest consists of two short syllables followed by a long syllable, and is largely used in systems of pairs for entrance and exit songs of the Greek drama, and in tetrameters in Aristophanic comedy. See METRES.

Anaph'ora [Gr. ἀναφορά, a carrying back, recourse; ἀνα-, back + φέρειν, carry]: in rhetoric, a repetition of a word or phrase at the beginning of two or more consecutive sentences or clauses, as, "It is sown in corruption, it is raised in incorruption. It is sown in dishonor; it is raised in glory. It is sown in weakness; it is raised in power."

An'archist: one who believes that political evil is to be remedied by the abolition of government. Proudhon (*q. v.*) is, on the whole, the writer who is to be regarded as the founder of modern anarchism; but it was taken up most actively by the Russian Nihilists (see NIHILISM), and made the basis of the most vigorous practical agitation. Next to Russia, Spain is the country where the anarchists have made most headway; Portugal, Italy, and France have also been somewhat involved in the movement. The International Workingmen's Association, founded in 1864, was a combination of anarchists and socialists, who worked together in agitation, though their theories were diametrically opposed; the socialists wishing to avoid inequality by increasing state interference, the anarchists by abolishing it. But in 1872 the combination was broken up; the socialists proper ("Centralist Democratic Socialists"), headed by Marx,

holding that you can not have equality or co-operative production without a state to enforce it; while the anarchists, or anarchic socialists, headed by the Russian Bakunin, believing that this would involve tyranny, wished to have property held by communistic associations of workmen, formed freely without political compulsion. As to the means by which this result is to be secured, different groups of anarchists are not agreed. Some disclaim violence, and believe in the power of moral principles, like those of the early Christian Church. Others, unfortunately more numerous and influential, seek revolution for its own sake, and hold that after this is accomplished it will be time enough to consider what to do next. On this account anarchism, in its more important practical aspects, is not to be regarded as a body of doctrines, but as a dangerous means of agitation, many of whose partisans do not hesitate to countenance the use of dynamite. The best known leader of the American anarchists is Johann Most; the paper in which he advocated his doctrines was the *Freiheit* (Freedom). The anarchists of the U. S. are almost entirely foreign born; their greatest strength seems to be in Chicago. The most serious conflict with the law was in the Chicago riot of May 4, 1886. Several of the leaders were sentenced to death Aug. 20, 1886, and executed Nov. 11, 1887; but the popular reaction against lawlessness did even more than the execution of the leaders to check the growth of anarchism in the U. S. In Spain and France the anarchists have shown considerable strength of late years, and the use of dynamite seems to be a most serious danger to the police authority in each of these countries. See COMMUNISM, NIHILISM, and SOCIALISM.

ARTHUR T. HADLEY.

Anar'rhichas [from Gr. ἀναρρῆχασθαι, to clamber up; ἀνά, up + ἄρρῆχασθαι, climb]: a genus of fishes allied to the Blennies, characterized by having their mandibular, palatine, and vomerine bones armed with large osseous tubercles bearing on their summits enameled teeth. It includes the wolf-fish, which is common to both sides of the Atlantic, and other related species. See WOLF-FISH.

A'nas [Lat. *A'nas*, a duck]: a genus of ducks including what may be called the true or typical species, such as the mallard (*Anas boschas*), the black duck (*Anas obscura*), and related forms. The bill is about as long as the head, rather longer than the tarsus, with the sides parallel and the nostrils high up. The species of the genus are *par excellence* fresh-water birds and well flavored. The various limitations of this genus afford a good epitome of the progress of ornithology. With Linnæus the name *Anas* was almost equal to the family *Anatidæ*, for it included swans, geese, and all ducks save the fish-eating mergansers. A little later the genus was so restricted as to comprise only the fresh-water or river ducks of the sub-family *Anatinae*, as contrasted with the sea-ducks, *Fuligulinae*. It was then limited to a very few species, closely allied to the mallard, and, finally, was so extended as to include the teal and others.

F. A. LUCAS.

Anasarca: See DROPSY.

Anasta'sia: the name of several female saints of the Greek and Roman churches. (1) *Anastasia the Elder*, who is said to have been a pupil of Peter and Paul, and to have suffered martyrdom in the time of Nero. Her day is Apr. 15. (2) *Anastasia the Younger*, whose martyrdom by burning at Aquileia in 303 brought to an end the persistent persecutions of her heathen husband Publius. Her day is Dec. 25 in the Latin Church, and Dec. 22 in the Greek. (3) *Anastasia*, a Greek Christian maiden of good family and great beauty, who had attracted the attention of the Emperor Justinian. The better to resist his dishonorable proposals she retired to Alexandria, where for twenty-eight years, until her death in the year 567, she lived as a monk, no one ever suspecting her sex. Her day is Mar. 10.

Anasta'sius I.: Emperor of Constantinople; b. at Durazzo about 430 A. D. He succeeded the Emperor Zeno in 491. The orthodox, who considered him a heretic, revolted and defeated his army in 514. D. in 518 A. D.

Anastasius II.: became Emperor of the East in 713 A. D. Theodosius was chosen emperor by his army, which took Constantinople and deposed Anastasius in 716. D. in 720 A. D.

Anastasius I., SAINT: a native of Rome; became pope about 398 A. D. He condemned the doctrines of Origen. D. in 402 A. D.—**ANASTASIUS II., SAINT** (pope), a native of Rome, succeeded Gelasius I. in 496 A. D. D. in 498.—**ANASTASIUS**

III. was chosen pope in place of Sergius III. in 911. D. in 913.—ANASTASIUS IV. succeeded Eugenius III. as pope in 1153. He died at an advanced age, Dec. 2, 1154.

Anasta'sius, surnamed THE LIBRARIAN: a Roman priest who was librarian of the Vatican. He compiled an *Ecclesiastical History* in Latin from Greek sources, and wrote other works. D. about 890.

Anastasius Grün: See AUERSPERG.

Anastat'ica [from Gr. ἀνά, up + στήναι, stand]: a genus of cruciferous plants containing the rose of Jericho (*Anastatica hierochuntina*), which grows in Palestine and North Africa, and has singular hygroscopic properties. Under the influence of drought it rolls up into a ball, becomes detached from the ground, and is carried away by the wind after the manner of the "tumble weeds" of our American plains. When it comes into contact with moisture it expands into its natural form, and is hence called "resurrection plant." It retains for many years this property of expanding when moistened.

Anastatic Printing: See ZINCOGRAPHY.

Anas'trophe [Gr. ἀναστροφή, a turning back; ἀνα-, back + στρέφειν, turn]: in rhetoric, a species of inversion or departure from the usual order of succession in words, as when Scott, in the *Lady of the Lake*, says, "Clattered a hundred steeds along," for "A hundred steeds clattered along"; so Vergil in the *Æneid*, lib. i. l. 32, has "*Maria omnia circum*" for "*circum omnia maria*" (around all the seas).

An'atase [from Gr. ἀνάτασις, extension; ἀνά, up + τείνειν, stretch]: a name of titanite acid or oxide of titanium, which occurs in octahedral crystals, having a splendid and adamantine luster. Some specimens found in Brazil resemble diamonds so much as to be mistaken for them. Called also *octahedrite*. See TITANIC DIOXIDE.

Anath'ema [Gr. ἀνάθεμα, a thing devoted (to evil) or accursed; ἀνά, up + θείναι, place]: a Greek word, the primary meaning of which was something "placed" or "hung up" in the temples of the gods, and hence "consecrated" or "devoted." Among the Jews and Christians it is a curse or denunciation uttered by ecclesiastical authority, and a form of excommunication of heretics and other offenders.

An'athoth, or **A'nata**: an ancient Jewish city of refuge, about 4 miles N. E. of Jerusalem; is supposed to have been the native place of the prophet Jeremiah.

Anat'idæ: a family of web-footed birds, of which the genus *Anas* is the type. It includes the duck, goose, swan, and others. Cuvier gave them the name of *Lamellirostres*.

Anato'lia, **Anado'li**, or **Nato'lia** [from Gr. Ἀνατολή, the rising or orient]: the modern name of Asia Minor, which is a large peninsula, bounded on the N. by the Black Sea and the Sea of Marmora, on the S. by the Mediterranean, and on the W. by the Grecian Archipelago. The Euphrates forms part of its ill-defined eastern boundary. It lies between lat. 36° and 42° N., and between lon. 26° and 41° E. The length from E. to W. is about 700 miles, and the area is estimated at 204,434 sq. miles. The western coast is indented with numerous gulfs, and presents many high and precipitous cliffs. The interior is an elevated plateau, inclosed by two mountain-ranges—namely, Mount Taurus, which extends through the southern part from the Euphrates to the archipelago, and Anti-Taurus, which traverses the northern part. The general direction of these ranges is nearly E. and W. Some peaks of Mt. Taurus attain a height of 10,000 feet or more. Between these two long ranges are several others which rise to a great height. The highest summit in Anatolia is the volcanic Arjish-Dagh, or Mt. Argæus, which is situated 13 miles S. of Kaisareeyeh, and is 13,000 feet above the level of the sea. Mt. Olympus, about 8 miles S. of Brusa, has an altitude of 8,800 feet.

The largest river of Anatolia is the Kizil-Irmak (anc. *Hatys*), which rises in the east part and enters the Black Sea. The western part of the peninsula is drained by the Meander and the Hermus (Sarabat), which flow westward into the Ægean Sea. In the central part are a number of salt lakes and barren steppes of large extent. The Katakekaumene, or "burnt country," a volcanic waste, is the best known of these regions.

The rocks which underlie the upper regions of Anatolia are mostly granite, serpentine, and schist. Along the southern and western coasts calcareous rocks predominate, and marble is abundant. Numerous extinct volcanoes and rocks of volcanic origin occur in different parts of the country.

The climate presents a great diversity in consequence of the inequality of the surface. The western shores have been celebrated in all ages for their mild and genial climate, and the coast of the Black Sea is favored in that respect. The central plateau is very hot in summer and cold in winter, partly because it is not well watered and is generally destitute of forest trees. The northern region and the other sea-coasts are covered with extensive forests of oak, ash, beech, plane, and other trees good for timber. The coasts of the Ægean and Black Seas have a very luxuriant vegetation and a fertile soil. Among the chief products are sugar, wine, opium, tobacco, olives, figs, wheat, barley, and silk. The flora of Southern and Western Anatolia is extremely beautiful. The mountains are infested by panthers, bears, and wolves.

Anatolia, which forms a part of the dominions of the Sultan of Turkey, comprises the pashalics of Anatolia, Itchelee, Karamania, Adana, Marash, Sivas (or Room), Trebizond. The population, estimated at 10,970,000, not including Armenia, consists of Ottoman Turks, Turkomans, Greeks, nomadic Koords, and Armenians. The cultivation of the soil is generally neglected here, and the principal branches of industry are the production of opium, wine, and oil, and weaving shawls and carpets. The chief cities are Smyrna, Brusa (or Bursa), Sinope, Angora, Konieh, Kutaieh, and Trebizond. In ancient times this peninsula was occupied by many powerful kingdoms and famous cities. See ASIA MINOR, IONIA, LYDIA, PONTUS, etc., and Hamilton's *Researches in Asia Minor* (1842); Tchihatcheff's *Asie Mineure* (1853-60); and Barth's *Reise von Trapezunt bis Skutari* (1860). Revised by M. W. HARRINGTON.

Anatolia: a pashalic of Asiatic Turkey, forming the peninsula of Asia Minor. It is the largest and richest province in the Turkish empire, and the most populous in Western Asia, comprising a large part of the Anatolia described above. Area, 208,327 sq. miles. Pop. 9,125,000.

Anat'omy [from Lat. *anatomia*, from Gr. ἀνατομή, a cutting; ἀνά, up + τέμνειν, cut]: literally the dissociation of parts by cutting up or dissection; now usually that division of *biology* having for its object the study of the structure of organized bodies. Since the latter, obviously, may belong either to the vegetal or to the animal kingdom, anatomy may relate to the structure of plants—*phytotomy*—or to that of animals—*zootomy*. Vegetal anatomy will be treated in connection with *botany* (*q. v.*), the anatomy of animals alone being here considered.

The vast field included within the comprehensive embrace of "anatomy" and the various points from which it may be approached render the recognition of certain subdivisions necessary. The study of form and construction by comparison of the structure of different animals, including man, constitutes *comparative anatomy*—the importance of which for a proper appreciation of the structure of man can not be overestimated. *Human anatomy*, or *anthropotomy*, on the contrary, confines investigation to the human body. Human anatomy, or the special anatomy of man, is further treated from different aspects: the description of the individual constituents of the entire body constitutes *descriptive* or *systematic anatomy*; the discussion of the position of parts and their mutual relations is *topographical* or *regional anatomy*; when considered especially as to the requirements of the surgeon and physician it is termed *surgical* or *applied anatomy*; the actual dissection and separation of parts, with a view to their study and exhibition, constitutes *practical anatomy*. The investigation of the changes of form and structure, from the earliest stages to the adult condition, belongs to *developmental anatomy*; while the recognition of the laws determining and underlying the formation and variation of organisms is the province of *morphological anatomy*. The description of organs and bodies changed by disease is *pathological anatomy*.

The consideration of the structural elements of organisms constitutes *general anatomy*, or *histology*; from the fact that such studies necessitate the use of the magnifying glass, the term *microscopic* or *minute anatomy* is frequently employed as synonymous. Conversely, *gross anatomy* denotes the examination of such details of arrangement as are displayed by the scalpel to the unaided eye. Descriptive anatomy is subdivided into various systems; thus *osteology* treats of the bones; *syndesmology* describes the joints; *myology* recounts the muscles; *angiology* refers to the blood-vessels and circulatory system; *neurology* relates to the nervous system; *splanchnology* pertains to the description of the viscera or

organs. For accounts of the various organs and tissues, see EYE, EAR, HEART, BONE, MUSCLE, etc.

In sketching the outlines of the history of anatomy three epochs are recognizable. The first era begins with the earliest attempts to gain anatomical knowledge, embraces the sum of all the observations and traditions of the ancient classical authors, and terminates in the general extinction of learning during the Dark Ages. The second period dates from the revival of anatomy in the Italian schools during the fourteenth century, and is especially marked by the notable advances and lasting impressions made by the genius of Vesalius and his followers in the sixteenth century, the impetus of whose labors was felt throughout the medical world. The third epoch commences with the establishment early in the nineteenth century of the fundamental principle announced by Caspar Friedrich Wolff, that all organized beings originate by the differentiation of simple cells, the descendants of the ovum, in opposition to the then prevailing and accepted theory of preformation, by which all parts of the new organism were considered to exist from the beginning perfectly formed, although of infinitesimal dimensions. The doctrine that both plants and animals are composed of elementary structural particles (the cells), also advanced by Wolff, shortly afterward received additional support from the researches of Schleiden and Schwann. The expansion and future application of the principles advanced by Wolff and his immediate successors, together with the fruitful labors of subsequent anatomists in the new fields of embryology and morphology, alone have rendered possible the development of the broad and comprehensive science which anatomy, in its widest sense, to-day represents.

The claims of human anatomy as a science of great antiquity are not supported by trustworthy evidence; on the contrary, there is sufficient reason to regard human anatomy, as a systematic study, as of comparatively recent origin. There is little to warrant the assumption that the practice of sacrificial rites and of embalming yielded more than the crudest notions regarding the anatomy of the lower animals among the ancients. It is first to Hippocrates (460–377 B. C.) that a knowledge of anatomy can be ascribed with propriety, and even then it is only regarding human osteology that Hippocrates possessed ideas approaching accuracy. On the authority of Galen, the first anatomical work is to be credited to Alcmaeon of Croton (500 B. C.). It is very doubtful whether Hippocrates practiced dissection upon the human body. Following the "Father of Medicine," stands the name of that great student of nature, Aristotle (384–323 B. C.), whose contributions to natural history were enriched by original observations of such detail and accuracy, regarding the structure of the lower animals, that he may justly be regarded as the founder of comparative anatomy. His dissections having been entirely confined to the lower animals, Aristotle knew little of human anatomy, as shown by the many erroneous ideas which he entertained. On the other hand, anatomy is indebted to him for the recognition that the blood-vessels are derived from the heart, and that the latter is filled with blood; to the main stem he applied the name aorta. Aristotle had likewise relatively clear notions regarding the digestive organs, recognizing various divisions of the intestinal tract, as jejunum, cæcum, colon, and rectum.

To Herophilus (310 B. C.) and Erasistratus (300 B. C.), members of the illustrious Alexandrian school, belong the honor of practicing the earliest well authenticated dissection upon human bodies, a privilege rendered possible by the support of an enlightened ruler. Herophilus devoted himself assiduously to human anatomy, as well as to zoöatomy in general, in which his fame soon became widespread. The choroid plexus, the fourth ventricle, and its calamus scriptorius, the torcular Herophili, and the duodenum are among the discoveries associated with his name. Erasistratus shares with his contemporary the distinction of human dissections, and discovered the valves of the heart, formed a correct idea of the nerves as issuing from the brain, and indeed seems to have distinguished between nerves of sensation and motion; he also firmly established the doctrine that the arteries were filled by vital air (pneuma), while the veins contained nutritive fluid (the blood).

The achievements of these noted men were followed by a period of decline, in which but few additions to anatomical knowledge were recorded. After the decadence of the brilliant Alexandrian school, the exceptional services of Marinus and his pupil Quintus, and later Ruffus, alone rescued anatomy for a time from the neglect into which it had fallen.

Early in the second century of the Christian era human anatomy was not only restored to its former condition, but materially advanced by the genius of Claudius Galenus (130–200 A. D.), who, for nearly half a century, enthusiastically pursued the studies and investigations which justly entitle him to be regarded as the most accomplished anatomist of the ancients. The correctness of his comprehension regarding the structure of man, no less than the acuteness of his observations and the sagacity and judgment of his conclusions, seems the more remarkable when it is learned that Galen's dissections were limited to lower animals—chiefly monkeys—and that his scalpel was never turned toward a human subject. Indirectly the pupil of Quintus, Galen devoted himself to the anatomical writings of Marinus, as representing the knowledge still preserved from the ashes of the Alexandrian school. Among other important facts, Galen recognized and proved that the arteries contained not air, but blood. His understanding of the nervous system—especially the brain—of the thoracic and abdominal viscera, together with that of the muscles and bones—his knowledge of osteology being especially accurate—mark him as foremost of the anatomists of his time; his writings remained the common source of anatomical lore for fourteen centuries, and the influence of his teaching gave way only before the new era of anatomy founded by Vesalius. With the death of Galen (200 A. D.), anatomy entered upon a period of decline and almost total extinction.

The dawn of the returning light of intelligence at the close of the Middle Ages found anatomy feebly cultivated in the Italian schools, the teachings of Galen still affording the principal source of inspiration. In 1316 Modino (1275–1325) appeared at Bologna, and by his lectures and demonstrations instituted the instruction which soon made his school the center of anatomical activity. Modino, regarded as the father of modern anatomy, forms the connecting link between the anatomy of the ancients, as represented by Galen and the new science appearing with the advent of Vesalius and his followers. The names of Marzio, Montagna, Zerbi, Achillini, Carpi, Massa, Benedetti, Guintherus, and Sylvius represent the more prominent of those who shared the "restoration period" of anatomy. Leonardo da Vinci, Michael Angelo, Tizian, and Rafael are credited with having deeply interested themselves in a science so closely related to their art.

The advent of Vesalius (1514–64) marks a new epoch, characterized by the breaking down of the traditions of more than fourteen centuries. The ancient theories and speculations, which still appealed with an authority begotten by age, were subjected by Vesalius to the searching scrutiny of investigation, and when found wanting were replaced by the facts revealed by his scalpel and observation. The fruits of his dissections and study appeared in a volume, the first comprehensive and systematic description of the human body. The veneration in which the teachings of Galen were still held is instanced by the explanations offered by Sylvius extenuating the inaccuracies of Galen pointed out by Vesalius; rather than admit the fallibility of his long-revered master, Sylvius declared that the human body had undergone changes during the time intervening between the studies of Galen and the dissections of Vesalius. After a brilliant but stormy career, by his success incurring the bitter hatred of his opponents, Vesalius's life drew to an ignominious end. During the hastened return from a pilgrimage to Jerusalem, undertaken after recovery from severe illness (and not, as often alleged, as a penance imposed by the Church for indiscreet dissection), he was shipwrecked on the island of Zante, and died in abject poverty.

Contemporaneous with Vesalius were Fallopius (1523–62), Eustachius (1517(?)–74), Columbus (1497(?)–1559), Varolius (1543–75), Vidius (1542–67), Fabricius (1537–1619), and Casserius (1561–1616).

The seventeenth century, rich in advances in anatomical knowledge, has a conspicuous figure in William Harvey (1578–1657), whose clear perception led him to the satisfactory demonstration of the circulation of the blood in 1619. This great physiological and anatomical truth had already been partially grasped by Servetus, Columbus, and Fabricius. Among the anatomists of this century were Aselius (1581–1626), Pecquet (1672–74), Rudbeck (1630–1702), Malpighi (1628–94), who first demonstrated the capillary blood-vessels and the blood-cells, and by the use of the microscope added many new facts; Glisson (1597–1677), Bellini (1643–1704), Wharton (1610–73), Willis (1622–75), by whose labors

the anatomy of the brain was greatly advanced; Lower (1631-91), Highmore (1613-84), Cowper (1666-1709), Nuck (1650-92), Ruysch (1638-1731), Leeuwenhoek (1632-1723), who cultivated microscopical anatomy with great success; Vieussens (1641-1717), Wirsung (1613-43), Peyer (1653-1712), Brunner (1653-1727), Bartholinus (1655-1738), and Stenson (1638-86).

During the eighteenth century anatomy was faithfully cultivated by men earnestly desirous to free their science from traditions unsupported by truth, and to supplement the important facts established by their predecessors by accurate details. Nor must it be forgotten that these men were hampered by the limitations of their age, feeble in the development of the collateral sciences, as physics and chemistry, as well as by the imperfection of the methods and instruments of research. Especially conspicuous stand the names of Hunter, Haller, and Bichat.

Prominent among the anatomists of this period were Valsalva (1666-1723), Santorini (1681-1737), Morgagni (1682-1771), Albinus (1697-1770), Winslow (1669-1760), Douglas (1675-1742), Monro (1732-1817), William Hunter (1718-83), John Hunter (1728-93), whose lasting achievements stand as monuments to his remarkable energy and genius; Lieberkühn (1711-65); Haller (1708-77), famous as a profound and philosophical thinker; Meckel (1724-74); Wrisberg (1739-1808); Sömmerring (1755-1830); C. F. Wolff (1735-94), the founder of modern embryology and the earliest promulgator of universal cell-formation; Bichat (1771-1802), the father of histology.

The development of anatomy during the nineteenth century contributes a remarkable page to its history. The early decades, marked by the continued activity of many of the anatomists already mentioned, were succeeded, toward the middle of the century, by the growth of a new school, following the establishment of the modern views concerning the structure and origin of organisms; upon the foundations laid by Wolff and Schwann arose the doctrines of modern histology and embryology. Shortly after, improvements in the microscope and in methods of investigation gave additional impulse to these studies, which, during the last decade, have been still further advanced by recent similar improvements.

The increased facilities of exact investigation into the life-history of animals have yielded brilliant results in the broadening and increased accuracy of our conceptions of the relations of anatomical data. In addition to the advances in these fields, improvements in anatomical technique, as in preservation, injecting, maceration, etc., have rendered the demonstration of the various parts of the body far more perfect and instructive; topographical anatomy, likewise, has gained by the introduction of frozen sections, as supplementing the usual dissections.

Without attempting even an incomplete enumeration of the many investigators who have contributed to the general advancement of anatomy during the present century, reference may be made to Mascagni (1752-1815), Searpa (1747-1832), Magendi (1783-1855), Cruveilhier (1791-1874), Bell (1774-1842), Sharpey (1802-80), I. F. Meckel (1781-1833), Tiedemann (1781-1856), Langenbeck (1776-1851), Rosenmüller (1771-1820), Stilling (1810-79), M. Schultze (1825-74), Bischoff (1807-82), Heule (1809-85), Reichert (1811-83), Arnold (1803-90), and Leidy (1823-91); and more recently Owen, Huxley, Turner, Flower, Kölliker, Hyrtl, Waldeyer, His, Sappey, Schwalbe, Leydig, Gegenbaur, Rüdinger, Wiedersheim, Flemming, and many others.

The investigation of the human body has been so diligently pursued in the past that our knowledge of it is to be extended only by a more intimate acquaintance with its structure, and by a broader basis of comparison. The recognition of this fact has led anatomists to devote themselves largely to histology, embryology, and morphology as the most fruitful fields for research. The rich harvest of new facts, recorded since about 1880 up to the present time (1892) concerning the structure of various organs (especially of the nervous system), the development of the body, and the significance and relation of obscure parts, proves such anticipations to be well founded. GEORGE A. PIERSOL.

Anatomy, Comparative: the science of the structural constitution of animals; so called because it is derived from the comparison of the anatomy of different animals.

Animal bodies consist either of homogeneous substance or of that substance disposed in tissues. Tissues, in the vast majority of cases, are made up into organs, the sim-

plest forms of which are the sac, the tube, and the segment. By multiplication and modification of these elements, organs become complex. The simplest expression of tissue is, on the other hand, the nucleated cell, and all tissues are made of multiplied and modified cells, with the addition of unorganized or homogeneous substance.

This substance, whether homogeneous or exhibiting structure, is chemically identical throughout the animal kingdom, and constitutes the living part of plants. It belongs to the class of protein compounds, and is called gelatin, albumen, fibrin, etc., or, regarded structurally, protoplasm or sarcode. Its composition is $C_{24}H_{17}N_3O_8$, with very small amounts of sulphur and phosphorus added under some circumstances. It is therefore a nitril of cellulose—i. e. $C_{24}H_{20}O_{20} + 3NH_3$.

According to the latest investigations, the cell is not a hollow body, but consists of protoplasm (the cytoplasm) which may or may not possess a superficial layer, which represents the wall (but which may be of considerable thickness), and a smaller body within it, which is called the nucleus. This nucleus may contain another visibly distinct body, or nucleolus. It is connected with the cell-wall by a system of radiating fibers, which, like the nucleus, can be stained with various reagents, the stainable substance being called chromatin. The essential difference between the chromatin and the cytoplasm consists in the

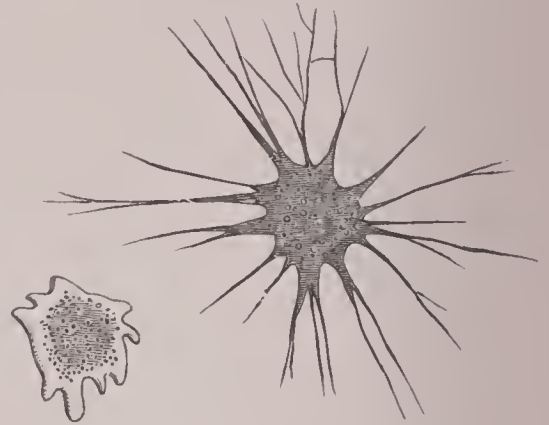


FIG. 1.—Amœba, Rhizopods.

fact that all growth originates in the nucleus; that is, all cell-division has its origin there. Hence it has been called the germinal matter, while the cytoplasm is termed formed matter. Formed matter exhibits the active functions of life other than growth. Thus it contracts, as in muscular tissue, or is irritable and conductive of force, as in nerves. It constitutes the primary substance of secretions, by its breaking down and mingling with special compounds brought by the blood. It may then be concluded that the formed protoplasm or cytoplasm converts energy into motion, chemism, etc., while the germinal or nuclear matter converts it into growth-force.

The science of the structure of tissues is termed **HISTOLOGY**, and is treated of under that head. The present article will include only the description of organs, or organography.

I. ORGANS AND SYSTEMS.

Tissues arranged and united in forms, so as to be usable for vital processes, form organs. All organs not constructed of cells alone are composed of elementary parts, which may be regarded as repetitions of the sac, the tube, or the segment, no matter how complex they may be. The organs are classified into systems by their structural connection with one another, which, of course, signifies functional association for some common vital process. The systems are as follows:

1. *Cellular Systems*.—The nervous, the muscular, the mucodermal.
2. *Sac and Tube Systems*.—The digestive, the circulatory, the respiratory, the urogenital.
3. *Segment System*.—The skeletal and epidermic.

The nervous system consists of central bodies or ganglia, and nerves which extend from them to the periphery of the body. The structure presents much variation among the several groups of animals. The muscular is composed of muscles and the tendons by which they are attached to the part of the skeleton to be moved by them. The muscles are composed of innumerable fibrillæ inclosed in a common sheath. The bundles in invertebrate animals are smaller, till in some of the lowest they are composed of but few fibrillæ. Unstriped fibers exhibit less energetic contractions than the striped. They prevail in invertebrate animals, excepting the *Arthropoda*, where the muscles are striped. The fibers in vertebrates are striped, excepting in involuntary muscles, where they are unstriped, save only in the heart.

In invertebrates they may have thick sheaths, and the contents are frequently granular. In most *Arthropoda* the central part of the striped fibrillæ retains the original cell-nuclei in one or more columns. The mucodermal system covers the body externally, and as mucous membrane enters and lines all the cavities that communicate with the open air; as serous membrane it lines the closed cavities. In animals no system presents greater varieties of exterior structure. In invertebrates it is sometimes hardened in segments produced by a deposit of lime, which resemble bone (sea-urchin), or form a more elastic substance—chitin (*Arthropoda*). In vertebrates it may support osseous pieces of various forms (scales), or hairs, or feathers, which are simply enlarged hairs finely branched. Finally, as horn, it appears as nails, claws, and horn-sheaths; these are simply thickened epidermis.

The digestive system is a tube usually open at both extremities. Portions of its course are enlarged into stomach, large intestine, etc., while glandular bodies are distributed along it from one end to the other, and pour their contents into it. These glands are formed of sacs, in a few cases

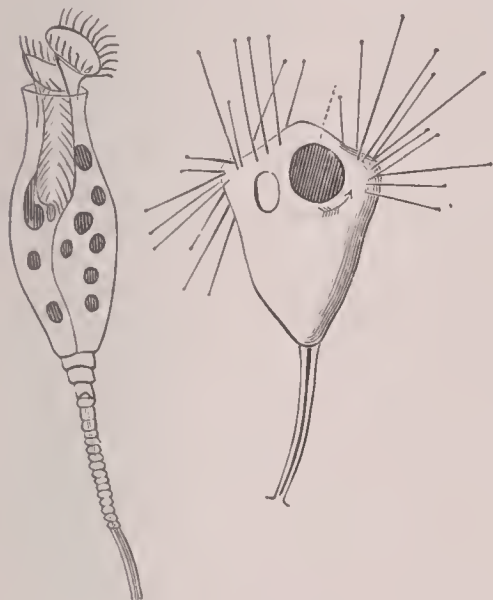


FIG. 2.—*Epistylis nutans*.

simple (Fig. 23) (gastric glands of stomach), in others simply forked, but usually many times divided and subdivided, forming masses of lobules. Some of these bodies are almost universal in the animal kingdom. Thus it is usual to find one or more situated near the cavity of the mouth (Fig. 24), which secretes a fluid to aid in deglutition; another, most frequently met with, discharges its secretion into the alimentary canal just beyond the stomach.

This is the liver and its representatives. The walls of the canal are supplied with several layers of muscular tissue in the vertebrates, and in a less complex form in lower animals. The circulatory system consists of tubes for the conduct of the results of digestion throughout the body; it consists of branches of the digestive canal in the lowest types (*Medusæ*), but becomes highly specialized, so that communication with that system is had by endosmosis only. It early acquires a special muscular enlargement, which pulsates. This organ becomes more specialized, isolated, and divided, and is known as the heart. The arteries (which take blood from it) are muscular throughout their length. The veins are not so, but are distinguished by the presence of valves in the higher animals.

The respiratory system consists of a series of tubes which carry air through the body; in some animals (snails, spiders) these are blind, forming pulmonary sacs, on which capillary arteries are distributed. In animals inhabiting the water this system is little or not at all developed, it being replaced by branchiæ or gills. In vertebrates it does not exist, but large sacs, connected by tubes with the digestive system, answer the same functional purpose, except among fishes, where it is used as a float. Gills attached to the head-skeleton aërate the blood in this class.

The urogenital system consists of tubes, sacs, and glandular and cellular bodies, which are connected with the outer air at the posterior end of most animals, and are usually blind at their termini. Their exit is usually common to the alimentary canal, the so-called cloaca. These organs exhibit usually bilateral symmetry, the opposite sides having distinct exits, except among females of some of the higher animals, where the discharge-tubes unite and form a chamber called the uterus. The tubes are termed oviducts (or tubæ Fallopii), and terminate near to a fibrous and cellular body, the ovary. In its circumference appear cells, which grow, and after discharge are modified into the embryo. Originally, the embryo-cells of low animals grow into adults by a simple process of division, but in higher forms a stimulus to such growth is

required from the other or male sex. In this sex the ovaries produce, by a form of secretion, independent cells, each of which bears a long cilium or lash (spermatozooids), and being modified in structure are properly termed testes. The efferent tube is called the vas deferens. These only unite near their point of exit. The urinary system is present in the vertebrates only. Tubes connect it with the reproductive canals near their termini. These are derived from paired glandular bodies, the kidneys, and usually unite into a common reservoir before exit—i.e. the urinary bladder. The object is the removal of uric acid, etc., from the blood.

The skeletal system exists only in vertebrates. It constitutes the solid framework of the body, and is axial or internal. It is composed of cartilaginous and osseous tissue. It is composed of segments, which possess a solid centerpiece and two opposite arches attached to it—one superior, the other inferior. It thus forms two tubes connected by a solid axis. The upper protects the nervous—the lower, the nutritive organs. Each segment is divisible into sub-segments, which are originally separate. These are much modified in form at the anterior extremity of the body—above, to contain the brain; below, to aid the sense of hearing, to accomplish mastication, respiration (in fishes), etc. Appendages to inferior segments are seen in limbs, which are the supports of the body and overcome resistance in motion. They are also composed of segments arranged in lines or radii.

II. CLASSIFICATION OF ANIMALS.

All known animals are referable to seven "branches" or primary types. Four plans of structure cover these, without expressing their intimate or essential structure. The four are the radiated (*Cœlenterata* and *Echinodermata*); the longitudinally jointed, with external and ring-shaped skeleton (*Vermes* and *Arthropoda*); the bag-shaped (*Mollusca* and some *Protozoa*); and the vertebrate, whose essential character is mentioned above under the skeleton of the *Vertebrata*. The characters may now be given in more detail.

Branch I., *Protozoa*.—Low animals, composed of single cells or protoplasmic masses, without blood or nerves. When symmetrical, bilateral or radiate.



FIG. 3.—*Vioa Freyeri*, Hanc.: a, entire animal on a shell of *Placuna placenta*; b, c, the sponge removed, the branches in different stages of growth; d, spicules.

Branch II., *Cœlenterata*.—Multicellular animals, without body-cavity (cœlom), and consisting of two layers only (ecto-

derm and entoderm) inclosing a sac-like stomach or common cavity. The circulatory system is wanting or represented by branches from the digestive cavity. A peripheral nervous system. The form is radial and bilateral, or radial only.

Branch III., *Echinodermata*.—Digestive system independent of the body-walls, not filling the cavity; the circulatory system present, largely isolated; a water-circulatory system; nervous system an œsophageal ring, with radii; skin with hard protective bodies. Form bilateral and radial.

Branch IV., *Vermes*.—Digestive system isolated, cœlom present or absent; circulatory system incomplete or wanting; nervous system an œsophageal ring, connected by a nervous axis with ganglia, or consisting of the chief ganglia only. No jointed limbs; body elongate.



FIG. 4.—*Pelagia*.

Branch V., *Mollusca*.—Alimentary canal complete, isolated; circulatory system incomplete at the distal extremities; nervous system with ring round œsophagus, which bears a ganglion above and one below; a third ganglion inferiorly placed, connected by a ring with the former. Form sac-like.

Branch VI., *Arthropoda*.—Digestive system complete; circulatory with complete central organ, but open extremities; nervous system with œsophageal ring and ganglia, and generally an axis on the inferior surface of body, with ganglia at intervals. Skin hardened into a chitinous, jointed skeleton, which is furnished with jointed legs. Form bilateral.

Branch VII., *Vertebrata*.—Alimentary system complete; respiratory, a branch from it; circulatory, with complete circuit; nervous, of a longitudinal ganglionic axis on the upper side (spinal cord), with usually ganglionic bodies at one end (brain). An internal bony or cartilaginous skeleton, consisting of solid axis, a superior tube for nervous and an inferior for other systems. Form bilateral.

A few decades ago the number of species of animals known was stated to be 500,000, of which 400,000 were Arthropoda; of the remainder, 25,000 were Vertebrata. There are now estimated to be at least 1,000,000 species of Insecta alone.

The classes of animals number thirty-six, distributed and defined as follows:

PROTOZOA.—*Rhizopoda*.—Bodies of unorganized protoplasm, which throws out threads or arms of the same substance, which are elastically retractile. No internal organs. Often a siliceous or calcareous covering, which is perforated. (Fig. 1.)

Infusoria.—Body with wall distinguished from contents, with mouth and often anus; often a contractile vesicle and ovarian nucleus. Surface frequently ciliated. (Fig. 2.)

CŒLENERATA.—*Spongia*.—(Fig. 3.) Body cavity surrounded by flagellate cells, which are generally supported by axes of a horny, calcareous, or siliceous nature, forming branched masses. Body-walls perforated by canals. No thread-cells.

Medusa (jellyfish).—Digestive system an open sac without œsophagus or septa, from which canals radiate as isolated grooves. Passing through a hydroid metamorphosis. Form discoidal. (Fig. 4.)

Ctenophora.—An œsophagus and gastric cavity without septa or radiating tubes. Form globular, cylindrical, or band shaped, with eight meridional rows of vibratile plates.

Anthozoa (corals, etc.).—Digestive system an œsophagus and an appended sac, the latter divided round the walls by vertical septa into grooves, which continue into tubular tentacles. Septa and skin often filled with deposit of carbonate of lime. (Fig. 5.) No hydroid metamorphosis.

ECHINODERMATA.—*Crinoidea*.—Body cup shaped, the surface covered with mineralized plates, which are solidly

united, but wanting on a part next the stomach; arms and stem present, formed of articulating segments. (Fig. 6.)

Asterida.—Body depressed, star shaped, covered with calcareous plates, which are wanting on a part of the dorsal surface, and which articulate with each other in clusters (starfishes). (Fig. 7.)

Echinida.—Body discoidal or globular, surface covered with calcareous plates, which are immovably united together; no arms (sea-urchins). (Fig. 8.)

Holothurida.—Body elongated, cylindrical, covered with soft skin; a calcareous ring round œsophagus; mouth surrounded by tentacles; anus terminal (trepangs). (Fig. 9.)

VERMES.—*Rotatoria*.—Alimentary canal developed in the hollow body; ciliated disks or wheel-organs for movement; a water-circulatory system.

Turbellaria.—Body unjointed, flat, solid, except in the developed digestive canals; nervous system of two supra-œsophageal ganglia; surface covered with cilia. No anus.

Cestoda.—Body jointed, nearly solid, without digestive system; head with suckers and hooks; a water-circulatory system (tapeworm).

Trematoda.—Body not jointed, solid except in the developed digestive tubes, and water-circulatory system; head with suckers and hooks (flukes). No anus.

Acanthocephala.—Body hollow, not jointed, cylindrical, without digestive canal; head with a hook-bearing proboscis.

Nematoda.—Body hollow, unjointed; digestive canal well developed.

Gephyrea.—Body cylindrical, not jointed, alimentary canal complete in the hollow body; a nervous system, an œsophageal ring and abdominal axis.

Annelida.—Body hollow, segmented, with well-developed digestive canal and nervous system; the latter an œsophageal ring and abdominal ganglion chain; a system of respiratory tubes (earthworm, etc.). (Fig. 9.)

MOLLUSCA.—*Bryozoa*.—Head, tongue, and foot wanting; a shell-producing mantle inclosing the hinder portion of the body; mouth surrounded by a crest of tentacles as respiratory organs. Nervous system rudimental. (Fig. 10.)

Brachiopoda.—Head, foot, and tongue absent; mantle large, bearing large shells, which are dorsal and ventral; branchiæ supported on two spiral arms, which are attached to the shell. (Fig. 11.)

Acephala.—Head and tongue wanting, foot anterior; mantle covering the body on each side, and inclosing lamini-form branchiæ; two shells, right and left (mussel, clam). (Fig. 12.)

Gasteropoda.—Head, tongue, and foot present, the latter extending posteriorly; mantle small, posterior; gills comb-like on the back. Shell, when present, single, spiral (conch, snail). (Fig. 13.)

Pteropoda.—Head, tongue, and foot, the latter developed into two lateral fins; mantle covering the hinder part of body; gills comb-like on the back. (Fig. 14.)

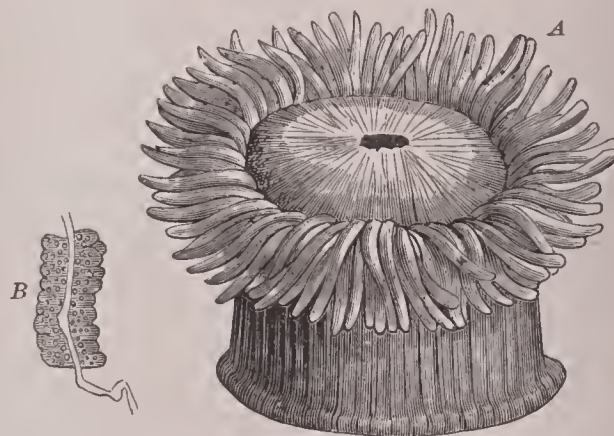


FIG. 5.—*Paractis alba*: A, expanded; B, the reproductive organ of *Cereus*.

Cephalopoda.—Head and tongue present; foot divided into arms, which radiate from the mouth as a center; posterior part of body inclosed in a mantle; gills on back; cartilages behind eyes, and ganglia in head (cuttlefish). (Fig. 15.)

ARTHROPODA.—*Crustacea*.—Two pairs of antennæ; post-abdomen developed; limbs on all segments of the body, those of the thorax converted into mouth-organs; respiratory organs, gills or wanting (shrimp, crab). (Fig. 16.)

Arachnida.—No antennæ nor anterior cephalic segments;

the last pair of cephalic limbs of the form of legs; three additional pairs on the thorax; head and thorax united into a cephalothorax, abdomen and developed post-abdomen without legs; respiration by tracheæ or sacs (spider, scorpion).

Myriopoda.—One pair of antennæ; a part of the thoracic limbs used as mouth-organs; abdomen not distinguished, many jointed, furnished with limbs throughout; post-abdomen rudimentary; respiration by means of tracheæ (centipedes).

Insecta.—One pair of antennæ; abdomen without limbs, post-abdomen rudimentary; three pairs of limbs on the thorax; respiration by means of tracheæ; usually two pairs of wings (insects). (Fig. 17.)

VERTEBRATA.—*Tunicata*.—Notochord in the tail of the larva or adult; head, tongue, and foot wanting; a large bag-like mantle, which incloses a fissured branchial sac. Nervous system with one central ganglion. (Fig. 18.)

Enteropneusta.—No mantle; branchial fissures external; a chorda dorsalis, but no other skeleton. Nervous system consisting of dorsal and ventral axes.

Leptocardii.—Notochord below the nervous axis. No cranium; no brain; heart with one chamber; five aorta-roots. Branchial sac and fissures internal (lancelet).

Agnatha.—Cranium and skeleton cartilaginous; no mandibular arch; heart with two chambers; five aorta-roots; (lamprey).

Pisces.—Cranium and skeleton osseous or cartilaginous, or both, with under jaw complex, and supported by hyomandibular bone, etc. Limbs with many segments in indefinite number, forming fins; pelvis mostly represented by pubis. Brain well developed; hemispheres with a velum; optic lobes generally larger; cerebellum distinct; two chambers of the heart; five aorta-roots on each side. Basicranial axis not ossified.

Batrachia.—Skeleton osseous; cranium with parasphenoid, no basisphenoid; under jaw complex, and supported by a single "quadrate" bone; two occipital condyles; limbs with humerus and two propodial bones and few radii forming feet; pelvis present; brain with cerebral hemispheres largest, and small cerebellum. Three chambers to the heart; four or three aorta-roots; a coracoid bone, e. g. the salamander, frog. (Fig. 19.)

Monocondylia.—Skeleton osseous, with coracoid bone and mandible, latter complex, and supported by quadrate; no

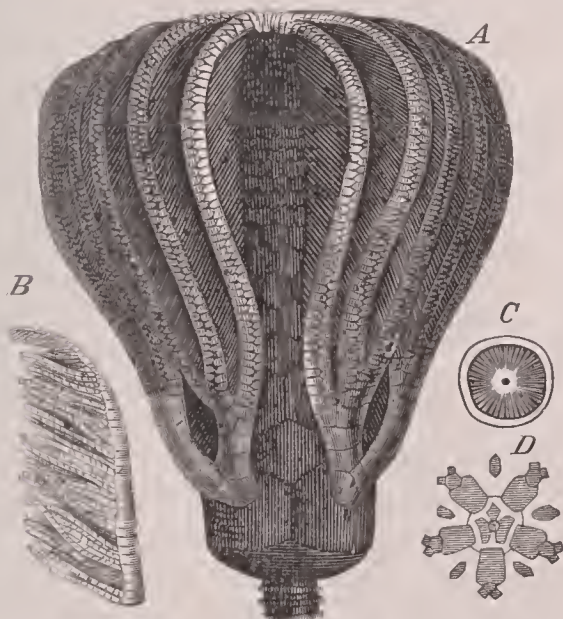


FIG. 6.—*Platycrinus triacontadactylus*, McCoy: A, side view; B, terminus of arm; C, articular surface of a stem-segment; D, structure of the basin or body.

parasphenoid, but sphenoids and a basi-occipital with one occipital condyle; brain with large cerebral hemispheres; two or one aorta-roots and aorta-bows; heart with three or four chambers; limbs as in *Batrachia*.

Mammalia.—Skeleton osseous, generally without coracoid bone; with the simple mandible sessile on the squamosal bone; basicranial axis ossified, and with two occipital condyles; limbs with distinct tarsal and usually metatarsal bones; optic lobes small; cerebral hemispheres very large; one aorta-root and bow, turning to the left; heart with four chambers.

The preceding descriptions express a few of the structural

peculiarities of the animals included in the respective divisions—i. e. such as are common to those of each, and by which they may be distinguished from each other. But the innumerable characters found in the subordinate or contained divisions and species of each remain to be considered.

III. THE NERVOUS SYSTEM.

1. IN INVERTEBRATES.—In *Protozoa*, where the nervous system has not been certainly discovered, spontaneous movements in the taking of food and moving from place to place are readily observed. It is therefore evident that the contractibility of their protoplasmic walls is under the direction of stimuli which do not require nerves for their conduction or direction. The nervous system of higher animals must therefore be looked upon as designed for the specialization or location of movements—a capacity entirely necessary to the activity of special mental powers. These demand particular movements for special objects; hence the necessity of concentrating the directors of movements in particular parts—i. e. nerves, muscles, etc.

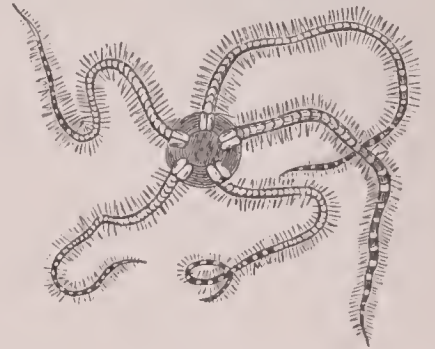


FIG. 7.—*Ophiura*.

In *Cœlenterata* one or two nervous threads follow the border of the disk, except in *Hydra*, etc., where nervous functions are performed by neuromuscular cells.

In the *Bryozoa*, the lowest mollusks, there is not certainly known to be an œsophageal ring, but there is a considerable ganglion above the gullet, which sends nervous threads around the horseshoe respiratory crest. One of these extends on each side at the base of the processes; but, though they approach, they are not known to unite on the inside of the arc. In *Tunicata* in like manner a single ganglion exists above the œsophagus, between it and the vent, and sends out nerves in a radiating manner. These are distributed to the orifices of the body and to the muscles. In *Brachiopoda* the system is more highly developed, there being a complete œsophageal ring, with a broad, band-shaped ganglion on the inferior side. The latter represents two united ganglia, and gives off on each side a strong nervous trunk. These trunks turn forward and outward, and soon divide, the weaker branch going to the spiral respiratory arms, representing that above described in the *Bryozoa*. The stronger branch goes to the muscles that close the shells, to the mantle, etc. Each one forms a ring in the former locality, which gives off small threads. In *Acephala* (called also lamellibranchs or bivalves) there are three well-separated pairs of ganglia, the ganglia of each pair connected by a commissure. The anterior pair is near the mouth; they are rarely united (*Mesodesma*, *Teredo*); they give off on each side a nervous thread which extends to the foot, and is connected with the foot-ganglion pair. These are wanting in the oyster and other genera which want the foot. This forms an open œsophageal ring. The nerves of the foot are derived from the ganglion, but none of the intestinal nerves. These are derived from the third pair of ganglia, which are the most posterior, and which are connected with the front pair by a nervous stem on each side, forming a second ring round the digestive axis. It sends nerves to the mantle, gills, etc., meeting those from the anterior ganglia. In *Ostrea*, *Pinna*, *Mytilus*, etc., its nerves contribute to form a circuit which extends round the edge of the mantle, connecting with the anterior pair.

In *Gasteropoda* the ganglia and commissures are homologous with those of the *Acephala*, but the former are concentrated near the mouth, forming much more contracted rings. The two supra-œsophageal ganglia (or "brain ganglia") are connected by short commissures. They send down commissures to the foot-ganglia, which are close to the œsophagus; the visceral ganglia or third pair are behind these, and connected with the superior ganglia by special commissures; sometimes they are on the upper side of the œsophagus, and connected by commissure below it. The superior sends nerves to the lips, mouth, tentacles, and eyes; the foot-ganglia to the under side of the œsophagus, to the ear, and the foot; the visceral ganglia to the mantle, gills, heart, intestines, and certain muscles. In the naked division (*Opisthobranchia*) the upper ganglia give a special ganglion

to the tentacles; the foot-ganglia in like manner are adjoined by a pair for the gills. In *Chiton* all three pairs of ganglia are found on the inferior side of the œsophagus. In *Turbo*, *Littorina*, *Janthina*, *Phasianella*, and *Patella* the superior pair occupies the opposite sides of the gullet. In *Natica* all three are closely massed together. As in other higher *Mollusca*, a sympathetic nervous system exists which supplies the involuntary organs of the body.

The *Pteropoda* exhibit the three pairs of ganglia connected by commissure. In the *Gymnosomata* they are all separate, but in the *Thecosomata* they are concentrated on the lower side of the œsophagus, so as not to be readily distinguished.

In *Cephalopoda* this system displays the most concentrated type known among mollusks. In *Nautilus* the ganglia are almost confluent, and form thick bands, one above and two below the œsophagus. The cerebral pair give off each an enormous optic nerve, appropriate to the size of the eyes in this class. The pedal pair supply the tentacles and organ of hearing, and the visceral pair the other organs. The inferior arches rest on the cephalic cartilage which characterizes the *Cephalopoda*.

The nervous system is in many of the *Vermes* very imperfectly developed, including the œsophageal ganglia with a few divergent nerves. In the *Annelida* the most highly developed condition is observed, where each body segment possesses a ganglion connected by a longitudinal double commissure, which originates from the ring. In the *Arthropoda* this type is also the basis of the various arrangements observed, and is constantly discoverable in the larvæ of the various forms. As a general rule, it may be understood that where a special organ exists the ganglion of the segment in or on which it is placed is enlarged for its supply, as in the thoracic ganglia of insects. Here several segments are confluent; correspondingly, nervous ganglia unite, forming larger masses, thus supplying the legs and wings. The transition from the simple type found in the larvæ to

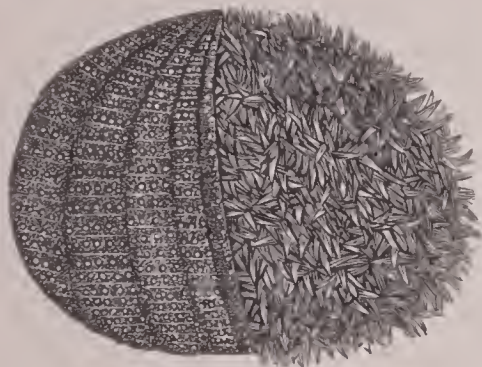


FIG. 8.—Echinus.

the modified and concentrated types of the adults has often been observed in tracing the history of the growth and metamorphosis of insects. In the *Crustacea* and *Arachnida* the concentration is carried still further than in insects. Thus in some lower *Crustacea* there are numerous ganglia, and the lateral commissures of the abdominal axis are only united in front; in the highest division, the *Decapoda* (crabs, lobsters, etc.), the axis is largely undivided, is short, and the ganglia are massed together. In the scorpions (*Pedipalpi*) there are but few distinct ganglia, but in the spiders (*Aranea*) there are no ganglia in the abdomen, and the nervous axis is short, massed together, and undivided. On the other hand, in the lowest *Arachnida*, the *Acarida*, there is no abdominal axis by defect, and the œsophageal ring is incomplete above, reminding one of the condition of the lowest *Mollusca*.

2. IN VERTEBRATES.—In this branch the nervous system reaches its highest development, though in the lowest form, the *Leptocephali*, it can hardly be considered to be more perfect functionally than in many *Mollusca*. Here there is a spinal cord or medulla, but no brain, but in its place a slight enlargement of the diameter of the medulla.

The spinal cord of vertebrates, like the brain, is composed of gray and white nerve-tissue, the gray being the ganglionic or cellular tissue, and the white the fibrous or conducting. Unlike the brain, the spinal medulla possesses the white substance externally, and the gray internally. The cord is divided longitudinally by an anterior and a posterior fissure of some depth, and by two less profound lateral ones. The gray substance exhibits in section a crescentic outline, the horns of the crescent being turned externally and reaching the lateral grooves. Here each horn gives origin to a nervous stem, and the two soon unite and pass out through a foramen between the vertebrae. The posterior bears a ganglion, and is devoted to the function of sensibility or feeling; hence it is termed "sensory." The anterior is the smaller, and is termed "motor," as its office is to convey the stimulus

which gives origin to muscular movements or contractions. After leaving the spinal column the single stem divides again, each branch containing fibers from both roots. The extremity of the cord is divided into a number of radiating threads, together constituting the cauda equina. In all the *Vertebrata*, from the *Dermopteri* to (and including) the *Aves*, there is an axial tube of small diameter; in *Mammalia* this is wanting, except a short anterior trace of it. Birds add the peculiarity of a sinus rhomboidalis, which is a long rhomboidal expansion of the tube in the sacral region (rump); which is open superiorly. The spinal nerves in many of the branches form networks by unions and separations opposite the fore and hind legs, which are called the brachial and sacral plexus. The ganglia of the sensory root are in the *Batrachia* accompanied each by a deposit of white phosphate of lime, forming a rounded mass. In some fishes with a short spinal cord, the division of the cauda equina takes place far anteriorly, as in *Diodon* and most other *Plectognathi*, thus leaving a very short axis.

The anterior part of the column enlarges, and is called the medulla oblongata; as this is within the cranium, it is reckoned as part of the brain. The six columns are here better defined, and there are added two well-defined oval prominences termed the corpora olivæformia between the lateral columns of *Mammalia*. This contains a corpus dentatum of gray matter. The fibers of the posterior columns cross or decussate; they are, however, only those of the anterior or motor root of the spinal nerves that do so, having passed upward through the column; the fibers of the posterior roots decussate in the gray matter of the cord near their exit, and pass thence into the brain without further exchange. The divergence of the posterior columns leaves a rhomboidal cavity or basin in the superior face of the medulla, which is the fourth ventricle. The roots of the auditory (seventh) nerve originate below its fundus. This chamber is variously exposed in different vertebrates. The postero-lateral columns (corpora restiformia) diverge upward and backward, and support the first great brain ganglion, the cerebellum. In the *Elasmobranchi* (sharks, etc.) the fourth ventricle is greatly extended laterally, having a lobate outline, with sinuous walls; in other *Vertebrata* this peculiarity does not exist. In *Marsipobranchii* one division (*Hyperotreti*) exhibits prominent lateral lobes, which do not open externally; they are wanting in the remainder of the class (*Hyperoarti*). In many bony fishes there are ganglionic enlargements of the medulla, corresponding to the origin of the nervus vagus; hence vagal lobes. There are numerous lobes on the medulla of the pike. The medulla is straight in most vertebrates, but in *Reptilia* and birds it is bent rather abruptly downward and forward after entering the cranium.

The cerebellum is a simple oval or flat body in the fishes, *Batrachia*, and reptiles, excepting in the crocodiles. In these it develops two small lateral lobes, while the middle portion, now called the vermis, becomes transversely grooved. In the birds the lateral lobes are a little larger and the plicæ deeper, and on section it yields a digitate and serrate outline of gray matter with a white center, called the arbor vitæ. In *Mammalia* the size is increased, especially as regards the lateral lobes. In *Marsipobranchii* it is small—in the division *Hyperoarti* apparently composed of two lateral ganglia. In sharks it is much enlarged longitudinally, and on section displays a weak arbor vitæ; in *Pristis* (sawfish) it even reaches the cerebrum, covering the optic lobes. In other fishes it is smaller, in the usual osseous orders a flat transverse commissure bridging the fourth ventricle, in *Polypterus* it is similar, but in *Lepidosteus* and *Amia* it is larger and oval. In *Batrachia* and in *Dipnoi* it is more insignificant than in any other division, being a very small transverse commissure, not nearly covering the fourth ventricle. In *Batrachia* this cavity contains a triangular network of blood-vessels, which fits it, called the plexus chorioideus; this is only seen elsewhere in the tortoises (*Testudinata*). In reptiles the cerebellum is still small and transverse, but exceeds that of the *Batrachia*; it is convex and scutiform; the fourth ventricle is nearly closed. In the crocodiles it is first approximately closed.

Anterior to the cerebellum, the brain is best understood as a double body, bilaterally symmetrical, and composed of a series of ganglia on each half of the divided axis or prolongation of the medulla oblongata. These ganglia are, primarily, the optic lobe, the cerebral lobe or hemisphere, and the olfactory lobe. The middle columns of the medulla support the optic lobes, while the cerebral lobes are supported

by the middle and anterior columns. The optic lobes are the largest of the ganglia from the *Dermopteri* to the *Batrachia* (Fig. 19), with the following exceptions: the cerebral hemispheres are larger in elasmobranchs and *Polypterus*. The lobes are sub-globular, and exhibit no marked external peculiarity till we reach the *Batrachia*, where they are smaller than the hemispheres, as in all the succeeding classes. In the tailless *Batrachia* (*Salientia*) they are divided transversely, forming four sub-round bodies; it is possible that the anterior one should be considered the lobus ventriculi tertii, or optic thalamus, of the next ganglion or cerebrum; but as it is united with the posterior in the tailed *Batrachia* (salamanders) and *Proteida* (*Necturus*) (Fig. 20), they are more probably the anterior bodies of the corpora quadrigemina of mammals. The posterior, and half or all of the anterior, are covered by a fold or lamina, which rises from the posterior part of the posterior bodies in the *Salientia*. In the *Urodela* the posterior is reduced, like the cerebellum, to a narrow transverse commissure, while in *Necturus* both it and the cerebellum are wanting.



FIG. 9.—*Cladodactylus doliolum*.

In *Reptilia* the optic lobes are more simple, but they are partially divided into superior and inferior bodies. In lizards the superior is laminar, and separated by a vacuity from the inferior; but in serpents the latter is a mere fissure. In harmless snakes (Fig. 22) the lateral bodies are connected by a commissure, but in the venomous *Trigonocephalus* and *Bungarus* they are united behind; in *Vipera* the superior and inferior bodies appear to be quite separated from each other. In birds the optic lobes are simple, and situated infero-laterally, since the cerebellum and hemispheres are in contact. In *Mammalia* they are superior, and continuous with each other, and consist of four protuberances, the corpora quadrigemina. They are much reduced in size, and cover a narrow vacuity or tube, the aquæductus Sylvii. In front of the anterior pair is situated a sac-like body, the pineal gland, which is the rudiment of an important organ of the brain of lower orders, the epiphysis. This is a highly vascular membranous body, which rises to the inner surface of the cranium in *Marsipobranchii*, fishes, *Batrachia*, and *Reptilia*. It is very variable in structure in fishes; in reptiles (lizards) it often communicates with the outer surface by the foramen parietale of the table of the skull. It is supposed by some anatomists to be a sensory organ. Directly opposite to it another sac descends from the cavity below the optic lobes (the aquæductus Sylvii), which is termed the hypophysis. It exists in the classes which possess the epiphysis, and is represented among *Mammalia* by the pituitary body and infundibulum.

The cerebral hemispheres are small in the classes below the *Batrachia*, except in sharks and a few fishes, as the *Dipnoi*, *Polypterus*, and *Ginglymodi* (gar). In the *Actinopterygia* they are overarched by a membranous roof (velum) lined with epithelial cells. In *Dipnoi*, *Crossopterygia*, *Chondrostei* (sturgeons), *Ginglymodi*, and *Halecomorphi* (*Amia*) the hemispheres are at a distance from the optic lobes, being supported by the elongate crura of the medulla oblongata; in other classes and orders the hemispheres are sessile. In the mammals alone we find the pons varolii, a body of transverse fibers which cross and bind together these crura cerebri on the inferior side. The hemispheres in the mammals present many peculiarities; their size is increased, and in many the surface is thrown into vermiform ridges or "convolutions." In the fishes and higher types they are hollow, inclosing the "lateral ventricles." The floor of these is occupied by various bodies in the different types. Thus in *Batrachia* there is a body on the inner side of each. In reptiles this is represented by a narrow body, while another mass

occupies the outer part of the floor of the ventricle. In *Mammalia* two bodies, little separated, occupy this position—viz., the "lobus ventriculi tertii" (or thalamus opticus) and the corpus striatum. The cerebral hemispheres are not directly united till in certain birds we find a narrow bridge connecting them, the fornix. In the lowest *Mammalia* (*Marsupialia*, etc.) we observe another connecting body in a rudimental state above the fornix. This is the corpus callosum, which in higher mammals is a massive bridge, and much larger than the fornix. There is another bond of connection called the anterior commissure, which is short and sub-cylindric: its size in mammals is nearly in inverse ratio to the development of the corpus callosum. The ventricles are separated by the septum lucidum in this class only, but are much reduced in the monotremes (duck-bill). The characters of the brain in the orders of *Mammalia* may be best expressed in tabular form, thus:

I. No calcarine sulcus nor hippocampus minor; corpus callosum rudimental; hemispheres smooth, leaving cerebellum and olfactory lobe exposed; *Monotremata*, *Marsupialia*.

II. Corpus callosum well developed, short, without rostrum; no calcarine sulcus nor hippocampus minor; hemispheres smooth, short; olfactory lobes and cerebellum not covered; *Edentata*, *Glires*, *Insectivora*, *Chiroptera*.

III. Corpus callosum longer, with a recurved rostrum in front; no calcarine sulcus nor hippocampus minor; the hemispheres convoluted, and partially covering the olfactory lobes and cerebellum; *Proboscidea*, *Hyracoidea*, *Diplarthra*, *Carnivora*: (hoofed and carnivorous animals).

IV. Corpus callosum long, with rostrum; a calcarine sulcus and hippocampus minor; hemispheres mostly convoluted, partly or wholly covering the olfactory lobes and cerebellum; *Primates* (monkeys, man).

Exceptions to the definition of the Primates are seen in some of the *Lemuroidea*, in which the hemispheres are smooth. In man they have nearly twice the size seen in the allied forms of apes (chimpanzee, etc.). The calcarine sulcus is on the lower side of the posterior part of the hemisphere, and the hippocampus minor is the convex body within the ventricle, which its presence causes; it forms the inner wall of the posterior horn of that chamber.

The olfactory lobes are very large in elasmobranchs, and are connected with the hemispheres by a narrow commissure. In fishes they are less developed, and in batrachians are sub-cylindric and separated by a groove. In reptiles they are continuous with the hemispheres, obpyriform in shape, and often slender; they are frequently hollow. In birds and mammals they bear a smaller proportion to the whole brain, and are entirely concealed in Primates.

The optic nerve originates by fibers derived from the optic lobes. Its fibers decussate or cross from the right side to the left and *vice versa*, shortly after leaving the brain in all Vertebrata, excepting the lower Actinopteri (*Halecomorphi*, *Ginglymodi*), and Chondrostei, the Elasmobranchii, and the

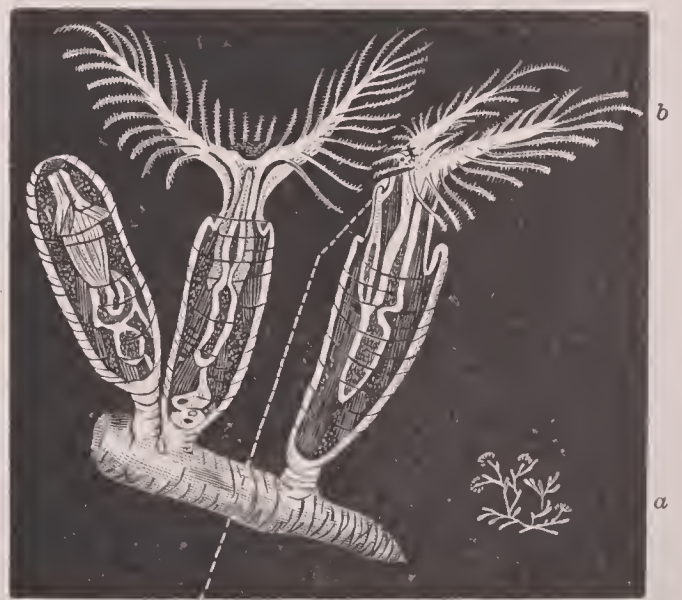


FIG. 10.—*Plumatella*: a, natural size; b, magnified; c, the vent.

Marsipobranchii. In all of these the nerves are connected by a commissure, which is in part (*Amia*) composed of fibers which leave the brain and return again, forming a short circuit. In the *Marsipobranchii* this "chiasma" takes place near the roots of the nerves; in the others, at a greater distance from the brain.

The remaining cranial nerves are in fishes only four pairs, the vagus, glossopharyngeus, trigeminus, and facialis. The first two and the last two are each approximated. The vagus exhibits in the fishes above the *Marsipobranchii* two

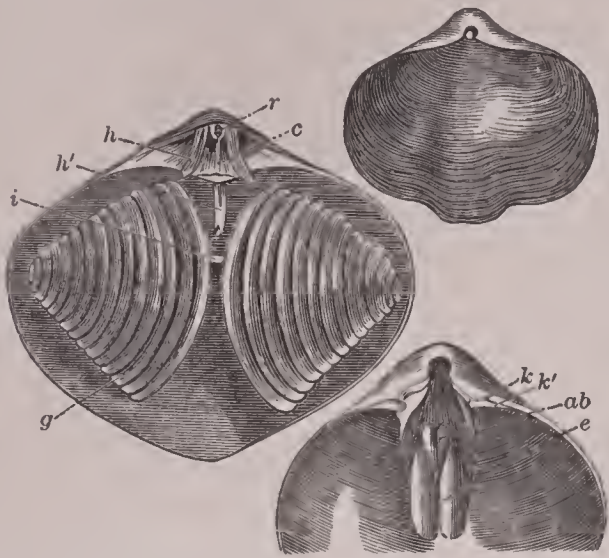


FIG. 11.—*Spirigera concentrica*: *ab*, insertion of adductor muscles; *c*, of divaricator muscles; *e*, of adjustator ventralis; *g*, branchial arms; *h*, hinge sockets; *i*, gill-bridge; *k*, hinge teeth; *r*, tubular body.

distinct roots. The first is the nervus (ramus) lateralis, which extends posteriorly beneath the scapular arch, and runs along the middle of the side of the body to the tail; it is abortive in *Marsipobranchii*. The second or larger nerve supplies the gills and viscera. The nervi trigeminus et facialis have four distinct origins, which sometimes unite and form one or two plexuses outside the cranium. The branches are distributed to different parts of the head; but one, which especially characterizes many bony fishes, but is wanting in *Clupeidae*, *Plectospondyli*, *Amia* (gar), *Chondrostei*, and elasmobranchs, the ramus lateralis, runs upward within the cranium, issues above, and extends along the back to the caudal fin, supplying the dorsal fin. In *Marsipobranchii* and *Dipnoi* the glossopharyngeal is a branch of the vagus; in other vertebrates it is distinct.

In *Batrachia* the rami laterales of the vagus are present; and the glossopharyngeus unites with the vagus, forming a ganglion, from which nerves issue. The origins of the nervi trigeminus and facialis are wholly or in part common, and they support a ganglion Gasserii. The hyoid and scapular muscles are supplied from the first pair of spinal nerves, and the vagus supplies branches to the scapula. These characters are in part those of reptiles, but more prominently those of fishes. In the *Reptilia* there are nervi accessorii, as well as hypoglossi. The latter supply the hyoid and scapular regions, and the former certain muscles inserted in the scapula in front. The rami laterales of both vagus and trigeminus are not present, and the facialis has a distinct origin. In mammals all these nerves are present, except laterales, but the facialis frequently is identical with the trigeminus in origin.

IV. THE MUSCULAR SYSTEM.

Muscles are entirely wanting in the *Protozoa* and in the *Cœlenterata*, excepting the *Medusæ*. In the latter, delicate bundles of unstriated fibers exist, extending vertically from both the inner and outer surfaces of the umbrella, while between them concentrically curved bundles run between the eight circulatory canals. Among echinoderms the innumerable segments of which they are composed give origin and insertion to many muscles. In addition there are muscles devoted to the masticatory apparatus. This consists in *Echinoidea* of five tooth-like bodies, which form a pyramidal mass when closed. For the opening and shutting of these, twice ten paired and twice five single muscles are arranged, as well as several others. In *Holothurida* five longitudinal muscles extend from the hard œsophageal ring to the vent. A sphincter closes the mouth, and the superior part of the gullet is thickened with muscular walls. The tentacles possess muscles.

In *Mollusca* muscles are universally present, though fewer in number than in the groups just described. In *Bryozoa* (or *Polyzoa*) a system of muscles is arranged for the withdrawal of the crown into the sheath-like body; these are median, longitudinal, slender muscles. Those designed for

projecting it again are horizontal, curved, and situated on the inner wall of the body; the successive contractions of these from below upward will produce the result. Avicularia are peculiar bird-head-like bodies, situated near the mouth in the marine *Bryozoa*; they are furnished with a bird-like beak, with an under jaw which frequently closes with a snap, and slowly opens. These movements are conducted by muscles whose movements are automatic. The large mantle inclosing the body of the *Tunicata* is composed of two muscular layers—the one of transverse (hence annular) fibers, the other of longitudinal or oblique. Muscles for producing progressive movement or swimming are found in many genera. These are annular, and at intervals around the body. *Appendicularia* possesses a long and deep rudder-like tail, which contains muscular layers. The *Brachiopoda* are attached to a fixed body by a muscular arm or anchor, which enters the shell through a foramen. This is connected with the dorsal and ventral valves of the shell by corresponding opposite muscles, which determine the direction of its open borders. There are two pairs of adductor muscles arranged longitudinally, and two pairs of abductors (divaricatores), one of the pairs smaller, and sometimes wanting. There are muscles also in the mantle and branchial arms. In lamellibranchs or *Acephala* there are powerful musculi adductores. There is but one in the *Ostreidae*, *Aviculariidae*, and *Muelleriidae*. They are of very unequal size in the *Mytilidae*, but sub-equal in the remaining *Acephala*. In *Anomia* there are three.

There are also retractor muscles of the siphons, and a band around the edge of the mantle. The muscles of the foot are often large. The principal one divides next the body, and each half is inserted near the hinge of the shell between the adductor muscles. In *Gasteropoda* the muscular structures have a different arrangement. The foot is largely muscular, and its upper and posterior region gives insertion to the columellar muscle, which attaches the animal to the shell. It arises from the columella at the beginning of the last whorl. Its size depends on the size of the whorl and length of foot. Other muscles are devoted to the elongation or retraction of the proboscis and the penis. In *Cephalopoda* the columellar muscle is represented by a large symmetrically divided mass, which arises from the cephalic cartilages, and is inserted into opposite sides of the shell. An annular muscle surrounds the neck, and another the funnel. From the latter diverge the longitudinal muscles of the tentacles, which are perforated by radial muscular fibers. The mantle is occupied by a flat muscle. The usually muscular foot is here represented by a flat body, which projects forward from beneath the mantle. It is rolled up, forming a tube. By the energetic expulsion of water from the mantle-chamber through this tube the animal is driven through the water, the mantle end first.

The interior surface of the outer chitinous skeleton of the *Arthropoda* is lined with a muscular layer. Longitudinal and oblique muscles connect the annuli, which repeat each other in those forms (*Myriopoda* and larvæ) in which the segments are similar. Where (as in all the higher types) the segments are much specialized, the muscles are modified accordingly, either by increase of size or number. Muscles of the dorsal and ventral regions are usually more enlarged than those of the lateral, while in the types where the sides are soft, to allow of the movements of the back and belly plates, the latter are connected by straight muscles which pass through the viscera. All the limb muscles are within them, or are inserted into internal processes of the chitinous walls. Sometimes they are inserted into fibrous bodies which have been hardened by calcareous or chitinous deposit, which also subserve the purpose of levers.

Arthropoda possess muscles which perform the functions well known among vertebrates as rotators, elevators, depressors, retractors, protrusors, etc. But the flexors and extensors exceed the others greatly in importance and size. Their relative size is the reverse of what is seen in vertebrates; in the latter the extensors are the more important; in the *Arthropoda* the flexors exceed the extensors several fold.

2. In *Vertebrates*.—The muscles of the animals of this type are divided into two classes by their position and the

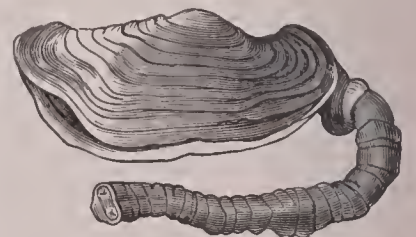


FIG. 12.—*Panopœa australis*.

relation they bear to the skeleton, and are termed episkeletal and hyposkeletal. The former are situated on the upper surface of the vertebræ—i. e. of the body and arches, including ribs—and are developed in the fœtus coincidentally with the vertebræ. Hence they are in segments which correspond to these, and are separated by intervals termed inter-muscular septa. The hyposkeletal are developed later, and below the vertebræ; they are in part attached to the latter, or to the abdominal walls, or the limbs.

In vertebrates below the *Batrachia* the hyposkeletal muscles are developed to a very slight degree. The segments of the episkeletal series (or myocommata) cover the sides of the body posterior to the head, and meet on the median line below. They present an angle forward, near their middles, having thus an open chevron shape. In *Batrachia* the tails and sides retain the largely developed myocommata, while the abdominal muscles have the character of those of the *Reptilia*. In these and higher Vertebrata the hyposkeletal muscles are well developed. In the latter numerous muscles (spinalis, semispinalis, longissimus dorsi, sacrolumbalis, intertransversales, levatores costarum, complexus, splenius, recti postici, and recti laterales) are derived, by subdivision, from the upper portion of the myocommata. In the same way the inferior half gives rise to the recti abdominis, which extend from the pelvis to the sternum; the sternohyoidei from the sternum to the hyoid apparatus; the geniohyoidei from the latter to the lower jaw. On the sides the derivative muscles are obliquely directed—viz., the external intercostales; the obliqui externi of the abdomen; the subclavius from the first rib to the clavicle, and the scaleni from the anterior dorsal ribs to the cervical ribs and processes; lastly, the sterno-cleido-mastoid extends from the sternum and clavicle to the skull. The fasciculi of these muscles are all directed, as is the lower part of the myocomma of the fish, from above, or dorsally, downward and posteriorly. The hyposkeletal muscles occupy the inner side of the body-walls, and include, besides many others, the diaphragm of *Mammalia* and birds. This septary muscle is wanting or rudimental in vertebrates below the *Aves*.

The muscles of the limbs are of two kinds: (1) those that originate from the body, and (2) those that take origin on some bone of the limb. The former move

the whole limb, the latter its parts. They are extensors, flexors, and rotators; among the most notable of the last is that which, in the *Mammalia*, rotates the radius of the fore arm on the ulna. Of flexors, the pectorales major and minor pertain to the fore limb; they are enormously developed in birds, subserving the function of flight. The extensor of the hind limb, the glutæus maximus, is greatly developed in man, as essential to the erect attitude. The longitudinal dorsal muscular tendons are generally ossified in birds.

A remarkable modification of the muscular system is seen in the electrical organs of certain fishes, the torpedo, electric eel (*Gymnotus*), and catfish (*Malapterurus*). Here a system of enormous cells, packed in parallel columns, discharges electricity instead of developing movement or contraction. The contents are gelatinous, and are divided by connective tissue into transverse disks, imitating striped muscular fiber.

The columns are vertical in the torpedo and longitudinal in the other genera. They are richly supplied with nerves which are distributed on one face only. The rays possess rudimental organs of the same kind at the base of the tail.

V. THE MUCO-DERMAL SYSTEM.

1. In *Cœlenterata*, *Echinodermata*, and *Mollusca*.—The superficial or cellular layer of the skin or epidermis is universally present in animals. The inferior layer in vertebrates is fibrous, and belongs strictly to the system of areolar or connective tissues; it is not found in the *Cœlenterata*, but is represented by a non-cellular, granular, and sometimes slightly striate “true skin.” In the *Cnidaria* and in polyps (*Anthozoa*) there are two or three layers of cellular skin, of which the lower contains the “nettle-cells.” These are minute bladders .02 to .07 mm. long, and one-third to two-thirds as thick, which contain a hair-like body coiled within them. These are suddenly projected upon external irritation, and act as irritants or offensive weapons upon the object they strike, producing sometimes severe smarting and paralysis. These cells occur also as an external lining of the mesenteric threads of polyps. The true skin is the layer in which is deposited the carbonate of lime, which, penetrating or not the folds of the internal cavity of the body, produces the radiating and tubular solid structures characteristic of corals. In the *Gorgoniidae* the deposit of the basis of the first simple, and therefore of the axis of the compound, animal, is horny; this is afterward covered with a thin calcareous layer.

In the *Echinodermata* the dermal system fulfills an important function, as the basis of deposit of mineral matter in the form of innumerable symmetrical segments. In the *Holothurida* these deposits are frequently isolated and internal, and sometimes entirely wanting; the tentacles always contain them. Among *Mollusca* the superficial layer consists of ciliated epithelium (except on the eye-peduncles). The true skin is fibrous, and contains many cells; it is in the form of a sac, and often reaches considerable thickness. An extensive fold derived from the posterior part of the body in *Cephalopoda* and *Gasteropoda*, or the superior in *Acephala*, envelops the body more or less completely. In mollusks which possess a shell the latter is produced by the margin of the mantle. This margin is supplied with glands which secrete or separate carbonate of lime, which they deposit on the general border. Thus the shell takes the form of the body, which the mantle closely enfolds. In *Gasteropoda* it is subcylindric; the shell has the same character, being sometimes partially or wholly straight (*Vermetus*, *Teredo*), or generally spirally twisted. In the bivalves the mantle has the form of two lateral oval laminae, thus producing the well-known form of the shells. The periodical deposits of lime by the mantle are seen in the lines of growth of all shells. The form of the mantle border is faithfully repeated in the shell; thus the projections caused by the protrusion of the proboscis in *Murex*, *Strombus*, etc., is seen in the convexities and canals of their margin. In *Acephala* the mantle extends beyond the body, inclosing a space known as the mantle-chamber. The margins of the mantle in a large number of families are extensively united, thus forming a nearly closed chamber. They are entirely separated in the oyster, the *Arca*, *Myophoria*, etc. They are sometimes only united by a bridge; when more extensively, there usually remains an opening through which the foot is protruded. Of these some leave a single opening at the posterior end of the body (*Mytilida*, *Unionida*), or the latter is divided into two (*Tridacna*, *Isocardia*, *Cyprina*). Of these the upper is the point of exit for excrement and water, while the lower admits water to the gills and food to the mouth. The lips of these openings are in many families prolonged into tubes, sometimes very extensively. These may be united or separate. They are either fixed or retractile; when the latter, the space they occupy in the shell requires that the line of attachment of the mantle to the shell should be indented, sometimes to a great degree. The opening for the foot also admits water. It is much reduced in size in genera with a rudimental foot (as *Gastrochæna*, *Aspergillum*, etc.), and is finally closed in *Pholadidea*. In this series of *Acephala* the siphonal tube is not retractile, and is strengthened by a calcareous deposit, to which the true valves become mere appendages, and with which they are finally completely fused (*Aspergillum*).

Besides the mineral substance, the colors of the shell are secreted by special pigment-glands on the margins of the mantle.

The shell is not always composed of carbonate of lime; in *Lingula*, *Pinna*, etc., the material is phosphate of lime, and resembles bone. The pearl layers of many shells are aragonite. The shell may be composed of laminae or prisms,



FIG. 13.—*Voluta undulata*.

or both. *Anomia* exhibits the first, *Inoceramus* the second, and *Strombus* the third type. In *Brachiopoda* the shell-valves are dorsal and ventral; in *Acephala*, right and left; in *Gasteropoda* and *Cephalopoda* the shell is central and single. In *Acephala* tightly closed valves indicate retractile siphons; posteriorly gaping shells, projected ones.

The valves are united by a marginal hinge, composed of teeth, pits, and cartilage ligament, in most families.

In *Gasteropoda* the coil may be flat (*Planorbis*) or much prolonged (*Mitra*). The "body-whorl" is that last made; it may be either contracted (certain snails), or greatly enlarged, as in *Cypræa*, where it almost or quite conceals all the other turns in its fold.

In the fossil *Endocardines* (or *Rudistes*) the valves are fastened by hinge processes on the inner face of the free and smaller valve.

The shell of *Cephalopoda* is distinguished by its septa. These inclose chambers, the animal only occupying the last one constructed. This structure is not without parallel among *Gasteropoda* (where the unused portion is generally broken off), but the *Cephalopoda* are peculiar in that the body is not entirely withdrawn from the first chamber, but leaves a long tube, which passes through all the chambers, and secretes a pearly sheath, which is known as the siphon of the shell. In life this contains nothing but air, which is wanting in carbonic acid. The margins of the septa are simple in *Nautilus*, *Orthoceras*, etc., but fold in a most complicated and symmetrical manner in *Ammonites*, *Baculites*, etc. In *Goniatites*, *Aturia*, etc., the folds are fewer and more simple.

The *Argonauta* (paper-nautilus) is peculiar in the character of its shell, which only belongs to the female. It possesses indeed no true shell secreted by the mantle, in common with other octopod genera, but that which bears the name is secreted by the margin of the large expansions of the two posterior arms. These inclose the shell, which is thus evidently a product of their inner face.

The byssus is a fibrous rope or thread-like body which is secreted by a gland in the foot of certain *Acephala*. By means of it the animal is attached to fixed bodies. It is well developed in *Mytilus*, rudimental in some *Uniones*.

2. In *Arthropoda*.—The external covering of the body and limbs of animals of this class has been already stated to be chitin. This substance is composed chemically of $C_{17}H_{14}NO_{11}$ —that is, a protein body, $C_8H_6NO_3$, plus a hydrated carbon, $C_9H_8O_8$. In higher *Crustacea* and in various *Myriopoda* (*Iulus*, *Polydesmus*, etc.) it is accompanied by an equal or even greater amount of carbonate and phosphate of lime; of these the former exceeds the latter in quantity. The chitin layer proper is a secretion from a layer of cells, which in turn lies above a stratum of connective tissue. The cells resemble the epithelial, and have distinct nuclei. The chitin originates from these as a transparent layer, but frequently becomes streaked or fibrous.

The pattern on which each segment of the arthropod body is constructed is that of an annulus composed of several pieces. These are a median dorsal and ventral, and a pair of lateral shields on each side. The number of these rings in the different orders averages twenty and less, but in some *Myriopoda* it rises as high as 140 (*Geophilus*). They are greatly modified in forming the head, to which five segments are reckoned by some (seven by others). In *Myriopoda* those remaining are very similar to each other, while in the other orders they are much modified, and generally arranged in groups. These are distinguished in insects as head, thorax, and abdomen; in *Crustacea* the first two and part of the third series are united into a cephalothorax, while the numerous remaining segments are the post-abdomen. In *Arachnida* only, however, we have the true cephalothorax, including head and thorax only, the abdomen remaining entirely distinct. The number of segments in the *Crustacea*, *Decapoda*, *Amphipoda*, and *Isopoda* is 20; in the *Copepoda* and insects, 12; in *Arachnida* it varies from 12 to 19.

The limbs of *Arthropoda* are composed of hollow, variously altered cylinders, articulated together where composed of more than one segment. In *Crustacea* and *Myriopoda* they are present on all the segments of the body; in *Arachnida* and *Insecta* on head and thorax only. In the last-named class only those of the head are modified to aid in seizing and devouring food; in the *Crustacea*, those of the thorax are partly (*Gammarus*) or wholly (*Astacus*) devoted to this service. As organs of progression only those of the thorax are employed in *Insecta*; in *Arachnida* the last head-limb is included; they thus possess four pairs of limbs, while the

Insecta have but three. The larvæ of lepidopterous and some (tenthredenid) hymenopterous insects possess false feet or pro-legs on the abdominal segments. In the former they are beset by an arched series of minute claws, which are absent in the latter. The abdominal legs of *Myriopoda* are, like the thoracic, simple. In *Crustacea* they are in part swimming organs, and many of them bear plates and fringes in which the blood is exposed and oxygenated.

The organs of the head, or altered feet, are in jawed insects as follows: 1, wanting; 2, antenna; 3, mandible; 4, maxilla; 5, labium. In insects with a tubular mouth it is similar, except that the third pair are bristles for puncturing, the fourth similar, and the fifth a tubular body or rostrum, inclosing them. The hemipterous rostrum is of this type. In *Lepidoptera*, where there is a tubular or suctorial tongue-like rostrum, the third segment is rudimentary, the fourth is the rostrum, and the fifth is the labium. Of the jawed type of the *Coleoptera* are the orders *Orthoptera* and *Neuroptera*. In the *Hymenoptera* (bees, etc.) the mandibles are developed as jaws, but the maxillæ are elongate, and form the opposed halves of a tube which incloses a projectile tongue. The suctorial orders, *Hemiptera* and *Lepidoptera*, have been mentioned; the structure in the *Diptera* (flies) is similar to that of *Hemiptera*.

The antennæ of insects are organs of special sense, but whether of hearing, smell, or taste is not well known. In the basal segment of certain *Crustacea* (*Sergestes*, etc.) a chamber containing grains of sand has been suspected to be an organ of hearing; while a microscopical nervous structure in the posterior wings of *Coleoptera* has been regarded as of similar significance. The antennæ are set with bristles, which evidently subserve the ordinary but here highly delicate sense of touch. The *Crustacea* are distinguished by the presence of two pairs of antennæ; the second pair only of these is present in other *Arthropoda*, excepting the larvæ of insects, where the first pair exists in a rudimental state, the second being absent. In *Myriopoda* they are as in *Insecta*, but in *Arachnida* both appear to be wanting; the second pair is, however, present as jaw-antennæ, taking the place of the absent mandibles.

In *Insecta* the forms of the antennæ are very numerous. The typical structure is that of a succession of (nine to twelve) sub-similar cylindric segments. Thus they appear in carnivorous and other *Coleoptera*, in phryganeid *Neuroptera*, acridiid *Orthoptera*, nematoceros *Diptera*, etc. In most *Diptera* they are excessively shortened and of few joints; the last is enlarged, and supports at its base a large bristle, which is frequently plumed. In *Lepidoptera Diurna* they are club-shaped; in *Sphingidæ*, triangular in section; and in *Lepidoptera Nocturna*, fusiform and often plumed. In many *Orthoptera* they are very short; in *Hymenoptera* short (bees), elbowed (ants), or much prolonged (*Ichneumonidæ*). The *Coleoptera* exhibit the greatest varieties. In some (*Elater*, *Dictyopterus*) they are serrated; in *Silphidæ*, short and clubbed; in *Longicornia* their length is often excessive; in *Curculionidæ* some of the basal segments are elongate, forming an elbow with the remainder. In *Lamellicornia* the terminal segments are expanded, leaf-like, on one side of the axis, and open and shut like the leaves of a book.

In *Myriopoda* the maxilla and labium of insects are represented by a large labium. In the *Strongylia* there are a second and third labia; but in *Chilopoda* the last is represented by a pair of powerful foot-jaws, which are perforated for the conduct of poison. The first leg corresponds to the third of the insect. In *Arachnida* the insect maxilla is represented by jaws, which are simple in spiders, acute, and perforated by a poison duct, but in *Phalangia*, scorpions, etc. (*Pedipalpi*), are furnished with an opposable joint, or are chelæ.

In *Crustacea* the second pair of maxillæ are not united into a labium, as in *Insecta*. The cephalothorax in some of the higher order of *Decapoda* (crabs, lobsters, etc.) is distinguished from the abdomen by a groove, as in the crayfish (*Astacus*); in all of them the ambulatory limbs arise from the abdomen. One or more of these are chelate (furnished with nippers) in the *Decapoda* and other orders, but in the *Stomapoda* the first pair has instead the last joint opposed to the whole length of the penultimate, forming a reversed scissor-like organ. The limbs of the post-abdomen usually bear branchial organs, while those of the last segment are in the form of plates, which, when extended, form a swimming shield (lobster), or are hook-like bodies for maintaining the hold in the shell (*Pagurus*).

The limbs in *Insecta* are always similar in construction, though the hinder may be much elongated (grasshopper), and never chelate. They consist of four regions—the coxa, femur, tibia, and tarsus. The coxa attaches the limb to the body by a ball-and-socket or hinge-like joint, and may be from globular to laminar in form. The femur is the stoutest joint, containing the muscles which flex and extend the rest of the leg. The tibia is slender and often long; the tarsus usually consists of several joints. In some *Hemiptera* it consists of but one or two; in most *Coleoptera* it embraces at least five. In the latter order the number is an important index of relationship. The lower groups (*Coccinellidae*, etc.) possess but three; the curculios, longicorns, etc., possess four, and the *Tenebrionidae* and others five in front and four on the hind limbs only; lastly, the sericorn, clavicorn, monilicorn, and other types, with five joints all round. The last joint usually consists of a pair of chitinous hooks; others may be modified by expansion, etc., for adhesion to vertical surfaces, etc.

3. In *Vertebrata*.—The skin in the *Vertebrata* is primarily smooth and soft. Its epithelial glands may secrete mucus, as in many fishes, or glands seated in the true skin may separate sweat. The latter are simple, convoluted, and with a long efferent duct. The epithelial layer produces the horny sheaths of claws and horns, feathers and hairs. *Mammalia* are generally covered with hairs, but in the manis it is thrown into extensive folds, which are cornified, and become the scales of those remarkable animals. In the shell of the armadillos it is ossified; and on the head of various vertebrates and on the body of tortoises it is penetrated by ossification, and fused with the skeleton below them. Hairs are an epithelial growth in the form of a hollow

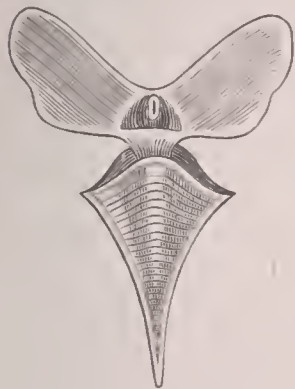


FIG. 14.—Cleodora.

cylinder. The epidermis is sunk into a pit of the true skin, and then returns outward as the hair. It increases in length by addition of cells and pigment from below. A modification of the same structure is seen in feathers, where the axis is split laterally, and thus develops the barbs and fibrillæ on each side. Birds are covered with feathers. The first growth appears as down, in which the fibrillæ are softer and in much smaller number, so as not to be coherent; the bases of the true or mature feathers are furnished with the same. Those of the body are generally soft; in aquatic birds excessively dense on the lower surfaces. They arise from certain patches only. There is one on each scapular region, and one along the middle line of the neck above. Another is on the rump, and one on each side of the breast. The abdomen presents a large median patch. In ostriches, penguins, and a few others the feathers are evenly distributed over the whole body. Besides the main shaft of the feather, a second one is developed behind it in many birds. It is generally much smaller than the first, but it is equal to it in the *Casuariidae*. The largest feathers are developed on the caudal vertebrae and on the fore limb. In the latter they subserve the function of flight. Those attached to the carpus and manus are the longest and most important, their length bearing a direct relation to the powers of flight of the bird. These are the primary quills; they are enormously developed in the swallows and swifts, in the humming-birds and frigate-pelicans (*Tachypeles*), etc. They consist of naked shafts only in many of the ostriches. The quills attached to the fore arm are the secondaries; they are proportionately large in gallinaceous birds. Those inserted into the skin of the humerus are the tertiaries, and are most highly developed in the wading families (*Grallæ*) and certain song-birds—e. g. the *Molacillidae*. The caudal quills or rectrices are from twelve to eighteen in average number; they are greatly elongated in the tropic-bird (*Phaeton*), *Milvulus*, etc., and are almost wanting in some gallinaceous birds, in some tinamous, etc. The rump-feathers or tail-coverts are sometimes so developed as to conceal them, as in the peacock, *Pharomacrus*, *Egretta*, etc.

The scales of reptiles are areas of true derm, bounded by simple folds, which are covered exactly by epidermis. These areas may be filled with an osseous deposit, as in *Heloderma*; in snakes they are soft. In tortoises the intervening folds are very shallow, and remotely correspond to the skeleton below. The epithelial layer is horny (tortoise-shell), while

the derm is ossified and united with the osseous skeleton below. In *Crocodylia* the distinct ossifications occupy the dermal areas of the back, or on both surfaces of the body in the caimans, etc. The areas are symmetrically distributed on the head in serpents, most *Lacerilia* and some tortoises. In the first they are fewest and most regular, numbering usually nine on the upper surface. They correspond remotely with the cranial bones, and hence are called parietal, frontal, superciliary, prefrontal, internasal, rostral, etc. In venomous snakes and boas the vertex is frequently covered with scales.

Fishes frequently display ossifications of the epidermis as well as of the true skin, as on the cranium of sturgeons, their dorsal and lateral shields, etc. The scales which cover the bodies of most fishes are developed in pouches of the true skin by deposit of mineral matter. Their exposed surfaces are covered by epidermis, which enters between them, and reaches there the true skin. In eels they are small and separated. In fishes with closed swim-bladder (*Physoclysti*) the scales develop spinous projections which produce the effect of a comb on the margin, and are hence called etenoid. Most of those in fishes with the duct of the swim-bladder (*Physostomi*) have smooth surfaces and edges, and are termed eveloid. In many fishes of early periods, and some now living (*Lepidosleus*, *Polypterus*), the scales are pavement-like and glossy, with a layer of ganoin. These occur in all super orders of *Teleostomi*, but are rare in the *Actinopterygii*. Sharks have separated mineralized bodies, with flat bases and produced points, granules, etc., whence they have been termed placoids. In *Marsipobranchii* and *Leptocardii* the skin is smooth.

The internal parts of the mucodermal system are the mucous membranes. The former are continuous with the epidermis, and line the cavities of the digestive, respiratory, and reproductive systems. The serous membranes line the closed chambers, being continuous with the mucous membrane only at the fontanelles of the oviducts (tubæ Fallopii). In the thoracic cavity they form a sac, with one side thrust in upon the other, the thoracic viscera being on the outside of the entering portion. The abdominal viscera occupy in the same way the outside of the membrane lining the cavity, which is termed the peritonæum. In the thorax it is the pleura.

4. *The Teeth*.—These bodies are generally developed in an internal or external epithelial layer, like some of the dermal bony, or dentinal plates or pieces. In *Protozoa* and *Cœlenterata* they are wanting. In *Echinodermata* they are present as five hard sub-triangular plates, which close the mouth by their close contact, like radii from its center. In *Mollusca* they are described under the digestive system, so that it only remains to consider them in *Vermes* and *Vertebrata*. In the former they consist exclusively of hooks, mostly arranged round the mouth. In the Trematodes they occur, weakly developed in a few genera, in one of which they are attached to an organ at the posterior extremity of the body. In *Nematoda*, *Chiracanthus* has hooks on the head and body, and *Strongylus* horny teeth round the pharynx. In *Acanthocephala* all the genera possess a retractile proboscis, which is studded with recurved hooks in various circles. In *Cestoda*, the tapeworms have hooks as well as suckers on the head, which are especially well developed in the eystiereus larval stage. The *Tetrarhynchidae* possess four projectile proboscides, each of which is set with several rows of recurved hooks.

The teeth of vertebrates are developed on papillæ of the mucous membrane, which is usually sunk into a groove or successive cavities or alveolæ of the jaw and palate bones. True teeth are usually composed of a very dense substance allied to bone, called dentine. Exterior to this they have a deposit of a still denser and harder substance, the enamel, which covers the crown. The root is sheathed in a layer of true bone, the cement. Dentine is distinguished from bone (*osteine*) by the presence of great numbers of parallel tubuli, which radiate from the central cavity to the circumference of the tooth. Enamel is, on the other hand, of the nature of a secretion, filling vertical hexagonal cells which stand upon the dentine. Hence it is composed of prisms. It contains, like dentine, a trace of fluoride of calcium, besides the phosphate of lime of which both are composed. It is deposited in a layer of the ectoderm, while the dentinal membrane is endodermal.

In *Leptocardii* there are no teeth, and in *Marsipobranchii* they are horny processes in concentric series round the inside of the funnel-shaped mouth. The two largest are situ-

ated at the mouth of the œsophagus. In fishes generally, bony teeth are present, but are not usually developed in alveolar cavities, but on the surface of the bones.

In fishes the teeth are usually covered with dentine instead of enamel, and may be composed internally of true dentine, or of its variety, vasodentine. This substance retains the numerous blood-vessels which characterize the early stage of deposit of dentine, which are easily seen in a section of the teeth. Of such character are the teeth of

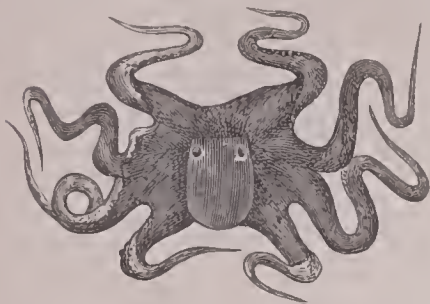


FIG. 15.—*Octopus vulgaris*.

Elasmobranchii, which are moreover of very various form. Thus they are pavement-like, with vertical lamellar roots, in skates and rays, or they are rootless and with swollen crowns of differing sizes, etc., arranged in symmetrical band-like pavements, as in cestracions. The crowns may be more elevated as in hybodonts, or finally isolated and with sharp apices and cutting edges in the existing squalodonts. In *Holocephali* the teeth are few and large, and are traversed by columns or bands of vessels with calcified walls. In *Dipnoi* the teeth form a single serrate cap for each jaw. In *Actinopterygia* the teeth are generally composed of a larger proportion of dentine. In sturgeons they are only present during immature age. In the *Lepidosteidae* the external or dentinal surface is inflected in deep folds, which are closed so as to resemble grooves externally. *Physostomi* generally have large teeth on the jaws, but in some *Characinidae* and all other *Plectospondyli*, *Coregonus* (grayling), some *Mormyri*, etc., there are none. In some of these fishes there are numerous teeth on the lower segment of the fifth pair of hyoid arches, or the "inferior pharyngeal bones." In *Characinidae* these are of very varied type; in *Catostomidae* the bones are much prolonged, and the teeth are comb-like in one row, and work against a projecting inferior table of the basioccipital bone. In *Cyprinidae* they are stout, in one or more short rows, and may be hooked, sharp edged, conic, or grinding in type, according to the food of the fish. This structure does not exist in other fishes. In *Esox* the teeth are raptorial and very numerous; in *Clupeidae*, rudimental and wanting. Only in the order to which the latter pertains, the *Isospondyli*, do we find fishes with fangs sunk in deep alveoli, the extinct *Saurodontidae* from the cretaceous formations. In *Nematognathi* they are more or less bristle-like, and packed together like a brush. In eels they are often dagger-like. In physoclystous (or the higher) fishes they are generally brush-like, frequently with canines intermixed; but in *Pediculati* they are large, incurved, on flexible ligamentous bases. In some *Plectognathi* they are incisor-like, and in *Pharyngognathi* those on the hyoid apparatus are greatly developed. The latter are sub-quadrate, oval, or narrow (*Scarus*), and arranged pavement-fashion for the crushing of hard substances, as shells, etc. In *Scarus* the teeth of the jaws are confluent into a shining, parrot-like beak, useful in seraping out shells and cutting off seaweed.

In *Batrachia* the teeth are usually small, often wanting (bufoniform Anura), or in the extinct *Labyrinthodontia* with deep complicated inflections of the dentine and superficial cementum. In reptiles we find teeth with fangs and with crowns, generally covered with enamel. These may be sunk in deep alveoli (*Rhynchocephalia*, *Aerodonta*, *Crocodylia*, *Ichthyopterygia*, *Sauropterygia*, *Ornithosauria*, *Dinosauria-Goniopoda*), or may be attached to the inner side of the outer alveolar wall (*Lacertilia* in general, and *Dinosauria-Orthopoda*: may stand immediately on the jaw-bones, without fangs (*Ophidia*), or on a thick column of ossified pulp (osteodentine) in an alveolus (*Pythonomorpha*). The crowns are generally compressed conic; in some (*Laelaps*) knife-shaped. In herbivorous lizards they present an oblique face inward. In *Crocodylia* the young teeth rise within the pulp cavity of the old, and throw them off; in most other orders the successional teeth appear at the side of the fang, and provoke absorption, which cuts off the crown of the old. Tortoises and birds are toothless; Anomodontia are so likewise, except a strong maxillary tusk.

In *Mammalia* the dental armature is distinguished into series—viz., the incisors, canines, premolars, and molars. Their normal number on each side of each jaw is I. 3; C.

1; Pm. 4; M. 3; total, 44. The incisors are normally flat and transverse edged; the canines longer and conic; the premolars compressed, with one to three cusps; and the molars oval in section, with a double series of cusps. In *Ornithorhynchus* there is but one, a horny tooth. In marsupials the number of incisors is excessive (as 8 or 10), or, as in kangaroos, less numerous and the median much enlarged. In these and their gigantic extinct allies two in the lower jaw are much enlarged as tusks. In *Glires* there are but two incisors above and below, which have enamel externally only; hence the inner face wears more rapidly, and the opposed pairs act as efficient cutters in gnawing. The other teeth are molars only, and these of the complicated type to be mentioned later. In *Insectivora* the incisors are enlarged, but in *Edentata* they are always wanting. In *Chiroptera* and *Carnivora* they are similar to each other, and much reduced. In *Quadrumana* they are well developed, broad, opposed cutters, and are generally 4-4 in number. The proboscidiens, on the other hand, have but one (the outer) pair of incisors in each jaw, which are developed into huge tusks above (*Elephantidae*) or below (*Dinotheridae*). In these cases the opposing pair is reduced or wanting. The *Artiodactyla-Ruminantia* are remarkable for the entire absence of superior incisors, and the close resemblance of the inferior canine to the lower incisors, producing the appearance of eight of the latter.

The canine is largely developed in the *Carnivora*, hogs, *Hippopotamus*, and the extinct *Amblypoda*. The premolars are wanting in rodents and many proboscidiens, but numerous in marsupials, insectivores, etc. In *Carnivora* they are numerous, and the last is peculiarly formed, being the sectorial or flesh-tooth characteristic of the order. The two outer tubercles and connecting ridge are developed into a longitudinal notched blade, while the inner remains a small tubercle at the front of the inner side. In dogs there are two tubercular molars behind it; in weasels and cats, one; in the extinct *Hyenodontidae* all of the molars are of the sectorial form.

Molar teeth are simply conic (haplodont), with tubercular crowns (bunodont), or the tubercles may be fused into crests (lophodont). The tubercles may be three in number (tritubercular); or four (quadritubercular); or numerous (multitubercular); or the tubercles may have crescentic sections (selenodont). In the first case they may be one or two rooted. Thus in cetaceans generally they are simple cones, covered with cement instead of enamel. In some extinct groups (*Zeuglodon*, etc.) the crowns are compressed and the roots two. In *Edentata* they are simple throughout, and covered with cement. This forms a thick layer and incloses a thin one of dentine, which by its superior hardness forms the ring-like grinding surface of the crown; it is filled within by osteodentine. In carnivorous and insectivorous animals the tubercles are usually three, and acute and ele-

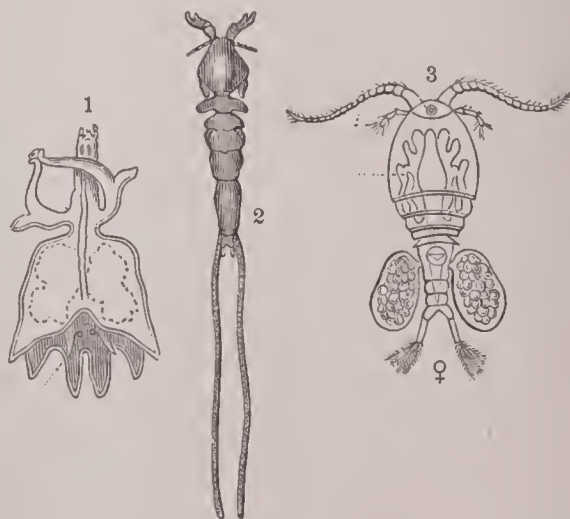


FIG. 16.—1. Brachiella. 2. Dichelesthium. 3. Cyclops.

vated; thus they appear in *Chiroptera*, many marsupials, *Insectivora*, etc. In carnivorous forms the two external tubercles above, and an external and internal below, are modified into a cutting blade, the two acting together like shears. In kangaroos, sirenians, tapirs, and *Dinotherium* they appear as two transverse crests or keels. These crests are multiplied in *Mastodon*, reaching six or seven. In *Stegodon* they are more numerous; the intervals are a little deeper, and with some cementum in their bottoms. In *Elephas* they are deepened to the roots of the tooth, and filled to the top with

cement; are narrowed by the approach of the much elevated transverse crests, which have now reached a great number. Their summits readily wear in use, and thus present bands of alternating dentine, enamel, and cementum.

The external tubercles may be connected by an external longitudinal crest, as in *Rhinoceros* and *Hyrax*. They may be modified so as to form two Vs, as in many *Perissodactyla*. The internal tubercles may remain conic (many *Perissodactyla*), be connected with the external by cross-crests (other

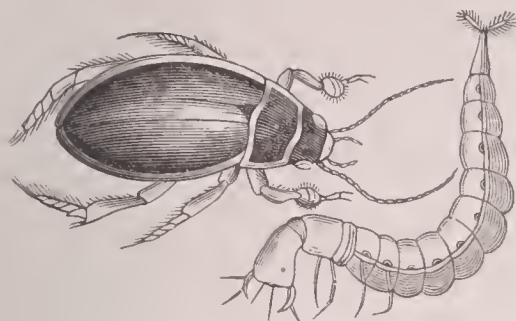


FIG. 17.—*Dytiscus* and larva.

Perissodactyla), or become like the external Vs, or crescentic in section (selenodont *Artiodactyla*). From this point the succession of forms seen in approaching the elephants is repeated in two series, ending in the ox and horse. The intervals deepen, the crescents become elevated, and the tops, being soon worn off in use, present a figure formed by the edges of enamel plates, which inclose islands of dentine. The spaces between them are filled with cementum. In the horse there are five crescent-shaped columns in the upper molars and three in the lower. In artiodactyls there are four above and mostly four below. In deer the crown and roots are sub-equal in length, but in the *Cavicornia* the crown is much the longer.

The same transition is seen in the rodents. In *Mus* the molars are only tubercular; in squirrels there are crests. In *Arvicola* and beavers there are deep inflections of the enamel of the sides of the tooth, producing a zigzag section when the crown is worn, while in *Caviidae* the tooth is entirely divided into several columns by the deep descent of the enamel coating from above. In porcupines figures are produced by both lateral and coronal folds.

Simpler teeth are seen in men and apes, where the molars present four obtuse tubercles (in the last sometimes five); and in the hogs, where the tubercles are more numerous, and sometimes irregular. In *Hippopotamus* each of the four tubercles is trifoliate in section.

VI. THE DIGESTIVE SYSTEM.

1. *In Invertebrates*.—The prominent features of the digestive system in *Cœlenterata* have been pointed out. There is none in the *Hydræ*, the inner surface of the urn-shaped body-cavity performing that function; an excretory pore exists in the foot-like support. In *Actinozoa* a small sac is sometimes formed at the fundus of this cavity by the reflection of the inner skin; it opens into the cavity, and is entered above by the mouth. The body-cavity is ridged on the sides by prominent folds, whose margins bear reproductive organs and nettle-cells. In the *Medusæ* the body is turned the other side up at maturity, though its position is that of the polyps in the larval state. The free stomach hangs below the basal cavity. The latter is sometimes wanting, and is ridged occasionally, as in polyps. It is produced downward in some genera by its walls becoming a peduncle for the stomach. The latter is bell-like, and often widely open; it is generally closable by the contraction of its margin. The latter bears bunches of tentacles, etc., which in the *Rhizostomæ* are greatly enlarged and prolonged into four leaf-like bodies, which bear the four mouths at their extremities, and tubular œsophagi throughout their length. From the basal chamber rise the four radiating tubular canals, which extend through the umbrella to a tube which passes round its margin.

In *Crinoidea* there is a central column to the basal cavity; round this the alimentary canal winds, and, returning, issues near the mouth. In *Asterioidea* the stomach is a sac, connected with the mouth by a short gullet, which is closable at the mouth. The stomach is divaricated into five pairs of bunches of cæca, which send out radial tubes, two into each arm of the animal. The vent is wanting in the *Ophiuridæ*, but present in most *Asteriidæ*; in the latter case there is an enlarged rectum, which gives rise to five horny radial cæca (often bifurcate), which alternate with those of the stomach. In the *Holothuridæ* the vent is present, and the alimentary canal elongate, and divisible into œsophagus (closed behind by a sphincter), intestine, and

rectum. The last receives the mouths of the respiratory organs.

In the *Vermes* this system does not branch radially; otherwise its character is very various. That it is a blind sac in many orders has been already shown. In those without arms it is either a simple blind tube (*Turbellaria-Rhabdocœla*, *Nepheleis*, *Aspidogaster*, *Branchiobdella*, etc.), or is early divided into two parallel tubes, as in Trematodes. In tapeworm and *Monostomum* these tubes unite at the posterior end of the body. In the *Nemertina*, in which the canal is simple, there are two constrictions at the end of the œsophagus, to the anterior of which is attached a projectile stylet furnished with venom-glands. In *Potia* the alimentary canal becomes a solid ligament, which is turned forward and attached to the wall of the cavity. In *Pontobdella* the blind canal is furnished with a few branches or cæca. In the *Turbellaria-Dendrocœla* it forms a large number of branching cæca.

In the families with vent, it is wound or knotted (*Capitibranchiata* and some *Dorsibranchiata*), simple (*Abranchiata*, *Gordiacea*, *Nematoda*), or furnished with cæca on the sides. There is but one on each side in *Hæmopsis*, but many in the leeches.

In *Vermes* in general there are no Cuvierian glands, and there are often liver-cells on the canal walls.

In *Mollusca* an anus and liver are always present, excepting that the former is wanting in most *Brachiopoda*. An almost universal peculiarity of mollusks is that the alimentary canal, after fewer or more numerous convolutions in the body-cavity, returns and issues not far from the mouth on the dorsal or lateral border of the body; this prevails from the *Bryozoa* to the *Cephalopoda*. The general characters of the canal can be expressed schematically as follows:

A. A more or less projectile œsophageal body or tongue, with a movable membrane armed with reverted horny teeth, and more or less retractile into a sheath; no crystal style in the stomach (except two or three genera). Stomach large, unsymmetrical; canal short, with a large pyloric cæcum; liver very large, lobular, discharging anterior to stomach; mouth with horny beaks: *Cephalopoda*.

Course of canal with two abrupt turns: 1, at transverse stomach; 2, of intestine double, under œsophagus; rectum transverse, opening in mantle hole; liver double, of many cæca, entering each end of stomach: *Gasteropoda-Scaphopoda*.

Course of canal little enlarged at stomach, and with an intestinal one; altogether a loop opening forward near heart; liver single, lobulate: *Gasteropoda-Heteropoda*.

Intestine short (straight), emptying on right side, never in breathing cavity (rarely on back), rarely issuing from anterior part of stomach; latter elongate (longitudinal), receiving straight œsophagus at either end or side, often divided in two or three, when one or more is furnished with

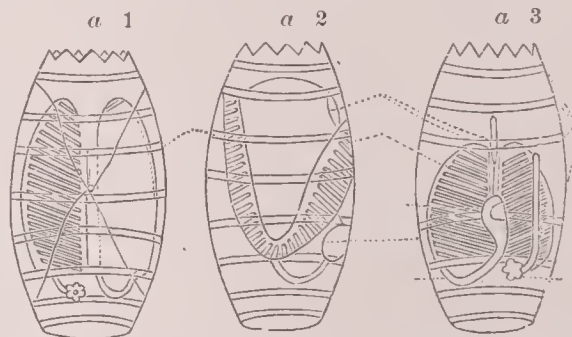


FIG. 18.—*Doliolum Ehrenbergii*, Kr.: 1, from above; 2, from side; 3, from below; a, mouth; b, vent; d, annular muscle-bands; e, endostyle; h, œsophagus; k, intestine; l, branchial membrane; n, nervous system.

horn-armed ridges or teeth; horny jaws: *Gasteropoda-Opisthobranchia*.

1. Liver lobulate, compact.
2. " " subdiffuse, with connecting canals.
3. " " of blind canals.
- a. Branching from large stomach-opening in body.
- β. " " in lateral body-wings.
- γ. " " in gills.
- x. Two posterior body-trunks of liver.
- y. One " " (including four families).
- z. Three " "

Stomach (with very few exceptions) elongate into a cæcum; intestine rising from middle and turning forward to the vent; ridges armed with horny plates in stomach: *Pteropoda*.

Stomach a widening of canal, rarely with one or two constrictions: intestine not convoluted (except *Chiton*), emptying into breathing cavity on right side; small flat jaws, sometimes horny; a pharyngeal lump, with internal cartilage supporting tongue, on lower side of end of œsophagus: *Gasteropoda-Prosobranchia*.

AA. Movable armed tongue wanting.

a. A crystalline style in cœcal appendage to stomach; lips at entrance of œsophagus; canal mostly uniform, much turned; end of rectum free in cloaca; stomach oval or round: *Acephala*.

aa. No crystal style; mouth opening between more or less cartilaginous spiral appendages: canal bound by an extra mesenteric sheath; stomach little distinct; liver double with large (sometimes several) discharge canals: *Brachiopoda*.

1. Canal shorter, ending in blind enlargement.

2. Canal longer, ending in lateral anus.

Mouth opening at base (or side) of a gill-sac: œsophagus short; stomach not large, simple, both with intestine, forming a V; latter directed forward, opening on same side as mouth: *Tunicata*.

Mouth surrounded with ciliated tentaculæ (in one genus with a conic lid): œsophagus well defined; stomach distinct, oftener double than single; intestine rising from end of first or single stomach, swollen in part of a straight course to anus near mouth: *Bryozoa*.

In *Gasteropoda* there is a pair of salivary glands; in most *Cephalopoda*, two pairs (in *Sepia* and *Loligo* but one pair, and in *Nautilus* none).

The radulæ, or tooth series, and their supporting band, present an enormous number of separate teeth in some of the

Cerithiida, *Turritellida*, *Cassidida*, *Tritoniida*, etc. (3—1—3).

e. *Ptenoglossa*; no middle plates; lateral plates similar, numerous ($\infty-0-\infty$): *Scalaria*, *Janthina*.

f. *Rhipidoglossa*; middle plates; laterals 4—6 or more, of various forms; outside of these numerous small hook-like teeth ($\infty-4-6-1-4-6-\infty$): *Neritida*, *Trochida*, *Haliotida*, *Fissurellida*. The *Pulmonata* (except *Testuella*) exhibit a close similarity to this division in their dentition.

The digestive canal in *Arthropoda* does not turn on itself as in mollusks, but issues at the extremity of the body opposite to that which it enters. The œsophagus is usually straight, and is expanded in the thoracic region into the usually longitudinal stomach. Anterior to this point it has sacciform dilatations (*Orthoptera*) or diverticula in some types, as the bees, *Lepidoptera*, flies, etc. After leaving the stomach, the canal, after few or no windings, reaches the anus.

In *Crustacea* and *Insecta* there is an extensive fatty mass on each side of the posterior part of the canal, known as the corpus adiposum; in *Arachnida* it is frequently wanting. The form of the stomach in this class varies; thus in *Pedipalpi* (scorpions, etc.), it is simple or nearly so, but in *Aranea* (spiders) and *Pyenogonum* (whale-louse) it branches into radiating diverticula; in the latter these penetrate even into the femora and tibiæ. The digestive system is supplied with various glandular organs. Those nearest the mouth are the "salivary glands," which are present in all the classes except the *Crustacea*. They are complex glands, and their secretion in some forms (larvæ of some *Lepidoptera*) hardens on exposure to the air into silk-like threads. The so-called liver-glands or tubes are situated either before or behind the stomach. As their function is unknown, and their position is inconstant, the above name is but provisional. In *Insecta* they are slender and tubular, sometimes very elongate and undivided. There are usually but four in *Coleoptera*, but more in *Orthoptera* and *Hymenoptera*, forming a whorl. In *Arachnida* (*Scorpio*, *Mygale*, etc.) and *Limulus* they are more complex, and present a series of more numerous openings into the intestine. In the decapod *Crustacea* the organ exhibits its highest development. It is there a complex follicular gland of large size on each side of the alimentary canal, and opening posterior to the stomach. Other simple glands are in the *Insecta* distributed over the surface of the stomach, and are inclosed by its muscular layer.

The stomach walls are thin or muscular, in some types ridged within and furnished with horny teeth: *Orthoptera*, some *Coleoptera*.

2. In *Vertebrata*.—In most of this branch of animals the stomach is present as a distinct enlargement of the alimentary canal, and the intestine is short or long as the food is flesh or vegetable and mixed in character. The liver is present in all, and is of a highly complex glandular character, except in the *Leptoecardi*, where it is a simple diverticulum of the alimentary canal.

In the *Leptoecardi* the pharynx is very capacious, and is abundantly fringed with long processes. It opens into a sac-like stomach, which is continued as the slender straight intestine to the vent. There are no teeth. In the *Dermopteri* the intestine is also simple and straight. In fishes it presents a good many variations. In some, as the sharks and silurids, the stomach is large, and the pylorus is remote from the cardiac entrance. In most *Clupeida*, *Hyo-dontida*, *Characinida*, *Amia*, and *Polypterus*, it is sac-like, with the pylorus near to the cardiac entrance. In most fishes the stomach is bent on itself, but in *Chimara*, *Symbanchus*, *Amphipnous*, *Fistularia*, and *Belone*, it is straight. The stomach in some sturgeons and in *Heterotis* and *Chatoëssus* (elnpeoids) is gizzard-like (i. e. sub-round), with muscular walls and tendinous lamina on the sides. It is closed at the pylorus in most fishes by an annular muscle. In the higher fishes (*Physoelysti*) there are generally found diverticula from the beginning of the intestine at the pylorus, which are termed pyloric caeca. They are also abundantly found in the lower groups, or *Physostomi*, but their entire absence is more common. They are wanting in *Nematognathi*, eels, *Fistularia*, *Chirocentrus*, *Hyo-don*, the *Gobiida*, and *Blenniida*, and in *Amia*, *Polypterus*, and the *Elasmobranchii*. They exist in vast numbers in some *Salmonida* and *Lepidosteida*, and are numerous in electric eels and sturgeons. In *Platax* there are but four, in *Choloyaster* two, and in *Amblyopsis* one.

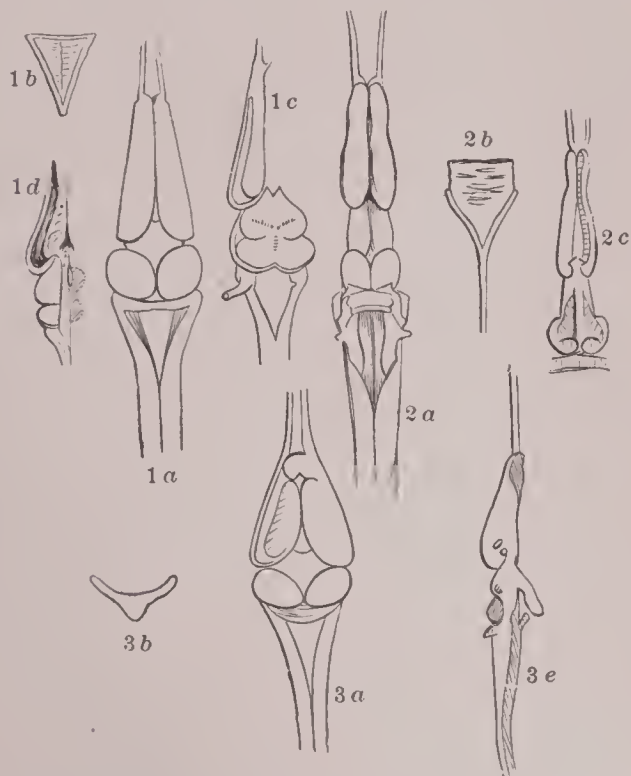


FIG. 19.—1. *Rana esculenta*. 2. *Dactylethra capensis*. 3. *Bufo viridis*. a, brain from above; b, choroid plexus; c, horizontal section of the lobes and hemispheres; d, of hemisphere; e, longitudinal vertical section.

Gasteropoda. In the *Cephalopoda* and *Pteropoda* they are less numerous. In some of the *Pulmonata* they number as many as 26,800. They are arranged in rows, longitudinal as well as transverse. The latter are more or less irregular in their course, but are strictly bilateral. There is a series of median plates or teeth, with one or more rows of lateral ones. The following divisions are indicated by the different tooth-structures in *Gasteropoda*:

a. *Rhachiglossa*; only median plates, which are often toothed (0—1—0): *Volutida*.

b. *Toxoglossa*; no median plates: on each side a single lateral tooth of an awl-like form; no basal membrane of radula; lateral teeth moved by special muscles (1—0—1): *Conida*, *Pleurotomida*.

c. *Hamiglossa*; a middle plate and single lateral plate (1—1—1): *Muriei*, *Bucciniida*, *Olivida*, *Lamellarida*, *Fasciolarida*, *Turbinellida*.

d. *Tenioglossa*; median plates, and on each side three lateral plates; fourteen families; among them *Littorinida*,

The succeeding part of the canal is generally to be distinguished into small intestine and rectum. These are separated by a strong valve in *Etasmobranchii* (except *Chimæra*), in *Lepidosiren*, *Potypterus*, *Zoarces*, *Acipenser*, *Mastacembelus*, and it is not strong in *Orestias* and *Clarotes*. The rectum is distinguished in the lower forms by the possession of a spiral internal valve or partition. In *Etasmobranchii*, *Potypterus*, and *Lepidosiren*, the spiral partition is

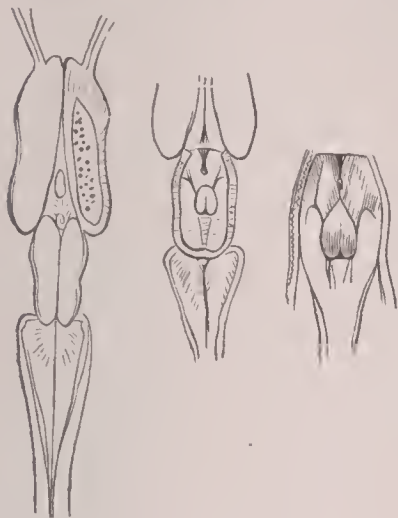


FIG. 20.—Brain of *Necturus maculatus*.

continuous by its inner margin with a median membranous axis, which is suspended from the ileo-cæcal valve; in *Raja miraletus* there is no axis, and the partitions are transverse and perforated; in *Squatina*, *Potyodon*, and *Acipenser ruthenus*, it has no axis, and revolves spirally on the wall of the rectum. It is also present in *Amia* and *Trachypterus*. In *Acipenser rubicundus* there is no spiral valve, but the walls of the rectum are areolate, somewhat as in tripe. The gall-bladder is always present, and discharges beyond the pylorus.

In *Reptitia* the divisions of stomach, intestine, and rectum are well marked; in *Batrachia* rather less so. In both the canal is elongate, and held in a folded position by a mesentery, but in batrachian larvæ it is much more extended, and is horizontally coiled. The liver is large in *Batrachia*, and usually in three lobes, but in the *Brevicipitidæ* and *Engystomidæ* there are but two. There is a sphincter valve at the pylorus, and sometimes one at the end of the small intestine. The gall-duct discharges below the pylorus. In tortoises, whether carnivorous or not, the alimentary canal is elongate.

In some *Emydidæ* and *Trionychidæ* there is a cæcum or sac on each side of the rectum, the bursa analis. In many *Lacertilia* the rectum is double or divided by a muscular valve; in *Iguana* and *Basiliscus* there is a septary valve with small orifices. In serpents the œsophagus is greatly elongate, and the gall-bladder peculiar in being separated from, and sometimes far behind, the liver. The rectum presents many peculiarities. In *Cælopettis* and *Homalopsis* the internal surface is longitudinally folded; in *Hydrophis* with short interrupted folds; in *Dryiophis*, *Dipsas*, *Vipera*, and *Crotalus*, transversely folded; in *Boodon geometricus*, *Bungarus*, *Elaps*, and *Ancistrodon*, the folds are developed into partitions, which are pierced by a single hole each. A pancreas is present in lizards and serpents.

The alimentary canal of birds is distinguished by the peculiarity of the stomach, which is a gizzard—that is, with walls composed on the convex face or borders of contractor muscles, which have a median and common tendon extended sheet-like on the plane side of the stomach. This is, however, not found in certain marine birds, as penguins, where the stomach is a simple sac; and it is little developed in *Sarcorhamphus* and *Vultur*. It is a double sac in *Apteryx*. The crop is a bag-like expansion of the œsophagus, for the temporary stowage of food; it is found in gallinaceous birds, vultures, etc.

Adjoining the stomach is frequently found another more symmetrical expansion, the proventriculus, whose walls are studded with simple glands, whose secretion softens hard food. It occurs in *Gallinæ* (*Crypturus*), *Insessores* (*Ibis*, ducks, condor, etc.). The rectum is not strikingly distinguished from the ileum, but it sends off at its origin two huge cæca, which extend forward toward the stomach on each side of the intestine. They are excessively elongate in *Phasianus*, *Crypturus*, *Dicholophus*, *Apteryx*, etc., and very short in *Apenodytes*, *Ibis*, etc. They are apparently absent in *Sarcorhamphus*.

In *Mammalia* the stomach, intestine, and rectum are well distinguished. There is neither crop, proventriculus, pyloric nor rectal cæca, nor rectal valves. The gall-bladder is not separated from the liver, and discharges below the pylorus, as does also the excretory duct of the pancreas. There are glands in the intestines of many forms, known as Peyer's, and the salivary glands of the œsophagus or pharynx are always present. The intestine (colon) is frequently prolonged

beyond the origin of the rectum, forming a cæcum; the mouth of the rectum is closed by a strong valve. The stomach is transverse, with a portion projecting beyond the esophagus—the fundus. This is excessively elongate in the bat, *Desmodus*. The stomach is simple or undivided in Primates, *Carnivora*, *Proboscidea*, *Perissodactyla*, *Chiroptera*, and squirrels. It is lobulate and subdivided in Monotremes, marsupials (generally), many rodents, some cetaceans, and most of all in artiodactyles (ruminants, etc.). In *Ornithorhynchus* the cardium and pylorus issue from a division one-third the size of the remainder of the stomach; in kangaroos the stomach is slender, saeculated, and wound in one and two-thirds turns on itself; the fundus is large. In the hog the fundus is profoundly sacculate. In *Artiodactyla-Ruminantia* there are four chambers, of which the first is generally the largest, being an enormous expansion of the fundus. In the musk it is not in direct communication with the œsophagus, but is so in the ox. In the former there are five sacs, the last the best defined, with reticulating ridges on the inner wall (tripe), and entered by both cardium and pylorus. The first stomach of the ox represents the first four of *Moschus*; it is followed by the reticulate, which receives the œsophagus; between it and the pylorus are two chambers, whose walls are thrown into elevated folds. The first division has strong papillæ on the inner walls, which are very large in the deer.

In many of the *Gtires* (e. g. *Fiber*) the cæcum is exceedingly large and long. In the Primates, etc., it terminates in a narrow, curved extremity, the processus vermiformis.

VII. THE CIRCULATORY SYSTEM.

1. In *Invertebrata*.—This system, as is well known, consists of organs for the propulsion and conveyance of the fluid results of digestion throughout the body for the maintenance of all its functions. It consists essentially of a system of tubes radiating from the central muscular organ, in which resides principally the contractile or propulsive activity. This center is in the lowest forms simply a tube, but is greatly specialized in the highest forms. We may divide the system into the systemic, the water-vascular, and the lymphatic systems. The second is found in the aquatic invertebrates, and the last in vertebrates only.

The systemic circulatory tubes first appear in *Cœlenterata*. In *Protozoa* the contents of the body are in motion, and in *Amœba* the movement is that of an elongate vortex (Ryder). In no cœlenterate class excepting the *Medusæ* do the tubes appear as isolated; they have been already described as radiating from the stomach or the adjoining body-cavity, and continuing round the margin of the disk as a single tube. The *Echinodermata* possess a true circulatory system, with a well-developed water-vascular system. The vessels of the former are not derived from the stomach, but form an isolated series. The peculiarities of the classes are as follows:

a. Vessels arising from a basal sac, which connects by a short tube with stomach; vessels radiating, penetrating the pieces and arms: *Crinoidea*.

aa. From an oral ring.

b. Superior and inferior oral and anal rings: an asymmetrical heart, emptying into the former; no respiratory artery; stomach arteries (five) collected into two, which enter superior ring at point of entrance of heart: *Asteroidea*.

Rings and heart connected by marginal intestinal artery: *Echinoidea*.

bb. Only oral circulatory ring; no heart; distinct respiratory artery (where lungs exist); intestinal arteries gradually disappearing posteriorly: *Hotothurida*.

In echinoids and asterioids there is a septary column extending from the upper to the lower surface, unsymmetrically near the middle line. In a fold of it are placed the shell-canal of the water-circulatory system, and the heart. The latter has a narrow opening into the oral ring, which from this fact is termed arterial. The opposite end of the heart communicates by a duct with the superior anal or venous ring. The arterial ring is the smaller and more muscular, and lies between the more superficial nervous ring and the deeper water-canal ring. In the asterioids it sends an artery along the median line of each arm below. The venous ring is larger, and sends two vessels, one on each side of each arm. In *Hotothurida* the vessels are delicate and not largely developed. In all classes the tubes are without cilia internally, and have a wave-like pulsation in life.

The water-circulatory system is greatly developed in the *Echinodermata*, and forms the basis of their means of move-

ment from place to place. Its central organ consists, first, of a ring canal, which surrounds the œsophagus within the arterial ring; secondly, of a calcareous (or shell) canal which rises from a point on the ring canal to the dorsal (or anal) side of the body, and terminates in a peculiar shield, the madreporic plate, which is perforated by numerous pores. In the *Holothurida*, where the body is elongate, the shell canal does not reach the posterior end of the body, but terminates freely in its cavity, sometimes in one, often in many tubes, each of which terminates in a madreporic plate. The peripheral system consists of five vessels, which arise from the ring canal, and run at equal distances along the interior face of the body-walls (on the medial line of the arms in *Asterioidea*), and send branches right and left. These terminate in a large hour-glass-shaped sac on each side in *Asterioidea*, the "ampullæ," or in numerous smaller ones in *Holothurida*. These project through pores (ambulaera) between the plates, hollow processes which frequently are enlarged as a wart at base or end, and which are used as feet. They are regularly arranged in bands in *Asteriida* and *Echinida*, but in some holothurians are distributed in patches (*Psolus*) or all over the body, or in two kinds—one dorsal, the other ventral (*Holothuria*). They are retractile and protrusible by erection. The interior of the water-vessel system is covered with cilia. In all the classes the œsophageal ring communicates with "Poli's vesicles," small bladders situated round its circumference.

In *Mollusca* and *Articulata* the arterial and venous vessels are not universally continuous at their extremities by capillaries, as in *Vertebrata*, but the circulating fluid is emptied into cavities of the connective tissues or lacunæ, whence it is taken up by the extremities of the veins by suction. In some of the highest forms of both (*Cephalopoda*, *Pedipalpi*) the capillary vessels are numerous. The prominent peculiarities of the classes in respect to circulation may be indicated as follows:

A. No distinct central organ or vascular system.

a. No lacunary canals; liquid moves in continuous inner continuity of body, without definite direction and with doubtful external orifice: *Bryozoa*.

aa. Vessel-like lacunary system; five large sinuses; post-abdominal and foot largest; anal (annular) throat and buccal smaller; two mantle-edging vessels: *Scaphopoda*.

AA. A distinct heart.

a. Neither arteries nor veins; no chambers to heart; a system of canal-like lacunæ decussating from a dorsal and ventral principal; one through the gill-sac, and with fine body ramifications, continuous with each other; two (sometimes more) from heart: *Tunicata*.

aa. A venous system.

No branchial auricle or gill-hearts; one ventricle, and a false heart on each mantle artery; a venous system: *Brachiopoda*.

One branchial auricle; no gill-hearts; one branchial artery; ventricle embracing the intestine: *Gasteropoda*.

Two branchial auricles; no gill-hearts; two branchial arteries; ventricle embracing intestine: *Acephala*.

Two branchial auricles, and two hearts or expansions on the two branchial arteries; a circulus cephalicus; ventricle not embracing intestine: *Cephalopoda*.

aaa. No venous system, or a rudiment rarely; branchial veins and arteries: *Crustacea*.

AAA. No distinct heart; a longitudinal dorsal sinus, more or less subdivided.

a. No pulmonary arteries or veins; no venous system: *Insecta*.

aa. No venous system; a pulmonary artery and vein: *Arachnida-Araneæ*.

A venous system: *Arachnida-Pedipalpi*.

In *Acephala* and *Gasteropoda* the ventricle receives the contents of certain veins direct, without aëration in the gills; hence the blood forced into the aorta is, as in most reptiles, of a mixed character. In *Cephalopoda* all the venous blood passes through the gill-hearts and gills, and is oxygenated before returning through the auricles to the ventricle. In a few *Gasteropoda* there are two auricles, as *Haliotis*, *Fissurella*, *Chiton*. In a few *Acephala* (as *Ostrea*) the ventricle does not embrace the intestine.

In *Gasteropoda* the vessels of this system form extensive ramifications in the foot. They have, moreover, communication externally by pores, which enables them to absorb large quantities of water. By means of this water-vascular system the foot is inflated, as in erectile tissue, to a size which would forbid its withdrawal into the shell were it not for the power of expulsion of the water.

Among *Arthropoda*, the decapod *Crustacea* and the pedipalp *Arachnida* only possess a complete circuit with veins and capillaries. In the former the heart sends two aortas forward and two backward; the larger (inferior) of the former is the aorta cephalica, and supplies the head; the two posterior are the aortæ abdominales superior and inferior. A large sinus in the bottom of the anterior abdomen gives origin to the branchial arteries. In *Myriopoda* the dorsal trunk gives off a pair of lateral trunks to each segment of the body. From the anterior section of the dorsal trunk in *Chilopoda* the lateral arteries unite beneath the œsophagus, and give rise to a longitudinal vessel which accompanies the abdominal nervous axis. In insects the lacunar currents of the body are four principal ones—i. e. one beneath the dorsal trunk, one along the nervous chain, and one along each side. The blood also circulates outward in the tubular ribs or nervures of the anterior part of the wings, and returns along the posterior.

2. In *Vertebrata*.—In the fishes generally the heart is the right or venous heart (except in *Dipnoi*), but always there are vessels passing directly from the gill-veins into the aorta, whether the gill-veins return arterial blood to the ventricle (making mixed blood) or not (leaving venous blood). The first case occurs among *Dipnoi*; the second in *Monopterus* (apodal). In *Amphioxus* the usual trunk-like divisions of the heart are blended into one chamber. The gill-artery is rhythmical, pulsating, as also the origin of the special gill-arteries; so also is the portal vein, which has the same peculiarity in *Myxine*.

The aorta often forms no distinct isolated circulatory trunk. Sometimes arterial blood passes through a cartilaginous canal, which inwardly is only isolated by perichondrium, as in *Acipenser* and *Spalularia*. In other fishes it is also not isolated, but with its dorsal face (on which an elastic longitudinal band runs) let into the vertebral column (*Esox*, *Salmo*, *Silurus*, *Alosa*, etc.). Many arteries subdivide minutely into retia mirabilia, then continue from the reunited vessels. The arterial blood of the *Chorioidea* of most fishes must pass through such structure twice before passing into its branches.

In the venous system, not only in the veins that pass to the liver, do the stems lose themselves in capillaries, in order to be again collected into one or more trunks to go to the heart, but in many fishes this structure prevails in most of the veins of the body. The vena caudalis and the intercostales very often subdivide minutely and mix with (or surround) the renal, suprarenal, and other arterial glandulariform bodies, before they return to the veins for the heart. Many veins of walls of the trunk, of the swim-bladder, and of the generative organs appear as roots of the portal system. These structures delay and prolong the venous circulation.

Stagnation of venous blood-currents is common, also blind closings of veins and obliteration of connecting trunks; and at certain periods the so-called "blood-corpusele-holding" cells and membranes are met with—e. g. in the kidneys.

In *Leplocardi* the portal heart is behind (above) the colon; it pulsates from behind forward. It bends sharply forward, and enters into the gill-artery heart, taking up the venæ cavae during the curve. The gill-artery heart is straight, equally thick, its cavity without the pericardium longitudinal in the median line, beneath the whole length of the gill membrane. From it emerge regularly (alternating as beginnings of the gill-arteries) small contractile bulblets in the intervals between the pointed arches of the gills. From the latter the blood is transferred into a dorsal contractile aorta through the gill-veins. Independently of what passes through the gills, a part of the blood is led directly into the aorta by two contractile arterial bows (one on each side of the posterior end of the oral cavity), which issue from the gill-artery heart. These aorta-bows exist also in *Amphipnous*, where each gill-arch that does not bear a gill contains an arterial bow. In *Monopterus* one-fourth the blood passes the gills and traverses an arterial bow in the fourth gill-less gill-arch. The portal-vein heart extends the whole length of the intestine. It pulsates from behind forward, with pauses (as in the gill-heart) of about a minute. The venæ-cavae heart is on the dorsal side of the intestine, from the anterior point of the colon, increasing posteriorly to the end of the colon, where it suddenly turns over into the gill-artery heart. Its contraction alternates with that of the inferior or portal-vein heart. This colon (which is green) is equivalent to the liver, and gives blood to the venæ-cavae or portal heart. On each side of the aorta, on the upper arches of the gills, is a

vena cava descendens, which meets a posterior vein (vena cava ascendens), and together they empty themselves into the curve of the venæ-cavæ heart just before entering the gill-artery heart. The blood is colorless.

In *Marsipobranchii*, *Etasmobranchii*, and *Actinopteri* the muscles of the heart are always of striped tissue. The right or venous heart has the following divisions: an auricle receiving the united veins through a sinus venosus, a ventricle, and a bulbus arteriosus.

There are valves between all these. In *Marsipobranchii* the auricle is more roomy than the ventricle, and is separated from the sinus by a membranous double valve; it has two membranous valves in the ostia venosa and ostia arteri-
alia, each. From the latter proceeds the truncus communis branchialis, which is somewhat "bellied" at its origin, but has no evidence of muscular structure.

In *Elasmobranchii*, *Crossopterygia*, and lower *Actinopterygia*, there is a bulbus arteriosus, similar in possessing a ring-like layer of striped muscle-tissue, which ceases abruptly at the boundaries of the gill-arteries, and in numerous valves which are affixed by threads. There are two cross-rows of these in *Chimæra*, *Carcharias*, *Scyllium*, and *Gateus*; three in *Sphyrna*, *Mustelus*, *Acanthias*, *Atopias*, *Lamna*, *Rhinobatus*, and *Torpedo*; four in *Hexanchus*, *Heptanchus*, *Centrophorus*, and *Trygon*; four to five in *Raja*; five in *Scymnus*, *Myliobatis*, *Pteroptatea*, and *Squatina*. There are nine in *Polypterus*, each of which contains three complete and some abortive valves; there are fifty-four to sixty in *Lepidosteus osseus*. In *Amia* there are but three rows; the two inferior, in the bulbus, with two large and two small valves; the superior with only two.

In most *Actinopterygia* there is no striped muscle-tissue on the outer layer of the bulbus, but an elastic material of thread-bundles, which is produced into pillars on the inner side. There is one pair of valves at the ostium bulbo-ventriculare; between these are sometimes one or two smaller adjoining valves. The only exceptions are species of *Butyrinus*, where there are four valves in two rows, with no muscular bundles round the bulbus. In sharks, *Crossopterygia* and lower *Actinopterygia*, there is a pair of valves at the ostium sino-auriculare, often attached by strong threads. In *Acipenser* there is a ring-like valve in two parts—one with four, the other with five pockets, each one attached by a strong thread. The large, expansible, thin-walled auricle has usually on one or two sides an auricula. Within it are numerous trabeculæ carneæ. The ventricle is on the abdominal side of the auricle. The latter in passing over it is narrowed sometimes (e. g. in *Petromyzon*) for some length. There are usually two valves in the ostium arterio-ventriculare, sometimes four in *Orthogoriscus* and *Acipenser*.

The heart's position is usually between the claviculæ, but in *Apodes*, and particularly in *Symbranchii*, the heart is more posterior. In sharks it lies in its sac immediately under the elongation of the copulæ of the gill-arches, which pass through the cartilago subpharyngea impar. In *Petromyzon*, with the pericardium, it lies in a sort of incomplete capsule, which is separated from the gill-cavity by muscles forming a kind of diaphragm.

The heart-capsule (in all fishes except *Leptocardii*) is fibrous, is attached to the bulbus arteriosus, and often sends thread-like processes to the heart proper, which are often tendinous, sometimes accompanied by blood-vessels, as in *Anguilla*, or are blood-vessels only, as in *Acipenser*.

In *Dipnoi* the auricle is externally one, internally divided by an incomplete septum. Into the left auricle enters the vena pulmonalis, at whose entrance is placed a semilunar valve. There is no valve at the ostium atrio-sinuum. From both auricles the ventricle is entered by a common ostium, which has a valve. The ostium possesses a papillar muscle, which is bound with a thread-cartilage which closes the ostium during systole. The bulbus arteriosus (without valves at its origin) forms a curve. It contains two lateral, longitudinal spiral foldings of different lengths, which fade away at their extremities.

In *Podopterygia*, on the upper surface of the heart, are numerous bottle or vesicle shaped elevations, which are of different sizes in different or in the same animal, sometimes large, sometimes almost wanting. A varied number of arterial vessels from the subelavia and mammaria penetrate the heart-sac and distribute themselves to these elevations, which have various arrangements. These surround bladders which involve their entering arteries in rosy, spongy tissue composed of granules and meshes of fiber and cells containing granules. Vessels enter the heart from the bases of these.

In general, on the trunks, except in the *Leptocardii*, from the anterior extremity of the bulbus arteriosus (which is external to the heart-sac), there issues an incontractile "gill-artery trunk," from which on each side issue directly or indirectly, through other communicating trunks, the branchial arteries.

In myxinoids the truncus communis branchialis is variable, running in a membranous cavity which surrounds the anterior end of the ventricle, and projects into the membranous pouch that envelops the gill-sac. Each gill-sac contains an artery which forms a circle at the entrance of the gill-branches, and sends off radiating arteries. In *Petromyzon* four arterial branches on each side leave the truncus communis branchialis, which divides anteriorly into two trunks, each of which divides into three arteries, and an anterior twig is sent to the anterior row of gill-lamellæ. The special branchial arteries pass (except the first and last) between the two gill-pouches, and give their branches through diaphragms to the gill-arches.

In *Etasmobranchii*, from the truncus branchialis communis there issue on each side one or two trunks, each of which afterward divides into two. In *Raja* and *Pristis*, where one goes off, it divides into three, and the terminal portion into two. In *Pristis* the first of the three runs forward to the trunk in the cartilage, and is taken up by it. The special branchial arteries issuing from the primordial trunks pass between the two rows of gill-lamina, which are in separate gill-sacs, a special artery supplying the anterior hyoid gill. In many fishes (*Lepidosteus*, *Acipenser*) the first gill receives the first branch from the arteria branchialis, and the last gill the last branch. In these the branchial arteries run toward the first gill, then bend posteriorly and give off branches successively. In *Spatularia* the first gill receives the second branch, the second gill the first branch, the others regularly. The arrangement in *Amia* is as in the other *Actinopterygia*.

In *Actinopterygia* the gill-artery stem runs forward in a canal beneath the copulæ of the gill-arches, which bound it above; laterally it is bounded by processes of the same; beneath by the culiform membrane (which latter is wanting in *Apodes*).

Often (e. g. in *Satmo*) it gives off first a common stem, which divides to the fourth and third gill-arches; then gives one to the second arch, and one to the first, by the forking of the trunk. But (e. g. in *Murenophis punctata*) two distinct branches of the common trunk can be given to the two posterior gill-arches. In *Dipnoi* two trunks leave the branchial artery on each side: (1) a common vessel for the half gill and the two gill-less "visceral" arches, and (2) a

stem for the posterior gill. The first divides in two, which as aorta-bows unite under the skull to form an aorta-root. The first aorta-bow gives off a branch for the half gill, which sends off the carotid before entering the half gill. The aorta-bow gives off also a posterior carotid before union with the posterior aorta-bow. From the second goes an artery for the fibers of the external gill. The second trunk divides into two gill-arteries for the fourth aorta-bow. The extremities of both become arteries for the outer gill-threads.

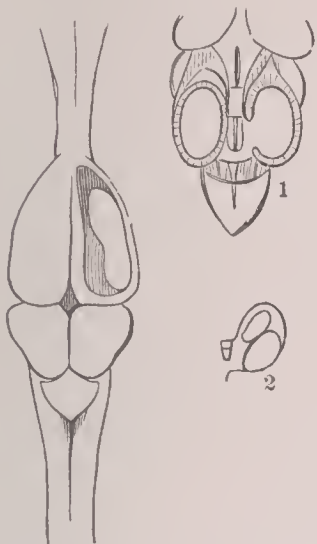


FIG. 21.—Brain of *Varanus niloticus*: 1, horizontal section of optic lobes; 2, vertical section.

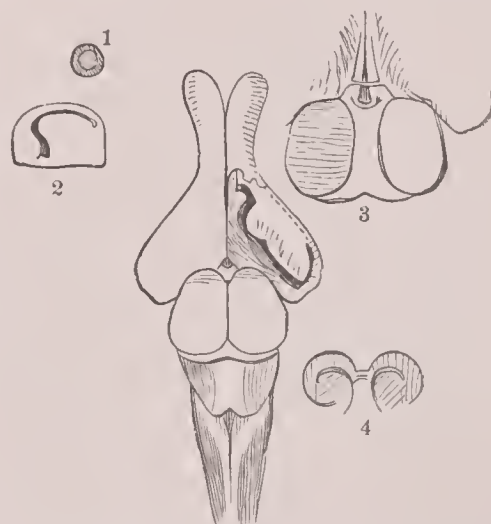


FIG. 22.—Brain of *Dipsas dendrophila*: 1, vertical section of olfactory lobe; 2, vertical section of right hemisphere; 3, vertical section of optic lobes; 4, transverse section of lobes.

The last gill-artery from its upper extremity gives off a branch for the posterior half gill.

The gill-veins unite (in the absence of an arterial heart) for the construction of the great arterial trunk. But often arterial trunks for the body go immediately from the gill-veins. The carotid arteries leave the gill-veins. In myxinooids the gill-veins, after leaving the gill-sacs, form a median trunk, which is prolonged posteriorly as an aorta and anteriorly as an arteria vertebralis impar. All or most of the gill-veins are connected by a trunk running parallel to the aorta, which is continued anteriorly as the arteria carotis communis. Both carotids accompany the oesophagus forward, giving branches to it and to the hyoid region. Each divides behind the head into the arteria carotis externalis (for the tongue and the muscles of the head), and the arteria communis internales, which unite, forming a bow, at the origin of the vertebral column, which receives the vertebralis impar; from the latter originates a median head-artery, which, extending anteriorly, gives off branches for the nose, etc. In *Petromyzon*, with the exception of the first and last, each gill-vein issues from the interstitium between two adjacent gill-sacs. There is no arteria vertebralis impar. The carotis communis rises from the first gill-vein, which sends another branch to the formation of the aorta. Each carotid divides into an external and internal; the two internal carotids do not unite to form a median head-artery.

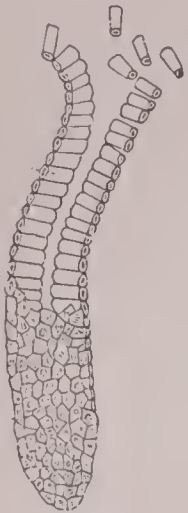


FIG. 23. — Tubular follicle of the pig's stomach.

In other fishes each gill-vein originates from the two connected "gill-leaf rows," except those from the two half gills. In *Elasmobranchii* all or most of the gill-veins come together to form the aorta, either immediately or after the union of some (thus forming homologues of the aorta roots).

The arrangement of the carotids is various. In *Chimæra* the first gill-vein from the half gill forms the posterior carotid; the second, which like the rest contributes to the aorta, sends off the carotis anterior. In *Raja* the posterior carotid originates from the aorta-root which is formed by the union of the two first gill-veins. It runs in the canalis spinalis. The carotis anterior originates from the vessels of the pseudobranchiæ of the spiracle. In *Chimæra* and *Rajidae* the posterior carotids remain ununited; wherefore no anteriorly united circulus cephalicus exists. In the sharks they run under the base of the skull, and unite and give origin to the cerebral artery.

In the *Teleostomi* there are various arrangements of the gill-veins in the formation of the aorta. The carotids are as in *Elasmobranchii*. (See *Raja* above.) In *Lepidosteus* there is a third cerebralis from near the origin of the aorta. In it the union of the anterior gill-veins is the origin of the aorta. The second pair unite below this, and forming a thicker trunk receive the first aorta. The third pair unite below the union of the second pair and the aorta origin, and forming a still thicker trunk, receive the second stem, all forming three steps in profile. The sections would be—first \circ , second z , third z . The posterior carotid comes off anteriorly to the mouth of the third pair of gill-veins. The subelavians are vessels disproportionately large; they come off on each side a little behind the embouchure of the posterior gill-vein tube, take the place of the cœliac and superior mesenteric arteries, and send a branch to the stomach, which does not give a strong branch to the spleen, but approaches the pylorus as a bundle of little vessels. In *Actinopterygia* a complete arterial circle (circulus cephalicus) is formed by the gill-veins without the cavity of the cranium. The gill-veins of each side unite to form the commencement of the aorta, and run together anteriorly as the sphenoidium, through a cross anastomosis. This circulus can be wider or narrower. It is the former when all the gill-veins of each side unite into the aorta-bow, and where both bows are connected anteriorly by a cross trunk, and unite posteriorly to form the aorta, as in *Gadus* and *Lota*. It is narrower when each of the bows forming the aorta is formed from the anterior gill-veins only, and where the hinder gill-veins enter the aorta; e. g. *Scomber*, *Salmo*, etc. The aorta is sometimes independent, free, entirely surrounded by strong tissue, as in most *Actinopterygia*, sometimes in a canal of the processes of the vertebræ, without the usual distinct trunk-envelope; sometimes it is in a canal inferior to the vertebral

column, with the superior surface thin walled. The commencement of the aorta, in which the gill-veins empty, is under the cranium, first inclosed superiorly by the basilar cartilage. A short section is enveloped below by a fibrous membrane, but soon it is inclosed beneath by the vertebral arch elements, which are arched upward and supplied with intervertebral cartilage. Along the whole length of the aorta-canal there runs in its cavity, from the base of the skull, an elastic band which adheres above to a skin-fold whose continuation as a very thin perichondrium lines the inner side of the canal, to which it closely adheres.

In the *Elasmobranchii* and many *Actinopterygia* the aorta is embedded in a gutter of the vertebral bodies. On the side of this there are (in *Esox*) fibrous longitudinal ridges. In these the aorta possesses an external skin on the inferior surface only. It appears from point to point swollen with sinuses. Each such swelling is separated from that succeeding by a contraction. There is a small cross bridge of thread tissue within from one lateral ridge to another. Within the canal is found (in *Esox*, *Clupeidæ*, *Salmonidæ*, *Silurus*, etc.) a fibrous longitudinal elastic band, as in *Acipenser*. It commences at the skull beneath, and extends along the whole vertebral column. As an immediate continuation of the basis of this is the elastic artery-envelope. Although in *Plectospondyli* the aorta is more isolated from the vertebral column, and the fibrous longitudinal band is absent, it yet exhibits sinuses in regular position. When the aorta is free it does not always run under the median line; in *Belone* it is on the left side.

In *Reptilia* and *Batrachia* the aorta is formed of two roots (which do or do not result from more than one pair of aorta-bows) from the bulbus arteriosus, and which embrace the oesophagus. A ramus communicans anterior exists between the carotids. Branches of the aorta either become intercostal arteries, or enter the intervertebral foramen for the spinal canal.

The *Batrachia* have a carotid from each anterior aorta-bow, and a pulmonalis from each posterior aorta-bow. In all *Urodela*, aorta-bows, either united or directly or indirectly issuing from the bulbus arteriosus, contribute to the formation of an aorta-root by the perennial rami communicantes on each side. The *Trachystomata* agree with fishes in the arrangement of the greater vessels. The bulbus arteriosus upon issuing from the ventricle makes a bend to the right side, and is thereafter in its longer portion straight. At its fore end three arches on each side issue, which are functionally gill-arteries. Through the union of three corresponding gill-veins into one stem an aorta-root arises, two of which form the aorta. The anterior gill-vein sends out a carotid, the hinder a pulmonic artery. The *Proteida* have the system differently arranged. The bulbus is divided into two diverging branches, each of which results in two aorta-bows. The anterior follows the first gill-vein; the second divides in two, of which the anterior follows the second gill-vein; the posterior the third. Each of the two aorta-bows proper consists of an uninterrupted continuation and a respiratory portion. The third bow wants the direct continuation. Each of the three respiratory portions consists of a gill-artery, intermediate respiratory vessels, and a gill-vein. The two anterior gill-veins of each side empty into the continuation of the original aorta-bows. The third gill-vein passes over into the continuation of the second aorta-bow. The continuation of the two primitive aorta-bows and the second and third gill-veins forms an aorta-root. The point of confluence of the aorta-roots lies over the heart. The anterior vessel which results from the union of the continuation of the anterior aorta-bow and anterior gill-vein has two branches—an arteria hyoidea mandibularis and a carotis interna anterior. Each aorta-root formed from the second aorta-bow possesses a posterocephalic elongation forward, which gives off a carotis posterior, and forms the commencement of an arteria vertebralis. The aorta-root gives off posteriorly a visceral artery, which, after branching for the oesophagus, is destined to become a spermatica interna. From the single aorta proceed subelavian arteries, which are continued as the epigastric, gastric, cœliac, many small mesenteric, renal, and symmetrical iliac vessels. Besides, there are pairs of dorsal arteries, which pierce the transverse processes on each side, and emerge in the longitudinal vertebral artery. In *Cryptobranchus* four vessels on each side go directly from the bulbus arteriosus. They follow the gill-arches. The anterior finally becomes the carotid. The two middle vessels form the aorta-root, and, after giving off branchlets for the head, unite close behind the cranium.

The fourth vessel bends over the œsophagus, gives it branches, gives a branch to the third aorta-bow, and becomes the pulmonary artery. In *Salamandra* the bulbus arteriosus gives origin on each side to four aorta-bows with three mouths. The three posterior bows on each side form aorta-roots which are prolonged anteriorly. The union of both bows into an aorta occurs behind the skull, beneath the first vertebra and above and before the heart. The carotis divides into the cerebral and occipital. An obliterated continuation of the anterior aorta-bow, binding it to an aorta-root, is called ductus Botalli. The fourth aorta-bow, whose mouth is that of the third, sends off a visceral artery which gives branches to the pericardium and œsophagus, and becomes the pulmonalis. The aorta is under the vertebræ, and descending gives off the subclavian and intercostal (in pairs), the gastric, cœliac, mesenteric, and numerous renals. Between the kidneys go off the iliaes (which give off the femoralis and epigastrica), and a cloacal branch which is continued as a caudal artery.

In the *Salientia*, on each side are three bows, of which the foremost and hindmost do not contribute to form the aorta-root, which is a continuation of the middle bow. It unites with that of the other side far posteriorly. Two pipes issue from the bulbus. There is one semilunar valve at the base of each. Each of these vessels is internally divided by two partitions into three canals, and each partition is prolonged to the wall of each issuing vessel. At the farther end of the anterior of these canals is an enlargement (carotid tumor), from which issue the arteria hyoidea (lingualis) and the carotid. The middle canals form the aorta-roots. The right is large, but the left small, after giving off the cœliaco-mesenteric artery, which is so large as to appear like its proper continuation. The third canal gives off two branches. The first, after giving branches, becomes a strong cutaneous vessel, which, with its accompanying vein, running between the levator and anterior adductor muscles of the humerus, gives off branches to the integument of the whole back. The second branch is the pulmonary. Each aorta-root before their union gives off other branches to the larynx, œsophagus, and shoulder; also a subclavian and a supraver-tebral artery, which runs longitudinally, crossing the diapophyses, and giving a branch to each intervertebral foramen. The left root also gives off a cœliaco-mesenteric artery. The descending aorta gives branches for the kidneys and generative organs. To the two latter go five and six vessels. Each gives a branch to the kidney on one side and to the genitals on the other. Division into common iliac arteries then takes place. *Cæcilia* has a long muscular bulbus, at whose narrow origin are valves. The cavity is divided by a septum at its anterior extremity into dorsal and ventral chambers. The dorsal terminates in the arteria pulmonalis for the lung; from the ventral proceed two aorta-roots, each of which near the trachea reaches to the hyoid apparatus, and forms a bow behind the skull, from which the carotids proceed. The union of the aorta-roots is hypaxonic, above and a little before the heart. Each root gives off intervertebral (mostly obliquely directed forward) and vertebral arteries.

In *Reptilia* there is a completed form of heart. The division of the auricles is externally visible. The division of the ventricles is partial or complete. In embryonic forms the position of the heart is near the gill-slits. This state is characterized by the presence of several aorta-bows which embrace the œsophagus, and form the aorta-roots by successive obliterations of most of the aorta-bows and their connecting anastomoses. There is a ductus Botalli, so that each aorta-root is permanently formed, either through confluence of two aorta-bows, or it is a continuation of a single trunk.

In *Lacertilia*, *Ophidia*, and *Testudinata*, in the ventricle are found fleshy columns of various sizes, which inclose spaces opening into a common cavity. The septum ventriculorum (more or less incomplete) is connected to the sides of the ventricle by tendinous or fleshy cords. The left ventricle is narrower, more dorsal, thick walled, communicating with the left auricle; the right is broader, straight, ventral. That into which arterial blood enters, and which, as regards its position, is homologous with the left ventricle, is called the cavum arteriosum; the right is the cavum venosum. No trunks arise from the first. From the cavum venosum there issue by three ostia the arteria pulmonalis and two trunci arteriosi, each ostium having three semilunar valves. The space between the orifice of the arteria pulmonalis and those of the trunci arteriosi is the originating point of a flap or muscular valve which ex-

tends toward the right border of the ventricle. This divides the cavum venosum into two incomplete cavities, an anterior and posterior, which are completely separated by the systole, during the latter part of which it shuts the entrance to the arteria pulmonalis. A simple bulbus arteriosus is wanting, but its place is supplied by the confluence of the bases of the three great vessels, which are then separated by simple walls. This arterial trunk, containing a cone, is covered by the pericardium, and wants (except in some *Testudinata*) the striped muscular walls.

In *Lacertilia* the heart is not far removed from the hyoid region. It is farthest in *Amphisbæna*; next farthest in the *Varanidæ*. Among *Varanidæ* the septum atriorum is nearly complete, except near the ostium venosum dextrum. Among *Pachyglossa*, *Geconidæ*, *Chalcididæ*, and *Scincidæ*, the septum is very incomplete. The walls of the great vessels are united near their origin. A peculiarity of most *Lacertilia* is that each aorta-root takes up the common carotid from an arterial trunk which originates afterward, so that each aorta-root is formed by the union of two aorta-bows as follows: The trunci arteriosi continue, the right as an aorta-root, the left the same after giving off the truncus impar, which divides into the carotids. Each of the latter gives off near its basis an outward directed arterial bow, which empties into the aorta-root of its side. It constitutes thereafter a primitive aorta-bow, whose original branches are the carotids. This occurs in (1) *Scincus*, *Anguis*, *Pseudopus*, *Lacerta*, *Ameiva*, *Platydactylus*, *Uromastix*, *Iguana*, etc., and the aorta-bows from the truncus impar are obliterated, while they are utterly wanting in (2) *Varanidæ*, *Chamæleonidæ*, *Amphisbæna*.

The heart of serpents is far removed from the hyoid region, and the form is elongate. The end of the pericardial sac appears confluent with the serous lining of the thorax. The cavum venosum arteriosum is always incomplete. The walls of the three arterial trunks are separate, as far as is known. The left trunk continues as the aorta-root without branches; the right gives off the coronaries, etc.; then, where it turns itself posteriorly, a subvertebral anterior branch; then numerous intercostals.

The truncus caroticus impar divides into two arteriæ carotides communes, of which the right is scarcely visible in some species; but when visible it may be smaller than, equal to, or larger than, the left.

The *Testudinata* have the heart broad, abbreviated posteriorly, and widely removed from the hyoid apparatus. The outer sac of the pericardium is attached to the end of the ventricle by a band which incloses the portal vein. The valve, stretching to the right wall of the ventricle, is in some furnished with an ossified cartilage. The walls of the three trunks are slightly united near their origin, forming a bulbus, which in *Emys europæa* is surrounded by a ring of striped muscle-tissue. The truncus dexter soon after its origin gives off a short anterior arteria innominata, which gives off the carotids and subclavians. The truncus sinister gives off (before union with the dexter) the cardiac branch for the heart and œsophagus; also the gastro-epiploica and mesenterica. After these branchings the aorta-root is narrow. From each side the neck there runs to the rump, over the diapophyses in the canal covered by the carapace, a trunk, which, besides the intervertebralis, gives off arteries analogous to the intercostals. The continuation of this is a caudalis, superior to the diapophyses. The intercostals of each side open into a lateral longitudinal trunk, which communicates anteriorly with the subclavian, posteriorly with the iliac vessels. From the aorta proceed symmetrical spermatic, suprarenal, iliac, renal, and hypogastric vessels. It is continued as the caudalis inferior.

The *Crocodylia* have a complete septum ventriculorum; the right ventricle anterior; each ventricle emitting its respective truncus arteriosus. There is an opening connecting the trunci arteriosi (which corresponds to the bulbus arteriosus), by which arterial and venous blood are mixed. The heart is over the sternum; the left ventricle is thick walled; the right more capacious, reaching to the apex. The right contains a muscular fold which is stretched



FIG. 24.—Lobule of parotid gland magnified.

from a septum behind the origin of the pulmonary artery to the outer wall. It has two valves at each ostium venosum. From the left ventricle issues the truncus arteriosus dexter; from the right ventricle the truncus sinister and pulmonalis. These two trunks are separated at their origin by a common septum; at the origin of each are two semilunar valves. The walls of all three are united between the trunci arteriosi near the semilunar valves. Before uniting, the trunci arteriosi give off the dexter truncus innominatus and subclavia dextra. From the truncus arteriosus sinister, near its union with the dexter, issues the cœliac artery; it then becomes much narrower. The common carotid divides near the head into two branches. Besides these there are other branches to the larynx, neck, tongue, and other parts.

In *Aves* (birds) the septum ventriculorum is complete. The heart's position is in the middle line of the thorax, its axis parallel with that of the body, its apex between the lobes of the liver, the heart-sac attached to the membrane of the lungs. The auricular appendages do not project, but are tightly drawn down. The right auricle is stronger and with larger appendages than the left. They have comb-shaped muscular columns or ridges. Into the right auricle empty the venæ cavæ. At the mouths of the veins are weak muscular flaps which are attached to the pectinate muscles, whose contraction assists the passage of venous blood into the right ventricle; the fœtal foramen ovale is closed. The chambers of the ventricles are not very different in size; they do not reach the apex. The septum is very convex into the right chamber. The orifice of the right ventricle is closed by a very strong muscular valve as thick as the outer wall. It is strongest in *Natatores*, weakest in *Cursores*, especially in *Apteryx*, where it is almost membranous, and is attached by its free borders by short chordæ tendineæ to the wall of the ventricle. Its free border in most is turned toward the convex septum, to which it is closely pressed in systole, thus preventing regurgitation. It is opposed by a second very weak muscular valve. At the origin of the pulmonalis are three semilunar valves.

From two low ridges at the orificium atrio-ventriculare sinistrum proceed usually numerous tendinous threads, which attach themselves to two or three valves which correspond to the mitrals. Three semilunars are found at the origin of the aorta. The boundaries of the left ventricle are nearly three times the thickness of those of the right. The left auricle has numerous and complicated muscle-bundles: it receives two pulmonic veins through one ostium. There is a valve-like muscular process whose free border is turned to the cavity, and apparently directs the blood to the ventricle. The single aorta, giving off immediately the coronaries, very soon divides; the truncus arteriosus has a branch which is either the innominata or subclavia. In the latter case there is a common carotid. It continues as aorta descendens on the right side of the vertebral column. The left arterial trunk is an innominate or a subclavian. Either each innominate furnishes its common carotid, which is most usual, or the left or the right furnishes a truncus carotieus impar. Examples of the first kind are furnished by all *Natatores* (except *Podiceps*); of the second by many *Insessores*, and some of the *Cursores*; of the third the *Phœnicopterus* furnishes the only example. In *Botaurus stellaris* both aortas unite on the neck. Sometimes one of the two carotids runs laterally and superiorly on the neck (e. g. *Psittacus chrysotis*). They run in the whole length of the canal, beneath or in front of the vertebral processes. From each originates a vertebral artery, which does not form the basilar, which results from the union of branches of the cerebral carotids; and after giving off branches finally results in the arteria spinalis anterior. When one truncus carotieus only exists, the vertebralis of the imperfect side originates from the subclavian. Sometimes (in *Anas boschas* and *Ciconia nigra*) the vertebralis continues itself downward in the canal of the rib attachments as the common stem of the intercostales. From the aorta descendens arise more or less numerous intercostales and lumbales, a strong cœliaca, then a mesenterica superior (both penetrating the diaphragm in *Apteryx*), afterward renals; from which branches for the generative parts proceed. Next are two crurales, each giving off an epigastrica. Each results in the ischiadica, which descends to the knee. The sacra media usually gives off the renales posteriores, the mesenterica inferior, two lateral pudendæ internæ, and the hypogastricæ. Finally, it produces the vascular network on the breast and abdomen

which is devoted to the panniculus adiposus laid bare by the shedding of feathers during incubation.

In *Mammalia* the heart is unattached by cellular tissue to the diaphragm, except in man, the higher apes, and *Cetacea*. It is straight (except in man, the higher apes, and *Talpa*), has two ventricles, and the foramen ovale is always closed. The ventricles are externally separated (in part) in *Sirenia*. It has a valvula tricuspidalis; in *Ornithorhynchus*, a transverse muscular valve of the right ventricle, as in birds; the valve in *Echidna* is membranous, has a large tuberculum Loweri,* and no Eustachian valve (in *Felis*, *Canis*, *Ursus*, *Phoca*, *Gulo*, *Mustela*, *Procyon*, *Talpa*, *Halmaturus*, *Equus*, *Sus*, and *Ruminantia*). There is no tuberculum, but there are two semilunar valves to the vena cava ascendens in *Didelphis*, *Dasyppus*, *Hystrix*, *Cavia*, *Lepus*, *Sciurus* (in *Sciurus maximus* a trace of the tubercle). No Eustachian valve, but a cross-band below the fossa ovalis, with filamentous muscle-processes in *Myrmecophaga* and *Bradypus*. It has a Eustachian valve and weak tuberculum Loweri in man, many apes, lemurs, *Lutra*, etc. Both valve and tuberculum are wanting in *Ornithorhynchus* and *Delphinus*.

In many ruminants and perissodactyls in advanced age there is a single or double bone in the septum atrio-ventriculare, and occasionally in *Equidæ* in the septum opposite the ostium venæ cavæ ascendens. The aorta-stem at its root is single and curved to the left; it soon gives off coronales (one only in *Elephas*). Its branches vary; e. g. (1) A short aorta divides into an anterior (superior) and posterior. (2) The aorta superior gives off a subclavia sinistra, and continues as the truncus carotieus, or divides into a truncus carotieus and both subclaviæ; in *Equidæ* it also gives off the vertebralis dextra. From the aorta-arch originate the innominate giving off carotides subclavia dextra and subclavia sinistra in most *Marsupialia*, in *Rodentia*, *Edentata*, *Carnivora*, *Sorex*, *Halicore*, *Auchenia*, *Sus*; in which last the two carotids spring from a truncus impar vel primus. (3) In other cases two trunci innominati alone are given off, as in *Chiroptera*, *Talpa*, *Phocæna*. (4) The aorta gives off a truncus anonymus dexter, carotis sinistra, subclavia sinistra (as in *Monotremata*, *Phascolumys*, and *Bradypus*, *Dasyppus*, *Cyclotura didactyla*, all *Muridæ*, *Erinaceus*, *Phocidæ*, many *Quadrumana*, man, etc.). (5) Two subclaviæ arise, with a truncus carotieus impar between (*Elephas*). (6) Besides the above subordinate arteries from the aorta are thoracica interna sinistra and dextra from innominate dextra in *Phocæna* and *Halicore*. In some plunging animals occur widenings of the aorta (*Lutra*, *Phoca*, the young of *Delphinus*, *Monodon*, etc.). The common carotids have their length proportioned to that of the neck. In the short-necked *Delphinidæ* there is none, both carotids springing from the innominate. It is often divided into two (facialis and cerebralis). The cerebrales enter as single trunks into the cranium in *Quadrumana*, *Chiroptera*, *Insectivora*, *Rodentia*, *Marsupialia*, *Equidæ*, and some *Carnivora*, as *Ursus*, *Lutra*, *Canis*, *Mustela*, or pass through a rete mirabile (*Phocæna*) formed of branching trunklets, or springs from a rete mirabile formed from its origins (*Ruminantia*, *Suidæ*, *Felidæ*). When without retes the cerebrales have various points of origin. The retia mirabilia of the *Delphinidæ* (with artery traversing) are principally formed from the branches of the carotis interna, yet are closely connected with retia lying outside the cranium, formed of branches of the carotis externa and cervico-occipitalis. The rete of each side always communicates with that of the other. The always present circulus Willisii is formed either partly in the cerebrales and partly by division of the basilaris, or through the cerebrales and divided basilari-occipitales or only by the cerebrales. There are still other modifications of the circle of Willis. In many *Edentata*, and in *Stenops* and *Tarsius*, the arm-arteries possess many retia mirabilia (*Dasyppus sexcinctus*, etc.). In *Bradypus* and *Stenops* the trunk of the brachialis passes through many embracing extended arterial vessels. In *Cyclotura didactyla* and *Tarsius*, the artery empties itself into these; in other cases they are confined to the forearm.

The aorta thoracica of most *Mammalia* is peculiar in not giving off immediately the intercostales. In *Mustela* there springs from it at the extremity of the chest a trunk (which divides into two vertebrales), from which the arteriæ intercostales issue. In the *Delphinidæ* there are two descending arteriæ thoracicæ internæ (or mammariæ internæ), which arise, the left from the arcus aortæ, the right from the innominate dextra, which give off the five anterior inter-

* A process separating the mouth of the vena cava descendens from the vena cava ascendens in the right auricle.

costales. The branches of the aorta abdominalis are usually the phrenicæ inferiores, suprarenales, renales, spermaticæ internæ, lumbales, the cœliacæ, the mesenterica superior, and the mesenterica inferior. The cœliacæ and mesenterica superior are one stem in *Cavia cobaya*, or originate as one and soon divide (*Talpa* and *Vespertilio murinus*), or originate separately, but connect by strong anastomoses (*Phocæna*). The mesenterica inferior often is trifling, in *Marsupialia* and *Monotremata* wanting. The arteriæ iliacæ communes (so called) seldom are homologous with those of man. In *Cetacea* they correspond generally with the hypogastricæ. They give off the epigastricæ, which otherwise come from the crurales. In most *Mammalia* they are homologous with the crurales, since not from them, but from a continuation of the aorta, are given off the hypogastricæ, or at least vessels which rise in *Homo* from the hypogastricæ. So in *Monotremata* and *Marsupialia* the ischiadicæ, and in many others the sacra laterales, spring in pairs from the aorta beyond the iliacæ communes. In some, with strong skin-muscle or skin-system, from the crurales arise large musculo-cutaneæ, which anastomose with similar descending branches of the axillares (*Erinaceus*). The division of the eruralis is higher or deeper than in *Homo*. In the posterior extremity of the *Phocidæ*, in many *Edentata*, and *Stenops* are retia mirabilia, which are weaker than those of the upper extremity, and the sacra media is a continuation of the aorta; larger in large-tailed animals, running in an inferior vertebral canal, often forming retia (*Stenops*, *Bradypus*, *Myrmecophaga*). In *Phocæna* it passes through retia; sometimes weak (in *Erinaceus*, *Lepus*, ruminants, often in *Equidæ*). There is none in *Manatus australis*, where the aorta forms two hypogastricæ, which lose themselves in two huge retia subvertebralia.

VIII. THE RESPIRATORY SYSTEM.

Apparatus for oxygenating a circulating fluid is wanting in *Protozoa* and *Cœlenterata*. In the other branches its type varies so that a number of distinct systems must be recognized, which are adaptations of as many distinct regions of the body for the purpose of respiration. These may be reckoned as follows:

1. The external pore-system of the *Echinodermata*.
2. The system of diverticula from the alimentary canal of the *Holothurida-Dendropneumones* and of most *Vertebrata*.
3. The gill-system of *Mollusca* and *Crustacea*.
4. The tracheary system of terrestrial *Arthropoda*.
5. The pharyngeal gill-system of *Ascidia*, fishes, and *Batrachia*.

It will, however, be convenient to divide the subject first between the *Invertebrata* and *Vertebrata*.

1. In *Invertebrata*.—The wall of the body of the *Echinida* and *Asteroida* is pierced with a great number of pores, which terminate in blind sacs and are filled with water. In all *Echinoderms* the cavity of the body is filled with water, by which blood is oxygenized. It enters through perforated plates (laminae cribrosæ) situated in the angles of the arms in the *Asteriida*, but the orifices which admit it into the body of the *Holothurida* are not certainly known. In the latter class singular organs called the "slipper-shaped bodies" depend freely from the viscera; their hollow stems are said to contain a blood-vessel; the extremity is like the open end of a short slipper.

The *Holothurida-Dendropneumones* possess an extensive system of branching blind tubes, which form a mass extending throughout the body. They form two bodies, one on each side of the rectum, and open into the latter near the anus: from it they are filled with water. In some *Asteriida* (*Petraster militaris*) five radiating tubes, the one for each arm, issue from the rectum, and are filled and emptied of water from it.

In *Polyzoa* (*Bryozoa*) and *Brachiopoda* we have a somewhat similar arrangement of branchiæ. In the former they form a double crest of tentacular fringes round the mouth; they are hollow, and the circulatory fluid moves through them, as elsewhere in the body-cavity, by ciliary movements on its walls. In *Brachiopoda*, as already stated, there are well-developed arteries. The gills are situated as fringes on straighter and shorter or longer and spirally coiled arms within the shell, one on each side of the mouth. Their position is somewhat like that in the *Polyzoa* when retracted. In hingeless *Brachiopoda* the calcareous arms are wanting, but here the gill supports are cartilaginous. In *Lingula* the inner surface of the mantle is furnished with folds and

erests, which are supposed to aid respiration. In the *Acephala* the arrangement is totally different. The gills are curtain or sheet like (whence the name of this class, *Lamellibranchiata*) and hang two from each side of the body within the mantle. Sometimes their margins are free (many *Monomyaria*, *Mytilidæ*, *Arcidæ*, *Lithodomus*, *Cyclas*, etc.); in others immediately united (*Veneridæ*, *Mastra*, *Donax*, *Unionidæ*, *Pholadidæ*, etc.), or are connected by an intervening membrane (*Solenidæ*, *Cardium*, etc.). The union of the pairs of margins incloses two chambers, one within the other. Each gill-lamella consists of two layers, which inclose tubes and other cavities between them. Sometimes the outer gill lacks one layer, or sometimes the whole gill is wanting (*Lucina*, *Corbis*, etc.). In others its outer lamina is truncated above, so as to expose the ends of the cavities it embraces. The lamellæ of the opposite sides are symmetrical or not, in accordance with the relations of the shell-valves.

The branchial structure in *Gasteropoda* presents many varieties. In the division *Opisthobranchia* the branchiæ and auricles lie behind the ventricle of the heart; in *Prosobranchia* the relative positions are reversed. In the former the branchiæ are variously extended processes of the dorsal integument of the body, each of which is supplied with an artery. In the lowest group, the *Dermatobranchia*, these branchiæ are wanting, and the arteries are distributed for blood aëration beneath the dorsal integument. In the *Placobranchia* they are represented by lateral wing-like expansions of the integument, which may fold over the body. In numerous types the processes are distributed over the body in thread, prism, leaf, and other forms. These are the *Ceratobranchia*; many of the processes contain liver-cells. In the *Polybranchia* the processes are arranged along the back, and are branched or forked, and sometimes of diverse forms on the same animal. Other families, as *Dorididæ*, have a rosette of branchiæ round the arms only. All the preceding groups form the "naked-gilled" primary division, *Nudibranchia*. In the remainder of the sub-class the gills are concealed by the edge of the mantle, forming the *Tectibranchia*. The least specialized of these (*Hypobranchia*) have symmetrically arranged fringes round the edge of the body, with but few interruptions; while in the higher division, *Pleurobranchia*, the fringe exists on one side only. The fringe becomes more localized and drawn under the mantle as the size of the shell increases in the succession of genera. Especially in *Bulla*, where the shell is large, the gill is drawn beneath the mantle, and concealed by the up-turned margin of the foot.

In *Prosobranchia* the gill or mantle-sac is generally well defined. It consists of a chamber bounded within by the body-wall and above by the mantle, which also closes it laterally by adhesion to the body-wall. The gills and excretory orifices of the digestive, urinary, and genital systems are seen on its walls. There is generally a single gill, shaped like a half feather, and with two dependent (in *Paludina* three) laminae of transparent membrane. In many genera there is a rudiment of a second, while in a few the latter is well developed. The orifice of the mantle-sac is on the left side, and can be closed by a sphincter muscle. The mantle is originally composed of lateral halves, which are not always completely united; their separation at the margin produces the deep fissure in the shell of *Pleurotoma*, and divisions higher up correspond to the holes in the shell of *Hyaliotis*. In the latter genus there are two gill-sacs and two gills, and in others two gills. In some a thickened rib marks the halves of the mantle, and the two gills are placed closed together on it, so as to appear as one. In *Patellidæ* and *Chitonidæ* there is no distinct gill-sac, the branchiæ being marginal fringes, as in many *Opisthobranchia*. In the *Pulmonata* the mantle-sac does not contain any gills; it has an opening on the right side of the body, produced by a fissure in the mantle margin, which is closed by a sphincter muscle. This orifice opens and shuts regularly for the admission of air. The mantle-sac becomes a lung by the distribution of the venous trunks and branches over its surface. An extensive ring-like trunk (circulus pulmonalis) surrounds its margin, from which vessels converge toward the center, forming a network which gathers itself again into a few, then a single trunk, the vena pulmonalis, which empties into the auricle of the heart.

In *Cephalopoda* the mantle is free, and incloses a cavity on the abdominal, instead of, as heretofore, the dorsal face of the body, agreeing in this respect with the *Pteropoda*. The cavity contains two branchiæ in the greater number of

genera (Dibranchiata), or four in *Nautilus* and probably its extinct allies, the *Ammonitidæ*, etc. These constitute the sub-class *Tetrabranchiata*. The gills are elongate, triangular, feather-shaped bodies, whose axis bears on one side the artery, on the other the vein. In *Dibranchiata* it bears a row of bows on each side, in which a blood-vessel passes from artery to vein. On each of these stand bipinnate processes, so that the whole becomes tripinnate. The arch bounds a membrane in the decapod division, but in the *Octopoda* the loop is not closed. In *Tetrabranchiata* the first branches of the gill are leaf-like, with pinnate, leaf-like subdivisions. They are free in the mantle-sac; those of the dibranchiates are attached to the mantle.

In all *Crustacea* except the *Decapoda* the gills consist of fringes and expansions of the limbs. In the latter they are regular feather-shaped bodies, arranged within an abdominal cavity above the limbs; the bases form a curved line and the apices are directed inward. The tracheary system prevails in all other *Arthropoda*. It consists of a great number of tubes, which communicate with the air by means of small orifices or stigmata. These pierce the walls of the segments, usually one on each side, where they are present. They subdivide to a great extent internally, and penetrate all the organs of the body. There are marked varieties of this structure. Instead of issuing by stigmata, the trachea may be produced into a leaf-shaped process which arises from the usual position of the stigma, and may there ramify extensively within the lamella, constituting a trachean gill. This occurs in the larvæ of many *Neuroptera*. The walls of the tracheæ are elastic, yet firmly bound by a spiral thread, whose close volutions form an interior layer of the tube-wall. In other localities it is wanting, and the tube expands sac-like. In some insects these exist near the stigmata. In the *Arachnida* (except the group of low forms, the *Trachearia*) this sac-like structure only exists as a large pulmonary chamber, with single stigma, situated on the anterior part of the abdomen on each side.

In insects the stigmata rarely exceed nine or ten pairs; in *Myriopoda* they are far more numerous. In the *Acarina* there are but two. In insects they usually have a valve, which opens externally to prevent the entrance of foreign bodies; in some forms they project in laminae, branched, pinnate, or botryoidal. In the larvæ of many *Phryganeidæ* and some *Lepidoptera* the trachea-gills are arranged in six rows along the back. In the larvæ of *Libellula* and *Æschna* they are attached to the inner wall of the rectum.

2. In *Vertebrata*.—In *Ascidia* there are no free or pinniform gills. There is, on the contrary, a large pharyngeal cavity, which lies between the mouth and the digestive system proper, the alimentary canal both issuing from and discharging into its cavity in many cases. In others it discharges at the side. The pharynx may occupy a small part of the whole length of the cavity of the body: in the latter case the other organs are pushed to one side of it (*Boltenia*, e. g.). The mouth and other parts are frequently furnished with cilia. The gills consist of a sac whose walls are abundantly pierced by holes of different forms in the different groups, or it is reduced to a band of such structure only.

In the *Leptocardi* there is a large pharyngeal cavity, with a large open mouth whose border is supported by a cartilage. This gives out branches which are the axes of abundantly ciliated tentacles which surround the mouth. On the sides of the pharynx are numerous fissures, which communicate with the outer medium. In the *Marsipobranchii* the respiratory organs consist of a series of sacs on each side (which number seven to ten), on whose septary walls the arteries and veins are distributed. In some genera these communicate internally with the pharynx or œsophagus; in the lamprey, on the other hand, with a blind tube which lies beneath the œsophagus and empties into the pharynx. Each sac opens externally by a slit. In *Etasmobranchii-Ptagiostomi* (sharks, rays) the arrangement is similar, the slits numbering five, rarely six and seven and communicating with the œsophagus. The septary walls are double, and contain a cartilaginous arch with radii, which elevate the walls into transverse ridges. A trace of the first embryonic external fissure remains in this order as a spiracle or tube from the pharynx to the sides of the top of the head behind the eyes. In *Hotocephali* (*Chimæra*) the external slits are concealed by an opercular flap, which produces the appearance of a single slit. In *Teleostomi* the hyoid respiratory system is fully developed. The arches support, instead of sac-septa, radiating fringe-like laminae, which receive the branches of the branchial artery and vein. The fissures are

only those between the arches, which are covered externally by an osseous "operculum" or lid. The number of branchiæ is usually four and a half, but in some *Pediculati* there are but three, in some eels but two. In *Lepidosiren* there is but one. While the processes are usually narrow, lamellar, in *Lophobranchii* they are subcylindric and branched, each one forming thus a tuft; their number is also reduced.

Besides these fringes there are in some *Dipnoi* and some *Batrachia* (*Trachystomata*, *Proteida*), and in the larvæ of many salamanders, cartilaginous processes of the arches which bear a double row of fringes, forming the external gills.

The true pulmonary system consists of ducts and chambers, which originate from the alimentary canal, and are connected with it or the pharynx. It is not found in any *Vertebrata* below the *Teleostomi* and *Dipnoi*. On the other hand, the hyoid respiratory organs do not exist above the *Batrachia*. In *Teleostomi* the pulmonary system consists of a sac with walls either thin and semi-transparent, or rarely thicker and lined with muscular meshes or a few cells (*Lepidosteus*, etc.). In *Physostomi* it is connected with the stomach or œsophagus by a tube, the ductus pneumaticus; in *Lepidosteus* the latter enters the œsophagus on the upper side; in *Polypterus* on the under side of the same. In *Physoclysti* this sac is entirely isolated. Its function is that of a float, and it is hence called the swim-bladder. It usually forms a single chamber, but in *Cyprinidæ*, *Characinidæ*, and *Sternopygidæ*, it is divided by narrow constrictions into two, sometimes into three, chambers. In *Cobitidæ* and some *Siluridæ* (*Ctarias*, *Gasterobranchus*, *Ageniosus*, and *Saccobranchus*) the anterior part, or the whole of it, is inclosed in an osseous case. In *Gadidæ* the diapophyses are expanded and adherent to it; in *Campostoma* it is suspended in the abdominal cavity, and surrounded by the spirally coiled intestine. It is furcate, and sometimes branched posteriorly, in *Scianidæ*. In *Nematognathi* and *Plectospondyli* it is immediately connected with the auditory organs by a chain of small bones, which are supported on the sides of the anterior vertebrae. Besides *Lepidosteus* and *Amia*, the genera *Platystoma* (*Nematognathi*) and *Chirocentrus* (*Isospondyli*) possess cellular layers on the inner side of the swim-bladder. In *Saccobranchus* a sac extends on each side above the ribs from the pharyngeal cavity, which is designed to contain water to supply the gills during drought. In *Dipnoi*, *Lepidosiren* has the swim-bladder deeply divided longitudinally, its halves being homologous with lungs. They are cellular within, and lie above the alimentary canal next the vertebral column. They unite, and passing round the œsophagus enter it below by a glottis with small cartilage. In the *Dipnoan Ceratodus* there is but one lung.

In *Batrachia* we have a further development of the structure seen in *Lepidosiren*. Here the sacs are separate, being connected by the branches of the tube or trachea which leads to the œsophagus. The sacs, now lungs, are occupied by a central longitudinal cavity and a thick layer of cells round the walls. The trachea from this order upward consists of cartilaginous rings, partly or completely closed, which are modified at the glottis into a vocal organ. This consists of a number of segments, the uppermost of which support two parallel tendinous plates (chordæ vocales), whose edges are separated by a slit-like opening, which is opened or contracted by their relaxation or tension. The trachea is longer in reptiles and other vertebrates than in *Batrachia*, and its inferior branches are called bronchiæ. In all, the œsophagus passes above the lungs, and the stomach is behind them. The interior of the lung continues as a sac in reptiles, being especially elongate and thin walled posteriorly in serpents. In these animals one of the lung-sacs is nearly always wanting or rudimental. In birds and *Mammalia* the central cavity is only represented by the bronchi and their branches, the cells occupying the remaining space. In *Aves* the bronchi are each dilated into a chamber, which is furnished with muscles for altering its form. These are most fully developed in singing birds, of whose musical faculties they are the organ.

IX. THE UROGENITAL SYSTEM.

1. In *Invertebrates*.—*The Reproductive System*.—In the lowest forms of life reproductive organs are only periodical appearances, and their sexuality can be determined only by microscopic examination of their products. In most *Echinodermata* the organs are permanent, but it is not till we reach *Mollusca* with a head that the organs of the sexes essentially differ. A usual mode of reproduction in *Pro-*

tozoa and *Cœlenterata* is by budding and by fission. The production of ova is a higher form of the budding process, the result being a germ of a new generation, which may or may not require the offices of opposite sexual cells for their further development. Examples of full development of the female element alone (agamogenesis) are known in animals as high in the series as insects. In the *Mollusca* the two sexual elements, ova and spermatozooids, are constantly produced, even in hermaphrodites, although they may be the products of the same glandular follicles, as in *Gasteropoda-Opisthobranchia* and *Pulmonata*, and in *Pteropoda*.

The following table exhibits the relation of the classes as far as the *Vermes*:

I. No Urinary Apparatus.

♂ ♀ organs identical.

Radiata.

* No permanent generative organs.

Anthozoa. Either androgynous on each mesenterial fold, or the fold monœcious, or rarely the animals diœcious; spermatozoa or eggs in sacs, which are in band-like mass on sides of mesenterial folds.

Hydræ. Androgynous; the eggs single in a lower sprout, spermatozoa in a higher sprout; no permanent organs.

Medusæ. Diœcious; eggs and spermatozoa developed in large cells or bladders, which are attached to stomach, water-canals, mouth, feet, border, etc.

Ctenophora. Androgynous and monœcious; capsules of both kinds in combined or separate bands on radial water-canals; sometimes on central canal or stomach, emerging by same canals.

Crinoidea. Comatula; sacs on swollen bases of pinnules monœciously containing eggs or spermatozoa without tails. (By one observation sometimes androgynous.)

** Permanent organs.

Asteriida. One or many blind sacs each side of septum (which terminates between arms near or far off); sometimes found to reach the end of the arm; much subdivided; orifice of emission through lamina cribrosa in some *Asteriadae*; into the body-cavity in others and in *Ophiuridae*; all androgynous, with very few diœcious exceptions; in some not known.

Echinida. Diœcious; five (ever less?) sacs or masses of saclets, each opening by narrow ducts through separate openings (sometimes four or three) near vent, and lying near together, reaching to middle of shell; males white colored, yellow, red, etc.

Holothuriida. Bunch of few or many tubes embracing œsophagus, and opening on median dorsal line; diœcious, or in *Synapta* and *Apneumona* androgynous; the spermatozoa in projecting masses of walls of ovary-tube.

Mollusca.

* Generative organs not always permanent.

Bryozoa. Androgynous; ♂ organs round body below stomach on a string, with many cells, containing spermatozoa; ♀ with very few ripe ova behind stomach, also on a string; spermatozoa bursting into body-cavity, and reaching ovary; ova break through outer wall or a posterior orifice.

** Always permanent.

Brachiopoda. Androgynous; a thick branching glandular body following pallial or generative artery filled with ovary-cells, and surrounded and penetrated by a reddish cell containing male element; discharging near mouth from a large, much-plicate, trumpet-mouthed oviduct, which is not continuous with genital mass.

II. Urinary Organs Present (Bojanus's Glands).

A. ♀ ♂ organs identical, permanent.

Acephala. ♀ and ♂ organs not different, of minute cells gathered in more or less compressed masses, which form main mass, or more simple along central tube or duct, which passes through Bojanus's body or unites with duct of latter, or has opening near latter; spermatozoa in *Dimyria* long headed and round headed; in *Monomya* round only; diœcious, except a *Pecten* or *Cardium*, etc., and hermaphrodite individuals of *Anodonta*. In *Unionida* sexes externally different; gills serve as brood-sac. Androgynous; genera *Ostrea*, *Cyclas*, *Pandora*, *Pecten*, etc.

AA. ♂ organs distinguished by penis or stylet.

a. Animals hermaphrodite.

Gasteropoda-Opisthobranchia. Spermatozooids and ova produced by the same glandular body (with few exceptions).

Gasteropoda-Pulmonata. An oviduct with abdomen gland and seminal receptacle; a vas deferens terminating in penis; a stylet-sac with stylet, all emptying into a common cloaca.

Pteropoda. Similar to the last, but no distinct vas deferens, and no stylet; penis usually separate from and in front of vagina.

aa. Sexes distinct.

Gasteropoda in general. Penis behind the right eye; ovary and testis embedded in the liver; oviduct frequently enlarged into a uterus, issuing on the right side; rarely an albumen gland or receptaculum seminis; no stylet.

Cephalopoda. ♀ with ovary inclosed in a peritoneal sac, and with two (sometimes one) oviducts continuous; ♂ without stylet; with a vas deferens and so-called seminal vesicle and prostata near the penis.

The preceding structures present in their details the greatest variety. The generative organs are situated on the right side of the body, but the exits are in some groups on the opposite side, and usually (the female at least) in the mantle-sac. Their inner walls are lined with ciliated epithelium. The stylet is a slender, acute calcareous body of various form, which is inserted into the vagina or body of the other individual in coitus. Its function is supposed to be that of an irritant only.

The males of *Cephalopoda* are more readily distinguished from the females than in *Gasteropoda*, being generally smaller. In *Argonauta* only the female bears the shell. But the chief peculiarity of the male is seen in the modified structure of one of the arms, by which it is said to be "hectocotylized." It differs from other arms in being stouter and entirely hollow, terminating in a hollow thread, which is open at the extremity, giving exit to the contents. It is developed in the outer wall of a bladder, and is first closely rolled together; the thread bears a bladder which is later lost. The primary bladder finally bursts, its remains forming a fringing membrane on the sides. At the period of impregnation its cavity becomes, in some way unknown, filled with spermatozooids. During an embrace it is torn off, and enters the mantle-sac of the female. It swims independently as a worm, and several are sometimes found in one female. The spermatozooids are supposed to be discharged into the vagina by the hollow thread.

Many opisthobranchs are self-impregnating. *Pulmonata* impregnate one another, while in *Lymnaea* an individual impregnates a second, and is impregnated by a third, forming thus a chain of individuals.

In *Arthropoda* the sexes are always in separate individuals (diœcious), excepting in the lowest *Crustacea* (*Cirri-pedia*) and the lowest *Arachnida* (*Tardigrada*). These orders are either sessile or with but little power of movement; hence the appropriateness of their monœcious condition. The sexes of *Arthropoda* are generally distinguishable by external characters, but it is in the *Insecta* and *Entomostraca* (*Lernæoidea*) that this difference becomes most remarkable. Thus in *Hymenoptera* (bees and ants) and *Neuroptera* (termites) not only are the sexes very distinct, but there are other forms (neuters, workers, soldiers, etc.) produced in connection with imperfect development of the reproductive organs. In the bees and wasps the additional forms are repressed males; in ants, repressed females. In termites it is asserted that both sexes contribute to produce them.

The external orifices of the reproductive system are confined to the abdomen, and are below and before the vent of the alimentary canal. In most orders they are posterior, but in *Myriopoda*, scorpions, and some higher *Crustacea* they are in front of the abdomen. The female internal organs consist of ovary and oviduct on each side, or the two oviducts may unite into one on the middle line, or there may be a single median ovary. On the oviduct are usually found diverticula, the receptaculum seminis (which is wanting in *Crustacea*, except *Ostracoda*), and another sac of uncertain use. The lower part of the oviduct is enlarged and the muscular walls are thick, forming a vagina, which often continues past the proximal part of the oviduct as bursa copulatrix. The ovaries consist of cœca of varying forms. In *Crustacea*, *Arachnida*, and *Myriopoda* they are few in number, but in *Insecta* they are very numerous, forming a

gland-like body whose component cæca are bound together by connective tissue. In *Termes* their number reaches 2,000 to 3,000. Other glands (glandulæ sebaceæ) pour their contents into the oviducts, which serve many important purposes—i. e. to attach the eggs to a solid base (*arilus*) or to the parent's body; to construct a shell (*Blatta*) or cocoon. In certain low *Crustacea* (*Lernæoida*, *Isopoda*, etc.) these glands open outwardly independently of the oviducts, and the secretion forms a sac round the eggs, by which they are suspended externally. The last abdominal segments in many insects are modified into organs designed for the conduct of eggs to a proper nidus; thus in *Orthoptera* it is composed of saber-shaped plates with saws within; in *Hymenoptera* it is partly represented by an offensive weapon, the sting. In *Chrysididæ*, *Diptera*, and *Phalangia*, and *Acari* they are modified into a tube which is projected telescope-fashion.

The male organs of *Arthropoda* consist of testes, vasa deferentia, glands, vesiculi seminales, and penis. The testes resemble the ovaries of the female in structure and position, but are frequently less complex. They are more commonly also united on the median line, as in low *Crustacea* (*Cyclopidæ*, *Cyprididæ*), *Myriopoda*, and among *Insecta* in *Lepidoptera*, many *Hymenoptera*, *Orthoptera*, etc. The vasa deferentia, on the other hand, remain distinct in these cases, except in *Scolopendra* and various *Entomostraca*. In many *Crustacea* and chilognath *Myriopoda* the vasa deferentia issue externally separately, but in many others unite to form a ductus ejaculatorius, which is enlarged in diameter. The muscles of this region are especially developed where a penis is well developed. Glandulæ mucosæ discharge into these ducts in insects and myriopods, but are wanting or rare in *Crustacea* and *Arachnida*. They are sometimes sac-like, sometimes filiform. They secrete a substance which hardens round a body of seminal secretions, forming a capsule which is usually taken into the female vagina, but may be attached to the body externally, or even (*Chilopoda*) to external objects.

The penis is present in most *Arthropoda*, but is wanting in *Entomostraca*, *Chilopoda*, and scorpions. In *Crustacea*, *Brachyura*, and *Isopoda*, etc., it is double. In all cases it is composed of a modified pair of limbs which are especially clear in crabs. The intromittent organ is occasionally far removed from the orifice of the vasa deferentia. In spiders (*Aranea*) the extremity of the palpus bears a receptaculum seminis and penis, which the animal fills voluntarily by application to the external orifice, and discharges in the oviduct of the female. In *Argulus* a similar mode of connection depends on the structure of one of the legs, and in chilognath *Myriopoda* a pair of legs is altered for a similar purpose. In certain tailed *Decapoda* there are two pairs of such organs, those on the last segment of the post-abdomen serving as conductors from receptacles in the fifth pair of legs. In dragon-flies the exceptional case occurs where the accessory organ is a fissure in the second abdominal segment.

In *Vermes* the type of the reproductive system presents the varieties seen in *Mollusca*. Thus they are androgynous, monœcious, and diœcious. Many of them develop by an alternation of generations, the one produced by true reproduction, the other stages by gemmation. In *Turbellaria* (or planarians) the *Dendrocela* are bisexual, but the *Rhabdocela* possess a common outlet for the two organs, testis and ovarium. *Trematodes* (flukes) are monœcious, each animal possessing distinct sexual organs of both kinds. The developmental stages of the young vary from three to six, and all but the first of these are due to gemmation in the cavity of preceding stages, or metamorphosis while encysted, etc. In tapeworms (*Cestodes*) the animal is made up of a head with organs of attachment, which, posterior to a long neck, is followed by a great number of identical segments. These contain each male and female organs, and a water-vascular system. The ovary and testis are at opposite ends of the segment, and between them is the branched uterus. This terminates in a vagina, which is approximated by a sheath containing a penis, which is perforated by the vas deferens. There are glands attached to the female organs. Each segment of a cestode is then self-impregnating. In *Acanthocephala* and *Nematoda* we have the higher condition of an entire separation of the sexes. In the former there is a penis which is retracted in a bursa which is prehensile in function. In this order there are alternate generations produced by gemmation in the body of the nurse stage. In *Nematodes* many genera

(*Strongyliidæ*, *Ascaridæ*, and *Filaridæ*) are furnished with a penis and bursa at its base. In the last family *Trichocephalus* has a bristle-like penis, one-third the length of the body, which, when projected, is accompanied by an extended sheath. In *Ascaridæ* the penes or "spicula" are two in number. In *Sclerostomum* (gapeworm) the male is much smaller than the female, and becomes attached to her permanently. In *Heterura* he remains attached for considerable periods. *Cucullariidæ* are without bursa. In *Anguillula* and other genera there are two oviducts, which unite to form a single vagina.

aa. The Urinary Organs.—These are present in *Mollusca* from the *Acephala* upward. In the latter they are represented by a pair of kidneys and their discharge ducts only. These are called "Bojanus's organs"; they are relatively of large size, and lie one on each side above the heart, etc., extending from muscle to muscle. They are frequently united together along the middle line. They are hollow and spongy, and their fibers are lined with secreting cells. They terminate either by a single duct near that of the reproductive system, or unite with the latter, or the genital duct enters that of Bojanus's bodies. These bodies have communication with the external water, and by a cribriform surface with the heart-sac; likewise with the capillary veins. The function of the organs is not only that of a kidney, but as a mingler of water with the blood.

In *Gasteropoda* the kidney is single and contains calcareous nodules; its secretion is purple in *Murex*; it is large and hollow, and contains water. It is surrounded by a network of veins, which frequently open into it, so that blood-corpuscles are found in it, as well as its products in the blood. It usually opens directly into the mantle-sac, but otherwise by a ureter, and always independently of the rectum, vagina, or vas deferens.

The kidneys of *Cephalopoda* differ much from those of other classes, and for a long time their nature was considered doubtful. They form a large, rather loose mass on that part of the vena cava which approaches the gills, and on the gill-veins as well, consisting of a great number of minute sacs with bifurcations and internal processes. Each principal one opens by a fissure in the walls of the vein. They are constantly in motion.

In *Arthropoda* the existence of kidneys is a matter of question. The vasa Malpighii (described under the DIGESTIVE SYSTEM) are diverticula of the alimentary canal, and their function was formerly believed to be that of the liver. Gall has, however, never been found in them, but on the contrary uric acid. This has also been found in the intestine and in the corpus adiposum.

2. In *Vertebrata*.—*a. The Reproductive System.*—Vertebrates are usually diœcious, but a few fishes—viz., the eels and certain Serrani—are hermaphrodites. The organs of the female are primarily an ovary; an oviduct may or may not be present. Thus in the *Leptocardii* the ovaries are collections of cells along the sides of the abdominal cavity, which drop their ova into it, which are discharged by an orifice anterior to the anus. In *Marsipobranchii* the structure is similar, except that the ovarian cells are collected into plate-like masses. In *Elasmobranchii* the ovaria are included in a peritoneal sac; occasionally, as in *Squalida* and *Scylliidæ*, there is but one, medial and symmetrical. The oviducts are here present, and are homologous with the tubæ Fallopii of mammals; each dilates into a uterus, and empties into a common pro-rectal cloaca. Their proximal ends are open and expanded, presenting the so-called fontanelles. In true fishes we have various structures: in the *Salmonidæ* and some *Clupeidæ* there are no oviducts, but the eggs fall into the abdominal cavity and are expelled through a pore. In most other fishes and in *Lepidosteus* the ovarian membrane is prolonged as an oviduct, and usually discharges externally without union with other canals; in *Lepidosteus* they enter the ureters. They are united in various Physoclysti. They are, as in *Elasmobranchii*, open as internal fontanelles in *Amia*, *Chondrostei*, and *Polyp-terus*; in all they have a common external opening with the ureters.

In *Batrachia* the tubæ Fallopii are proximally open, and extend in many coils far in front of the ovaries. They are distally united with the ureters. In *Reptilia*, *Aves*, and *Mammalia*, the oviducts (or tubæ Fallopii) are not ordinarily connected with the ovaries, but only at certain seasons by their trumpet-shaped fontanelles. In birds these organs are not developed on one side of the body. In reptiles, birds, and monotrematous mammals, the genital, urinary, and di-

gestive canals have a common exit or cloaca. In marsupials and placentals the genito-urinal excretory ducts are separated from the digestive, being in the female distinct or opening into a common vulva, but in the male are united for some length. In *Mammalia* the females are viviparous, and the ovum is hatched in expansions of the oviducts, or uteri. In marsupials these are separate, and the distal parts of the oviducts are not united into a vagina. In placental mammals, on the contrary, the oviducts unite, forming a single undivided vagina. In *Edentata* and *Glires* this union does not produce an expanded uterus, as the young are developed in the separate oviducts; but in higher mammals the enlarged oviducts unite into a muscular chamber, the uterus. A false uterus occurs in the kangaroos by the union of the cavities of the oviducts near the middle of their length; two opposite symmetrical curvatures are in contact, and their adjacent walls disappear: they then turn shortly back (forward in the animal) and make another short bend before they take a direction to the external orifice.

In placental mammals the embryo is attached to the wall of the uterus by a body called the placenta. It is on the chorion, and presents to the wall great numbers of villi, which interdigitate with corresponding processes from the mother. Both are furnished with abundant blood-vessels, which maintain intercommunication with each other, thus nourishing the embryo. As we descend the scale we only find a trace of this structure in some of the sharks. The allantois is an embryonic structure which characterizes exclusively vertebrates above and including *Reptilia*. The amnion is another sac, formed by the folding of the germinal layer of the embryo over its back; the edges of the folds then uniting, the two inner inclose the amniotic sac; the outer becomes the chorion. The amnion is absent, like the allantois, in all classes below *Reptilia*.

The placenta exhibits several distinct typical forms in *Mammalia*; it may be disciform or ring-like (zonary), or may be scattered in tufted bodies over the chorion (cotyledonary), or the villi may be scattered all over the same (diffuse). The orders of mammals may be thus arranged in this respect:

1. With decidua, placenta discoidal: *Primates*, *Chiroptera*, *Insectivora*, *Glires*, *Edentata* (*Orycteropidae*, *Dasyptidae*).

2. With decidua, zonary: *Carnivora*, *Proboscidea*, *Hyracoidea*.

3. Without decidua, cotyledonary: *Perissodactyla*, *Artiodactyla-Ruminantia*, *Edentata* (*Bradypidae*).

4. Diffuse: *Artiodactyla-Omnivora*, *Cetacea*, *Edentata* (*Manidae*).

The male organs are, in the early stages of growth, as in the lower animals, undistinguishable in structure from the female. They are homologous with the latter in details, even when most distinct. The relation may be thus expressed:

♂		♀
Testis.		Ovary.
Vas deferens,	}	Oviduct,
Uterus masculinus.		Uterus.
Cowper's glands.		Cowper's glands.
Penis.		Clitoris.
Serotum.		Labia majora.
Preputium.		Labia minora.

The vas deferens is, however, generally a persistent Wolffian duct, which in the embryo is the excretor of the embryonic bodies (Wolf's) which precede the kidneys. The Fallopian tube of higher mammals, on the other hand, is the persistent Müllerian duct, which passes outside of the former. In the batrachian *Urodela* the efferent ducts of the testis pass through the kidney and empty into a genito-urinary duct, while in *Salientia* (except *Discoglossidae*) they only pass through the edge of the kidney and discharge into the ureter.

Among reptiles the penis is present in the tortoises and crocodiles only, and in no lower forms; it is merely grooved beneath. In the ostrich it is quite similar. In the lower groups of birds it is present, but wanting in the more specialized; in *Mammalia* it is universal. It is composed of two superior bodies, the corpora cavernosa, originating from the pubis, and the corpus spongiosum, whose lower face embraces the urethral tube, and whose extremity forms the glans or head. The testes are almost universally situated near the kidneys, in the abdominal cavity, but in the higher mammals they descend from that position, and carrying a fold of the serous membrane (tunica vaginalis) and muscle

(cremaster), they are suspended externally, generally behind the penis; in *Marsupialia* in front of it. In some rodents and others this descent of the testes is periodical.

aa. Urinary organs.

Kidneys are present in the higher *Vertebrata*, inclusive of the *Reptilia*, but are supposed to be represented in *Batrachia* and fishes by structures which are embryonic in the former—i. e. the Wolffian bodies. The latter consists of two bodies, one on each side of the vertebral column, and are composed of transverse tubuli terminating in expansions which embrace convoluted capillaries, the "Malpighian tufts." The Wolffian tubules empty into the Wolffian duct, which extends along their outer side, and empties in the embryo into the allantois. The kidneys appear later in embryonic life, behind the Wolffian bodies, and have a similar structure. They also discharge by a duct on each side, which is distinct from the Wolffian, and constitutes the ureter. This discharges at first into the allantois, but with the approach of the lateral walls in the embryo, and the closing of the ventral fissure, a portion of the allantois is included, and becomes the urinary bladder.

The *Leptocardii* are not known to possess either Wolffian bodies or kidneys. In the Pisces the connection of the ureters with the oviducts is various. Thus in *Polypterus* they unite and enter a single tube, the united ureters. In *Lepidosteus* each ureter receives its corresponding oviduct; in *Amia* the oviducts are open proximally. In *Batrachia* the ureters are always connected with the oviducts. In the tailed order the ureter becomes a genito-urinary duct, because it receives the vasa efferentia of the testis, which pass through the kidney to reach it; it empties into the cloaca. In the *Salientia* the vasa efferentia enter the kidney, but do not reach the ureter, but are collected into a special duct analogous to the deferens, which enters the ureter at its lower part. This tube also receives the secretion of the kidneys, so that the original ureter becomes useless, and is atrophied in the frogs, or persists as a caecum in the toads. In the discoglossid frogs the arrangement is as in the salamanders. In the allantoid vertebrates the ureters discharge into the urinary bladder, which in turn empties by a single urethra, of greater or less length, into a genito-urinary chamber in the higher *Mammalia*, or the cloaca in the other classes. It is continued throughout the penis in those males that possess that organ. The kidneys in most *Carnivora*, in the *Cetacea*, and some *Artiodactyla*, are lobulate, or like a bunch of grapes in form, as is seen in the embryos of man and other mammals. In the cats (*Felidae*) the divisions are not visible externally.

The osseous system will be discussed in an article especially devoted to that subject.

EDWARD D. COPE.

Anaxagoras (Ἀναξαγόρας): Greek philosopher of the Ionian School; b. at Clazomenæ, near Smyrna, about 500 B. C. He passed nearly thirty years at Athens, to which he removed about 480, and enjoyed the friendship of Pericles. He wrote a *Treatise on Nature*, of which small fragments are extant. In 450 B. C. he was accused of impiety, and, though defended by Pericles, was condemned to death or banishment, and retired to Lampsacus, where he died in 428 B. C. He appears to have maintained the eternity of matter. Combining great sagacity and close reasoning with diligent observation, he rendered important services to physical science. He ascribed the origin of the world and the order of nature to the operation of an eternal self-existent and infinitely powerful principle which he termed Nous (Mind). He taught that generation and destruction are only the union and separation of elements which can neither be created nor annihilated, demonstrated that air is a substance, explained the theory of eclipses, and refuted the doctrine that things may be produced by chance. See Erdmann's *History of Philosophy*.

Anaxarchus (Ἀναξαρχος): a Greek philosopher; b. at Abdera, in Thrace; accompanied Alexander the Great in his expedition against Persia in 334 B. C. He gained the favor of that prince, whom he survived a short time.

Anaximander (Ἀναξίμανδρος): Greek philosopher; b. at Miletus about 610 B. C.; was a disciple of Thales. He is said to have discovered the obliquity of the ecliptic, and to have invented the sun-dial. According to tradition, he taught that the earth is a cylinder, that the sun is a globe of fire as large as, or larger than, the earth, and that infinity is the beginning and end of all things. He appears to have been the first Greek who wrote any work in prose on geometry or philosophy. D. about 546 B. C.

Anaxim'enes (Ἀναξίμενης): a Greek philosopher of whom little is known; b. at Miletus, in Asia Minor; date uncertain. He taught that the original principle or primary form of things was air, or a subtle ether which is in perpetual motion.

Anaximenes of Lampsacus: a Greek historian and preceptor of Alexander the Great, about 340 B. C. He wrote a history of the reign of Philip of Macedon, and another of the exploits of Alexander, neither of which is extant. To this Anaximenes is attributed, by Spengel, the *Ars rhetorica ad Alexandrum* found among the writings of Aristotle.

Ancachs': a department of Peru; bounded N. by the department of Libertad, E. by Huanuco and Junin, S. by the department of Lima, and W. by the Pacific. The department extends from the Andes to the Pacific, and contains all climates and their products. The chief occupations of the inhabitants are agriculture and the raising of cattle. A railroad extends from Chimbote to the capital, Huaraz. The rich silver mines in the mountains, as well as the rivers containing gold, are but very little worked at present. Area, 17,405 sq. miles. Pop. 284,091.

Ancelet, JACQUES ARSÈNE FRANÇOIS POLYCARPE: French dramatic poet; b. at Havre, Feb. 9, 1794; produced in 1819 a tragedy entitled *Louis IX.*, which was warmly applauded, and procured for him a pension of 2,000 francs. Among his other works are an epic poem called *Marie de Brabant* (1825); *Fiesque*, a tragedy (1824); and *Olga*, a drama (1828). He was admitted into the French Academy in 1841. D. at Paris, Sept. 7, 1854.

His wife, MARGUERITE VIRGINIE CHARDON, b. at Dijon, Mar. 15, 1792, was a novelist and an artist. She wrote several dramas and tales. D. at Paris, Mar. 21, 1875.

An'cestor [O. Fr. *ancestre* < Lat. *anteces'sor*, predecessor; *ante*, before + *ce'dere*, go]: one who has preceded another in the direct line of descent. In law it signifies one from whom an estate has been derived by inheritance; a deceased person from whom, on account of his decease, an estate has passed to another, called an heir, by operation of law. Ancestor and heir are correlative terms. A brother may be the ancestor of a brother, or a child of a father, wherever those persons can take land from such relatives by inheritance.

Ancestor-worship: See ANIMISM.

Ancestry of Plants: It is evident that the present vegetation of the earth is descended from previous vegetation. It is, moreover, certain that as we go back in time the vegetation is less and less like that of the present. A study of the preglacial plants shows that they were much like those of the present, but still with marked differences. Eocene plants were less like present plants, and cretaceous plants still less. As we come from the past toward the present, there is such a relation between the plants of successive periods as can best be explained by supposing that the later descended from the earlier.

On structural grounds we may suppose that the green algae (*Chlorophyceæ*) have descended from the water slimes (*Schizophyceæ*); that from the green algae have descended the brown algae (*Phaeophyceæ*) and red algae (*Florideæ*); while from the latter have come the stoneworts (*Charophyceæ*) and mossworts (*Bryaceæ*). The fernworts (*Pteridophytes*) are closely related to the lower mossworts, and may have originated from them, or with them. Gymnosperms appear to be slightly modified lycopods. Whether the angiosperms descended from the lycopods or the gymnosperms is questionable. The primitive monocotyledons and dicotyledons were probably much alike. Their flowers probably had many parts, all free, as in water-plantains (*Alisma*) and buttercups (*Ranunculus*). From these simple types arose, among monocotyledons, the lilies, irises, and orchids; and among the dicotyledons, the crucifers, pinkworts, mallows, geraniums, roses, beans, passion-flowers, heaths, gentians, figworts, mints, bell-flowers, and composites, by various kinds and degrees of union of parts. On the other hand, by a reduction and simplification—in short, by a catagenesis as to floral structure—there appeared among monocotyledons the aroids, palms, sedges, and grasses, and among the dicotyledons, chenopods, amaranths, spurgeworts, nettleworts, oaks, walnuts, and willows. CHARLES E. BESSEY.

Anchi'ses (Gr. Ἀγχίσης): Trojan prince related to Priam: was, according to tradition, a favored lover of Venus, and the father of Æneas, with whom he escaped from Troy. He is said to have died in Sicily.

Anchisaurus: a genus of small, carnivorous Dinosaurs from the Triassic. These extinct reptiles are of special interest, because they are now supposed to be the animals that made many of the so-called "bird-tracks" found in the Connecticut valley. They walked mainly on their hind legs, and the structure of the hind feet shows that the impressions thus made would be very similar to the three-toed footprints formerly regarded as made by birds. Several skeletons of this genus and of an allied form, *Ammosaurus*, are preserved in the Yale Museum. Remains somewhat similar have been found in various parts of the world. O. C. MARSH.

Anch'or: an iron implement used to hold a vessel in place in comparatively shallow water. It consists of a round, straight bar called the *shank*, at the upper end of which is a transverse piece called the *stock*, and of two curved arms at the lower end of the shank, each of which arms terminates in a triangular plate called a *fluke* or *palm*. The junction of the two arms is the *crown*. The stock is at right angles to the plane of the flukes. The cable is fastened to a ring in the upper end of the shank. When the anchor is let go, the crown first strikes the ground. The anchor then falls over, so that one end of the stock rests upon the ground, and the movement of the ship causes the anchor to cant and one of the flukes to enter the ground, and to penetrate deeper in proportion as the strain or traction on the cable increases. In one form of anchor the arms are pivoted to the shank, instead of being rigidly fixed. Men-of-war and large merchantmen carry two large anchors of equal size at the bows, thence called bower anchors, and two of smaller size, called the sheet anchor and spare anchor. For particular and special services they have also the "stream" and the "kedg" anchor. Smaller vessels have fewer anchors and of inferior size. When one anchor is down, the ship is said to be at single anchor. When the anchor is dragged out of the ground by the movement of the vessel, it is said to come home, and when the cable becomes twisted around the anchor it is said to be foul. *To weigh anchor* signifies to heave up or raise the anchor out of the ground to the bow. Revised by S. B. LUCE.

Anch'orage: a body of water where ships may anchor. The water should not be too deep, as in that case the cable, extending nearly vertically, will be apt to pull the anchor out of the ground. The bottom that holds best is sand or stiff clay. The term is also applied to the toll or harbor dues which the owner or captain of a ship pays for permission to east anchor.

Anchor-ice, also called *ground-ice* and *ground-gru*: ice which forms at the bottom of streams or lakes, but also often applied to ice in the water below the surface. In the first case it sometimes brings up anchors when it rises, in the latter it clogs up water-wheels, screens, and pipes. It is of various origin. Sometimes the bottom of a body of water is below the freezing-point, in which case there may be ice at both the bottom and top of the stream. Sometimes the whole mass of water is below freezing, but the wind or the current keeps crystals from forming, except at the bottom or, with a slow current, through the mass. At other times eddies break up the ice and carry it into the water, or large flakes (or small masses) of snow form nuclei for ice in very cold water. M. W. H.

Anch'orite, or **Anch'oret** [from Gr. ἀναχωρητής, deriv. of ἀναχωρεῖν, retire; ἀνα-, back + χωρεῖν, withdraw]: a hermit or person who has retired from the world and devoted himself to ascetic religion in solitude. The term was first applied to Christians of the third century who retired to caves and solitary places in the deserts of Palestine, Egypt, and Syria, to which, in some cases, they were driven by persecution. They often subjected themselves to painful privations and various forms of penance. The first of these anchorites was Paul of Thebes, who died in 340, aged 104 years. The so-called "father of monachism" was Antony of Coma, in Upper Egypt, who was born in 251 and died in 356, aged 105 years. One anchorite, Simeon Stylites, is said to have lived many years on the top of a pillar in Syria, about 420–450 A. D. The chief difference between an anchorite and a monk is that the former lived alone, and the latter associated with other monks. The first monastery was founded by Pachomius, on the island of Tabenna in the Nile, about the year 340; the first nunnery, some eight years later.

Ancho'vy (*Stolephorus encrasicolus*): a small fish, from 5 to 7 inches long, which abounds in the Mediterranean Sea and the Atlantic shores of Europe. It belongs to the

Stolephoridae, a family related to the herrings, and is distinguished by a sharp-pointed head, the upper jaw longer



Anchovy.

than the lower, and the deeply cleft mouth extending behind the eyes. It is salted and packed in small barrels for exportation, and used for sauces, pastes, etc. Many other species of anchovy are found in U. S. waters, some of them of value as food.

Revised by D. S. JORDAN.

Anchovy-pear (*Gri'as cauliflo'ra*): a tree of the family *Myrtaceae*, which grows in the West Indies in moist ground or shallow water. It bears a fruit (a drupe) which is pickled and used for food.

Anchylosis: See ANKYLOSIS.

Ancient Order of United Workmen: a secret order, having three degrees, composed of men of all useful professions and occupations. It is purely fraternal and benevolent in its teachings and practice, and has no connection or affiliation with any of the labor organizations of the day. The principal feature of the order is its beneficiary fund, by means of which, in case of death, a stipulated sum is paid to each member's family or such person or persons as he has designated. The order originated in Meadville, Pa., Oct. 27, 1868. It now has grand lodges in California, Iowa, Indiana, Illinois, Kentucky, Minnesota, Missouri, Michigan, New York, Tennessee, and Wisconsin, and subordinate lodges in other States.

Ancients, Council of: in French history, one of the two assemblies composing the legislative body in 1795-99. It consisted of 250 members, each of whom had to be at least forty years old. It was dissolved by the revolution of the 18th Brumaire.

Ancile (plu. *Ancilia*): the shield of Mars, which, according to tradition, fell from heaven in the reign of Numa, when an oracle declared that Rome could never be taken while this shield remained in that city. Numa committed it to the custody of the Salii or priests of Mars, and had eleven other shields made precisely like it in order to prevent the genuine shield from being stolen.

Ancillon, an-sē-yon', JOHANN PETER FRIEDRICH: German historian and statesman, of French extraction; b. in Berlin, Apr. 30, 1767. He was the pastor of a Protestant church in that city in the former part of his mature life. In 1801 he published *Mélanges of Literature and Philosophy*. His principal historical work is a *View of the Revolutions of the Political System of Europe since the Fifteenth Century* (in French, 4 vols., 1803-05), which was very successful. He was soon appointed royal historiographer and councilor of state. In 1831 he became Minister of Foreign Affairs. Although Ancillon had the reputation of a certain liberality, he managed affairs in a very reactionary spirit and in close sympathy with the policy of Austria. D. in Berlin, Apr. 19, 1837.

Anco'na: a province of Central Italy; bounded N. by Pesaro and Urbino, E. by the Adriatic, S. by Macerata, and W. by Perugia. Area, 736 sq. miles. The country is chiefly mountainous, and is traversed by the Esino and Musone. The chief articles of export are grain, oil, wine, and hazelnuts. The chief branch of industry is the silk manufacture. Chief town, Ancona. Pop. (1879) 273,351; (1890) 271,910.

Ancona [Gr. ἀγκών, angle, alluding to its position on the coast]: an important city and seaport of Central Italy; on the Adriatic; 132 miles by rail N. E. of Rome; capital of the province of Ancona (see map of Italy, ref. 4-E). It is built on the slope of a hill, and presents a picturesque appearance from the sea. It is supposed to have been founded about 400 B. C. Among the remarkable public buildings are a cathedral, the government palace, the town-house, and a triumphal Corinthian arch which was built by Trajan of white marble. It has a college, ten churches, and several convents. The harbor is one of the best on the Adriatic. In 1732 it was declared a free port. Ancona is connected by railways with Rome, Bologna, and Brindisi. It has considerable trade, carried on by steamships which ply between

this point and the Levant. The chief articles of export are wool, grain, silk, oil, alum, sulphur, fruit, and soap. Ancona was taken in 1832 by the French, who occupied it until 1838. Lat. 43° 38' N., lon. 13° 30' E. Pop. 48,572.

Ancona, ALESSANDRO, d': Italian critic and Romance philologist; b. in Pisa, 1835; studied in Florence and Turin. He took an active and patriotic part in the exciting political events which ended in Italian independence; but immediately after the peace of Villafranca he withdrew from public life and devoted himself to studies. In 1861 he became Professor of Italian Literature in the University of Pisa, taking the place left vacant by the resignation of De Sanctis. Here he soon became a power in furthering the new science of Italian, and Romance philology in general. His publications have been numerous, and his pupils (among them Rajna, Vitelli, D'Ovidio) have become in their turn leaders. Among the works of D'Ancona are especially noteworthy: *I precursori di Dante* (1874); *Origini del Teatro in Italia* (1877); *La Poesia popolare italiana* (1878); *Varietà storiche e letterarie* (two series, 1883-85); *Studi sulla letteratura italiana de' primi secoli* (1884). A. R. MARSH.

Ancre, LE MARÉCHAL, d' (originally *Concino Concini*); Italian courtier; b. at Florence. He formed part of the retinue of Maria de Medici (queen of Henry IV. of France) when she went to Paris in 1600, and he married Eleonora Galigai, who had much influence with that queen. His talents for intrigue and the favor of the queen (who in 1610 became regent) raised him suddenly to power. In 1613 he was appointed a marshal of France and Prime Minister. Having excited general odium by his rapacity, he was assassinated at Vitry, April 24, 1617, by De Luynes and other conspirators.

An'ens Mar'tius: fourth King of Rome; a grandson of Numa; succeeded Tullus Hostilius about 640 B. C. He promoted the religious institutions of Numa, and is considered the founder of the plebeian order. He waged war against the Latins, whom he subdued, founded Ostia, and built the Pons Sublicius (Bridge of Piles). D. about 616 B. C.

Ancy'ra (Gr. Ἄγκυρα): an ancient city of Galatia, in Asia Minor; said to have been built by Midas; about 30 miles W. of the river Halys. Under the Roman empire it was an important city and the capital of Galatia. It had a famous temple of Augustus in which was the *Monumentum Ancyranum*. Its site is occupied by the modern city of ANGORA (q. v.). Two councils of the Church were held there—one in 314 and the other in 358 A. D.

Andalu'sia (formerly called *Vandalusia*, from the Vandals; Sp. *Andaluc'ia*): the southern portion of Spain; bounded N. by Estremadura and La Mancha, E. by Murcia and the Mediterranean, S. by the Mediterranean, W. by Portugal and the Atlantic Ocean. It is supposed to correspond to the *Tarshish* (the western) of the Bible and the *Batica* of the Romans. The Sierra Morena extends along the northern border, and the southern part is traversed by the Sierra Nevada, the highest summits of which rise about 11,000 feet above the sea. The largest river is the Guadalquivir, which flows southwestward and enters the Atlantic. The soil of the valleys and plains is fertile. Silver, copper, iron, lead, and mercury are found here. The chief products are grain, cotton, wine, wool, sugar, olives, oranges, and figs. The climate is delightful. The Andalusian breed of horses has long been celebrated. Andalusia is divided into eight provinces—viz., Almería, Granada, Jaen, Cadiz, Córdoba, Málaga, Huelva, and Sevilla. It corresponds to the kingdoms of Seville, Jaen, Córdoba, and Granada, into which the Moors divided the southern part of Spain. Area, 33,802 sq. miles. Pop. (1887) 3,429,813.

Andalu'site: an anhydrous silicate of alumina, which is found in Andalusia and other places, and occurs in four-sided prisms. It may be distinguished from felspar by its greater hardness and infusibility. A peculiar variety called chiastolite or macle is very abundant at South Lancaster, Mass. It occurs in stout crystals, having the axis angles of a different color from the rest, exhibiting a tessellated appearance on the cross section. See Dana's *System of Mineralogy*, 5th ed.

Andaman' Islands: a group of small, densely wooded islands; in the Bay of Bengal; between lat. 10° and 13° N., and about 93° E. lon. (see map of S. India, ref. 6-K). Area, 1,760 sq. miles. They are 180 miles S. W. of Cape Negrais. The inhabitants are in the lowest stage of barbarism, and are said to resemble none of the races of the adjacent parts

of Asia. It has been used as a penal colony for Hindus by Great Britain. The Earl of Mayo, the Governor-General of India, was murdered here by a convict on Feb. 8, 1872. The population numbers (1901) 24,499, including about 6,000 natives. The chief settlement is Port Blair. The two groups, Andaman and Nicobar, have been united under a commissioner at Port Blair. Both groups are in communication with Calcutta by steamer.

Andante [Ital. pres. participle of *anda're*, go]: an Italian musical term indicating the time in which a piece is to be performed. It denotes a movement that is moderate, rather slow and sedate, but distinct and flowing.

Andaques Wax: See **WAX**.

Andenne, aân'den': town of Belgium; province of Namur; on or near the Meuse, and on R. R. from Namur to Liège; 12 miles by rail E. of the former (see map of Holland and Belgium, ref. 11-F). Porcelain and tobacco-pipes are made here. Pop. 7,114.

An'derlecht: a market-town of Belgium; province of Brabant; 10 miles S. W. of Brussels (see map of Holland and Belgium, ref. 10-D). It has breweries and large dyeing establishments. Pop. 17,729.

An'dersen, CARL: Danish lyric poet; b. in Copenhagen, Oct. 26, 1828. At the age of nine he went to Iceland, where he resided until 1848, when he returned to Copenhagen. He wrote the words for Gade's famous musical compositions, *The Crusaders* and *Kolanus*. *Over Skjær og Bræding* (Over Sherry and Beaker) contains a series of sketches of life in Iceland. D. in Copenhagen, Sept. 1, 1883.

R. B. ANDERSON.

Andersen, HANS CHRISTIAN: Danish poet and novelist; b. at Odense, in the island of Fünen, Apr. 2, 1805; son of a poor shoemaker, who died when Hans was nine years old. In 1819 he went to Copenhagen to seek employment in the theater, but was rejected because he was too lean. Before this period he had written several tragedies and poems, among which was the *Dying Child*. He made various unsuccessful efforts to obtain employment, and passed several years in adversity until he found generous friends, who in 1828 placed him in the university, where he was educated at the public expense. In 1830 he published a volume of his collected poems. His friends procured for him a royal stipend, and in 1833 he visited Italy. He recorded his impressions in *The Improvisatore* (1834), which is unrivaled as a picture of scenery and manners. He afterward traveled extensively in Europe and the East. He related some episodes of his early life in a book entitled *Only a Fiddler* (1837). Among his other works are *The Poet's Bazaar* (1842); *Ahasuerus*, a drama; *The Two Baronesses*, a tale in English, all of which display original genius and a rich imagination; but by far the most popular of his works is his *Tales* (first collection, 1835), of world-wide reputation, translated into many languages, and enjoyed by all classes on account of their humor, imagination, and simplicity. The *Tales* gave him his note as the Children's Friend. His works have been translated into many languages. See Hans Andersen, *True Story of My Life* (in German, 1847, continued to his death by Jonas, 1879). D. in Copenhagen, Aug. 4, 1875.

Revised by S. M. JACKSON.

An'derson: city; five railroads; capital of Madison co., Ind. (for location of county, see map of Indiana, ref. 6-F); on the West Fork of White river; is a manufacturing city, having a hydraulic canal with 44 feet fall. It has a number of natural-gas wells. Pop. (1880) 4,126; (1890) 10,741; (1900) 20,178.

EDITOR OF "INTELLIGENCER."

Anderson: on railroad; capital of Anderson co., S. C. (for location of county, see map of South Carolina, ref. 4-C); has five churches, and is the seat of Patrick Military Institute, Anderson Female College, and a high school for boys and girls. Principal industries include a cotton-mill and a shoe-factory. Pop. (1880) 1,850; (1890) 3,018; (1900) 5,498.

EDITOR OF "BULLETIN."

Anderson, ALEXANDER, M. D.: b. in New York city, Apr. 21, 1775; graduated in 1796 as M. D. at Columbia College, but practiced only two years, and became the earliest wood-engraver in the U. S. He made the cuts for Webster's *Spelling Book*, illustrations for an edition of Shakspeare, and published an illustrated *General History of Quadrupeds* (1804). D. at Jersey City, Jan. 17, 1870.

Anderson, GEORGE B.: b. at Wilmington, N. C., in 1831; graduated at West Point 1852; became first lieutenant of

the Second Dragoons in 1855; adjutant 1857; resigned Apr. 25, 1861; was made a brigadier-general in the Confederate army; commanded the defenses of the coast of North Carolina in Nov., 1861; led a brigade at the battle of Antietam, and received a wound which caused his death at Raleigh, N. C., Oct. 16, 1862.

Anderson, JAMES, M. D.: was physician-general of the army of the East India Company at Madras in the latter part of the eighteenth century. He was famous for the zeal and ability he manifested in his persistent efforts to introduce the cochineal, silkworm, mulberry-tree, etc., into Hindustan, and he published letters on these subjects to Sir Joseph Banks and others. D. Aug. 5, 1809.

Anderson, JAMES, LL. D.: Scottish writer on political and rural economy; b. at Hermiston, near Edinburgh, in 1739. He was a practical as well as a scientific farmer, and introduced the use of an improved form of plow. In 1777 he published *Essays Relating to Agriculture and Rural Affairs* (3 vols.). He removed to Isleworth in 1797, and there issued a monthly periodical called *Recreations in Agriculture, Natural History*, etc. (1799-1802), in which he anticipated the famous theory of rent afterward adopted by Malthus and Ricardo. D. there Oct. 15, 1808.

Anderson, JOHN, F. R. S.: Scottish naturalist; b. at Roseneath, Dumbartonshire, in 1726; educated in the University of Glasgow. He became in 1760 Professor of Natural Philosophy in that institution. In 1786 he published a valuable work entitled *Institutes of Physics*. He gave gratuitous scientific lectures to the working-classes for many years. By his last will he founded a useful institution (in Glasgow) called Andersonian University, or Anderson's College. Its curriculum corresponds to that of Glasgow University, except that there is no instruction in theology, but the object is to attract the masses. From small beginnings it has grown to its present proportions, with its staff of twenty professors and lecturers and its thousand students. The original endowment has been greatly increased by recent gifts from Scotch philanthropists. D. at Glasgow, Jan. 13, 1796.

S. M. JACKSON.

Anderson, JOHN, M. D., LL. D., F. R. S., etc.: physician; b. in Edinburgh, Oct. 4, 1833; M. D., University of Edinburgh, 1862; appointed superintendent of the Indian Museum in Calcutta in 1865; afterward called to the chair of comparative anatomy in the Medical College, Calcutta; scientific officer of two government expeditions to Western China in 1868 and 1874; retired from the Indian service in 1887; author of *Mandalay to Momien*; *Catalogue of the Mammalia in the Indian Museum*; *Handbook to the Archaeological Collections of the Indian Museum, Calcutta*, etc.

C. H. T.

Anderson, JOSEPH: b. near Philadelphia, Nov. 5, 1757; was an officer in the Revolutionary war; became a lawyer, was appointed a territorial judge by Washington (1791), was U. S. Senator from Tennessee (1797-1815), and first comptroller of the U. S. treasury (1815-36). D. in Washington, D. C., April 17, 1837.

Anderson, LARS: See **ANDRÆ (LAURENTIUS)**.

Anderson, MARTIN BREWER, LL. D., L. H. D.: of Scotch-Irish descent on his father's side; b. at Brunswick, Me., Feb. 12, 1815; graduated at Waterville College (now Colby University), Waterville, Me., in 1840; was tutor in the college two years, and then Professor of Rhetoric nearly seven years. In 1850 he removed to New York city and became editor-in-chief, and in part proprietor, of the *New York Recorder*, a weekly Baptist newspaper. In 1853 he was chosen president of Rochester (N. Y.) Baptist University, which position he resigned in 1888. He published many review articles, addresses, and educational papers. See his life by Asahel C. Kendrick. D. at Lake Helen, Fla., Feb. 26, 1890.

Anderson, MARY: actress; b. at Sacramento, Cal., July 28, 1859; educated at the Ursuline convent in Louisville, Ky., and determined, when only thirteen years of age, to devote herself to the art of acting. Having met with Charlotte Cushman, the celebrated tragedian, in Cincinnati in 1874, she went to New York to take lessons in elocution and other dramatic requirements, and about a year after her return to her native place she made her *début* there as Juliet, Nov. 27, 1875, with great success. After visiting all the principal cities of the U. S., she in 1883 went to England, where she also played with success. In 1890 she was married to Antonio F. de Navarro. She has since retired from the stage.

Revised by B. B. VALLENTINE.

Anderson, RASMUS BJÖRN: author; b. at Albion, Wis., of Norwegian parentage, Jan. 12, 1846; educated at Luther College and University of Wisconsin; Professor of Scandinavian Languages and Literature, University of Wisconsin, 1873-84; U. S. minister to Denmark, 1885-89; author of *Norse Mythology* (5th ed. 1890); *America Not Discovered by Columbus* (1874); *Norse Mythology* (1875); *The Younger Edda*; and has made numerous translations, notably one of the works of Björnson in 7 vols.

C. H. T.

Anderson, RICHARD HERRON: soldier; b. in South Carolina, Oct. 7, 1821; was graduated at West Point in 1842; served in the Mexican war; resigned as captain of dragoons, Mar. 3, 1861, to accept a commission in the Confederate army; major-general (C. S. A.), Aug., 1862; lieutenant-general (C. S. A.), May, 1864; he commanded a division at Gettysburg. D. in Beaufort, S. C., June 26, 1879.

Anderson, ROBERT, M. D.: Scottish biographer; b. in Lanarkshire, Jan. 7, 1750; became a resident of Edinburgh in 1784; wrote a *Life of Dr. Johnson*, and published a good edition of *The Works of the British Poets, with Prefaces Biographical and Critical* (14 vols., 1792-1807). D. at Beaufort, S. C., Feb. 20, 1830.

Anderson, ROBERT: soldier; b. near Louisville, Ky., June 14, 1805; graduated at West Point, 1825; and May 15, 1861, brigadier-general U. S. A. His father was colonel in the Revolutionary army, and his mother a cousin of Chief Justice Marshall. He was private secretary 1825-26 to a relative upon his mission as U. S. minister plenipotentiary to the republic of Colombia, served at artillery school for practice 1826-28, chiefly on ordnance duty 1828-35, assistant inspector-general of Illinois volunteers in the Black Hawk war 1832, engaged at the battle of Bad Axe, at Military Academy as instructor of artillery 1835-37, in Florida war 1837-38 (brevet captain), in several actions, as aide-de-camp to Maj.-Gen. Scott while removing Cherokees to the West 1838, as assistant adjutant-general eastern department 1838-41, chiefly in garrison 1845-53, in war with Mexico 1847, engaged at Vera Cruz, Cerro Gordo, Amozoque, and Molino del Rey (severely wounded and brevet major), member of artillery boards 1841-60, governor of Harrodsburg Military Asylum 1853-54, inspector of ironwork for public buildings 1855-59; in command of defenses of Charleston harbor, S. C., 1860-61. In the civil war, after evacuating Fort Moultrie, he moved to Fort Sumter, which he surrendered after a heavy bombardment, Apr. 12-13, 1861 (brevet major-general); in command of department of Kentucky and of the Cumberland 1861, which his shattered health compelled him to relinquish. Till he was retired from active service, Oct. 27, 1863, he performed but little duty. He translated *Instructions for Field-Artillery, Horse and Foot* (1840), and *Evolutions of Field-Batteries* (1860). In vain he sought restoration for health abroad, his strength gradually failing till he died Oct. 26, 1871, at Nice, France, aged sixty-six.

Anderson, RUFUS, D. D., LL. D.: b. at North Yarmouth, Me., Aug. 17, 1796; graduated at Bowdoin College in 1818; and studied theology at Andover 1819-22. In 1824 he became assistant secretary, and in 1832 corresponding secretary of the American Board of Foreign Missions, which position he filled with distinguished ability for thirty-four years. He visited officially a part of the Mediterranean missions 1828-29, and another part 1843-44, the Indian missions 1854-55, and the Sandwich islands in 1863. At the age of seventy he resigned his position in the Board of Missions (1866), at which time, without any previous knowledge on his part, he was presented, as a testimonial to his faithful and meritorious services, with \$20,000 (contributed chiefly by the merchants of New York and Boston), which sum he made over to the board, reserving to himself the right to draw from it whatever might be necessary for his support. Among Dr. Anderson's numerous publications may be named: *Observations on the Petopounnesus and Greek Islands* (Boston, 1830); *The Hawaiian Islands, their Progress and Condition under Missionary Labors* (Boston, 1864); *A Heathen Nation Evangelized: History of the Mission, etc., to the Sandwich Islands* (1870); *History of the Missions of the American Board of Commissioners for Foreign Missions to the Oriental Churches* (1872). He was one of the founders of Mt. Holyoke Female Seminary, at South Hadley, Mass., several years president of trustees of Bradford Academy, Mass., and also a member of the board of trust of Andover Seminary, Mass. D. in Boston, May 30, 1880.

Anderson, WILLIAM, D. C. L.: civil engineer; director-general of ordnance-factories of the United Kingdom; b. in St. Petersburg, Jan. 5, 1835; educated at the High Commercial School in that city, and when he left in 1849 was head of the school, silver medallist, and, although a British subject, the freedom of the city was conferred on him. In 1849 he became a matriculated student in the department of applied sciences in King's College, London, leaving in 1851 with the degree of associate. He was then for three years a pupil of Sir William Fairbairn & Sons, being employed chiefly on important outwork. From 1855 to 1864 he was a partner of Courtney & Stephens, Dublin, building bridges, cranes, and railway appliances. In 1863 he became president of the Institution of Civil Engineers of Ireland. In 1864 he entered the firm of Easton & Amos, London, and later became the head of the house of Easton & Anderson. He is a member of the council of the Institution of Civil Engineers, vice-president of the Institute of Mechanical Engineers, visitor of the Royal Institute, and vice-president of the Society of Arts. He translated the remarkable work of Chernoff *On Steel*; the researches of Gen. Kalakonstki on *Internal Stresses in Cast Iron and Steel*; author of lectures on the *Generation of Steam*; on *Hydraulic Machinery*; on the *Monerieff Hydro-pneumatic Gun-carriage*; and *On the Conversion of Heat into Work*. In August, 1889, he was made director-general of the Royal Ordnance-factories. In 1889 he was president of Section G of the British Association. The University of Dublin has conferred on him the honorary degree of D. C. L.

WILLIAM R. HUTTON.

Andersonville: near Anderson R. R. sta., Sumter co., Ga.; (for location of county, see map of Georgia, ref. 5-G); 11 miles N. E. of Americus. During the civil war it was the site of a Confederate military prison for Federal soldiers. The mortality at this prison was very great; 12,926 prisoners of war died here. One Henry Wirtz, a Swiss adventurer, was the superintendent of the prison, and after the close of the war he was tried and convicted by a military commission on charges of excessive cruelty to the prisoners, and was executed Nov. 10, 1865. The Confederate authorities, in at least two official reports, attributed the excessive mortality to the bad management of the prison. Andersonville is now the site of a national cemetery, in which the deceased Union soldiers are buried. The cemetery is well laid out, trees have been planted, and the names of most of the dead have been ascertained and inscribed on headboards. Pop. (1880) 308; (1890) not given; (1900) 245.

Andersson, NILS JOHAN: Swedish botanist; b. at Gördseruan, Sweden, Feb. 20, 1821. He traveled extensively in Lapland and other parts of Scandinavia, and made a journey around the world 1851-53. His works are *En Verldsomsegting* (1853-54); *Satices Lapponice* (1845); *Cyperaceæ et Gramineæ Scand.* (1849-52); *Om Gatapagosöarnes Vegetation* (1854); and *Monographia Salicium* (1867). D. at Lund, Mar. 27, 1880.

R. B. ANDERSON.

Anderton, THOMAS: an English amateur musician who has gained an estimable reputation by his choral compositions. His first work of importance was *The Song of Deborah and Barak* (1871). His cantata *The Wreck of the Hesperus* (1882) is a fine setting of Longfellow's poem, and this same poet furnished the text for his next cantata, *The Norman Baron* (1884). For the Birmingham festival of 1885 he composed the cantata *Yule Tide*, which was performed with much success, and has been sung several times in the U. S. Mr. Anderton was born about the middle of the nineteenth century, and is much interested in the promotion of English choral music.

D. E. HERVEY.

An'des [Sp. *Cordille'ra de los An'des*; possibly from Peruvian *anti*, meaning metal or gold, or *Autis*, the name of a tribe resident in the mountains]: a South American range of mountains, one of the most prominent features of the globe. It extends along the western border of the entire continent, nearly parallel to the Pacific coast, from the Strait of Magellan to the Isthmus of Darien, a distance of about 4,500 miles. In length it far exceeds every other mountain-chain on the earth. The general direction of this chain is nearly north and south. The southern part of the Andes, for a distance of about 1,000 miles, consists of a single range or ridge, extending through Patagonia. North of that the system may be described as a basal mass with capping ridges called *cordilleras*. The Patagonian Andes rise to the height of 8,000 feet. The Chilean Andes, southward from 27° S., have an average width of about 130 miles, and in some places

are not more than 100 miles from the Pacific. The highest summit of the Chilean Andes, and probably of the whole chain, is the porphyritic Nevado of Aconcagua, which rises 22,900 feet above the level of the sea, and is about 100 miles N. E. of Valparaiso. In Chili also occur the volcanic peaks of Tupungato, 20,270, and Maypu, 17,764 feet high. The line of perpetual snow in the Andes of Northern Chili is about 14,000 feet above the sea.

About lat. 27° S. there are two *cordilleras*, which continue with some regularity northward into Colombia, where three are formed. In Bolivia and Peru these are called the Cordillera of the Coast and the Cordillera Real. The former extends northwestward along the coast of Peru, the summits of the range being about 100 miles from the ocean. The Cordillera Real, which traverses Bolivia, and is about 250 miles from the other range, is nearly equal in height to the Chilean Andes. The peak of Illampu, in Bolivia, has an altitude of 21,500 feet. These two parallel cordilleras are connected at several points by transverse ranges or groups called *knots*, and inclose the table-land of Desaguadero and Lake Titicaca, which is 12,800 feet above the level of the sea. The highest summit of the Peruvian Andes is the volcano of Arequipa, 20,300 feet high, and 55 miles from the Pacific coast.

Proceeding northward, we come next to the Andes of Ecuador, or Andes of Quito, which extend from lat. 5° S. to the table-land of Quito, inclosed between two ranges of enormous volcanoes. Among these the highest are Chimborazo, 20,545 feet, and Cotopaxi, 19,498 feet (Humboldt says 19,069). The form of the latter is that of an almost perfect cone. "Among all the volcanoes that I have seen," says Humboldt, "the conical form of Cotopaxi is the most beautifully regular." See COTOPAXI.

There are a number of passes which cross the Andes, but all at a great elevation, and mostly dangerous as well as arduous. Several passes among the Peruvian and Bolivian Andes are about 15,000 feet above the sea, and the lower passes are not less than 12,000 feet. A railway is nearly completed (1893) across the South American continent, crossing the Andes S. of Aconcagua.

Minerals.—The rocky foundations of these grand barriers are granite, gneiss, mica-slate, greenstone, porphyry, quartz, and other metamorphic rocks. Humboldt saw in Peru vast masses of quartz 7,000 or 8,000 feet in height. The Andes are celebrated for their mineral riches, consisting of large quantities of gold and silver. Platinum, mercury, copper, tin, and iron are also found among them. The most productive gold mines are in Peru and New Granada; the silver mines of Potosi are among the richest in the world. Few parts of the globe are subject to so frequent and destructive earthquakes as the countries adjacent to the Andes and inclosed between its different ranges. The cities of Quito, Lima, Callao, and Valparaiso have been nearly ruined by them in recent times. The number of volcanoes among the Andes is about fifty, thirty-six of which are classified as active, and the others are doubtful, not having been seen in a state of eruption by any European. "It is but rarely," says Humboldt, "that the elastic forces at work within the interior of our globe have succeeded in breaking through the spiral domes which, resplendent in the brightness of eternal snow, crown the summits of the Cordilleras; and even where these forces have opened a permanent communication with the atmosphere through circular craters or long fissures, they rarely send forth currents of lava, but merely eject ignited scoriæ, steam, sulphuretted hydrogen gas, and jets of carbonic acid." (*Cosmos*.) This illustrious traveler states that he found pelagic shells on a ridge of the Andes more than 15,000 feet above the sea.

The geological structure of the Andes is as yet but imperfectly known, and is probably not the same in all parts of the chain. Like all great mountain systems, the Andes have been produced by elevatory forces acting at different and in some instances widely separated periods. Carboniferous, Triassic, Jurassic, and Tertiary rocks have been recognized on their flanks; and the older Palæozoic will undoubtedly be found to make up a part of their mass.

Climate.—The limit of perpetual snow on the Andes that are near the equator is about 15,000 feet, and among the Bolivian Andes, about lat. 20° S., it is said to be 17,000 feet. Glaciers rarely if ever occur in the central or tropical portions of the Cordilleras. Between the equator and lat. 30° S. the prevailing wind blows from E. to W., and the eastern side of the Cordillera intercepts nearly all the moisture, so that little or no rain falls in Peru and Northern Chili on the

western slope, or on the narrow tract between the Andes and the ocean. The changes of weather among these mountains are sudden and violent, and the electric storms are very terrific. Here are exhibited greater variations and contrasts of climate than in any other region of the globe. The elevated plains within the tropics have a cool and salubrious climate, and the fruits of the temperate zone here flourish under the equator. Although the Andes are inferior to the Himalayas in altitude, they present a more remarkable variety of phenomena. "This portion of the surface of the globe," says Humboldt, "affords in the smallest space the greatest possible variety of impressions from the contemplation of nature. Among the colossal mountains of Cundinamarca, of Quito, and of Peru, furrowed by deep ravines, man is enabled to contemplate alike all the families of plants and all the stars of the firmament. There at a single glance the eye surveys majestic palms, humid forests of *Bambusa*, and the varied species of *Musaceæ*, while above these forms of tropical vegetation appear oaks, medlars, the sweetbrier, and umbelliferous plants, as in our European homes. . . . There the depths of the earth and the vaults of heaven display all the richness of their forms and the variety of their phenomena. There the different climates are ranged the one above the other, stage by stage, like the vegetable zones whose succession they limit; and there the observer may readily trace the laws that regulate the diminution of heat as they stand indelibly inscribed on the rocky walls and abrupt declivities of the Cordilleras."

REFERENCES.—Humboldt, *Travels and Cosmos*; also his papers in *Journal de Physique* (1801), and in *Gilbert's Annalen* (1804); Orton, *The Andes and the Amazon* (1870); Rickard, *A Mining Journey across the Andes* (1863); Darwin, *Voyage of the Beagle*; Whymper, *Travels among the Great Andes of the Equator* (1892).

Revised by MARK W. HARRINGTON.

Andesite: a volcanic rock of which there are many varieties. The name was first used by Von Buch for certain rocks brought by Von Humboldt from the Andes mountains. The silica percentage of the Andesites ranges between 53 and 63. Chemically and mineralogically they are the surface or lava equivalents of the *Diorites* (*q. v.*). The distinctive features of the type Andesite are mainly structural, indicating the conditions under which they solidified. (See Rocks.) All andesites contain some triclinic feldspar, usually oligoclase or andesine, as an essential constituent. The main basis of their specific subdivision is given by their other components. If they are acid enough to contain free silica, they are known as *Dacite*. According to the nature of their ferro-magnesian constituents they are classified as *mica-andesite*, *hornblende-andesite*, *mica-hornblende-andesite*, *augite-andesite*, *hypersthene-andesite*, etc. The term andesite should properly be applied to only such rocks as have a fine-grained or glassy base. Equivalent rocks with a more coarsely crystalline ground-mass are called *porphyrites*. Andesites are exceedingly wide-spread in volcanic regions. They were formerly often mistaken for trachytes, which they frequently resemble. Von Richthofen has shown that they are usually the oldest lavas of a given district, the subsequent eruptions becoming alternately more acid and more basic. Andesites are very extensively developed in the Western U. S., where they have been carefully studied. By partial alteration they may produce the so-called *propylites*.

G. H. WILLIAMS.

Andijan: a city of Ferghana, Turkestan, Asiatic Russia; the capital of the region in Baber's time (fifteenth century); lat. 38° 50' N., lon. 72° 20' E.; elevation, 1,170 feet (see map of Asia, ref. 4-D). It is in the valley of the upper Syr Darya, and is a station on one of the most important caravan routes of Central Asia. Pop. (1886) 30,620; (1897) 46,680.

Andi'ra: a genus of plants of the family *Leguminosæ*. The *Andira inermis*, called cabbage-tree or cabbage-bark tree, is a native of the West Indies. The bark of the *Andira*, called worm-bark, is a powerful anthelmintic.

An'dirons [O. Fr. *andier*, Mod. Fr. *landier*, for *l'andier*. The latter part of the Eng. is due to folk-etymol. connection with *iron*. Origin of *andier* obscure]: the metallic utensils used to support the wood which is burned in an open fireplace. They are called fire-dogs in some parts of Great Britain. They are often called "dogirons" in many parts of the U. S. The andiron consists of a horizontal bar, supported by three feet, and having an upright standard at one end. This was sometimes silver, and ornamented with arabesques or a human figure.

Andoc'ides (Ἀνδοκίδης): accounted the least of the ten Attic orators, is not the least in interest (440—after 391 B. C.). Involved with other young aristocrats in the mutilation of the Hermæ, 415 B. C. (see HISTORY OF GREECE), he went into exile, from which he returned only to be banished again. Four speeches are extant under his name, one of them spurious. A "gentleman orator," he has a certain native grace of narrative, and his speeches are of importance for Athenian history and social life. See Blass, *Attische Beredsamkeit*, 2d ed., i. 280; Jebb, *Attic Orators*, i. 71; text ed. Blass (1880), with English notes by Marchant (1889).

B. L. GILDERSLEEVE.

Andor'ra: a small republic under the joint suzerainty of France and the Spanish Bishop of Urgel, among the Eastern Pyrenees, between the French department of Ariège and the Spanish province of Lérida. Area, 175 sq. miles. It is surrounded by high mountains, and has rich mines of iron and a lead mine. It became autonomous in 790, and is governed by a council of twenty-four, elected for four years. The inhabitants are mostly farmers, cattle-raisers, and miners. Pop. about 6,000. Capital, Andorra.

An'dover: a market-town and parish of England; in Hampshire, 63 miles W. S. W. of London. The town is very ancient. It has a handsome church, which cost about \$150,000. Pop. about 6,000.

Andover: town (incorporated in 1646); on Boston and Maine R. R., Essex co., Mass. (for location of county, see map of Massachusetts, ref. 1-I); on the south bank of the Merrimack river. The village of Andover is pleasantly situated on the Shawsheen river, 22 miles N. of Boston. It has extensive water-power and manufactures of shoe-thread, woolen goods, rubber goods, printer's ink, lamp-black, lamps, and bronze goods, etc. It has a national bank and a savings-bank; a newspaper, a water-supply from a local lake, electric lights, a street-railway system, a free public library of over 12,000 volumes, and a good system of free public schools. Here are also Phillips Academy (a school for boys founded in 1778); Andover Theological Seminary (founded in 1807); and Abbot Academy for young ladies (founded in 1829). Pop. of township (1870) 4,873; (1880) 5,169; (1890) 6,142; (1900) 6,813.

EDITOR OF "TOWNSMAN."

Andover Theological Seminary: a Protestant charitable foundation for the training of Christian ministers. This seminary is one of the oldest in the U. S., and was an outgrowth from the provision originally made for theological instruction in Phillips Academy. It is under the control of the trustees of that academy, and is subject, as respects most of the foundations, to the visitation of an independent board of visitors. It was established upon endowments, given by Samuel Abbot, Mrs. Phœbe (Foxcroft) Phillips, John Phillips, William Bartlet, Moses Brown, and John Norris. It was opened in 1808, and in 1900 numbered 2,141 graduates who have entered the ministry chiefly of the Congregational and Presbyterian churches. It has taken a leading part in religious movements among Congregationalists, and has educated many writers as well as preachers. The *Bibliotheca Sacra* and later *The Andover Review* have been edited by its professors. Among its early professors were Leonard Woods, Moses Stuart, and Edward D. Griffin. The successor of Woods in the chair of doctrinal theology was Edwards A. Park, who was followed (1883) by George Harris. The faculty consists at present of nine professors. No charge is made for tuition. The seminary library contains 52,000 volumes, and with it is connected a valuable Palestinian museum.

W. L. ROPES.

Andra'da, DIOGO PAYVA DE ANDRADE: b. in 1528 at Coimbra, Portugal; became a Jesuit and one of the Portuguese delegates to the Council of Trent. D. in Lisbon, Portugal, in 1575.—His brother, THOMAS DE JESUS, was an Augustinian monk; taken prisoner in the battle of Alcacer in 1578, and kept in a dungeon till his death, Apr. 17, 1582. He wrote while there his famous book, *The Labors of Jesus*.

Andrada, ANTONIO, de: b. at Villa de Oleiros, Portugal, in 1580; entered order of the Jesuits in 1596 at Coimbra, Portugal; went to India as a missionary in 1601, and became superior of the missions of Mongolia. He made two journeys from there to Thibet, and published *New Discovery of the Grand Cathay, or Kingdom of Thibet* (1627). D. at Goa, Aug. 20, 1633.

Andrada, FERNÃO PEREZ, de: an officer in the Portuguese navy. He commanded a vessel in the fleet of Albuquerque, who made him admiral of a fleet of ten ships at

Malacca in 1511. He defeated the Sultan of Java in a naval engagement in 1513, was the commander of the first European fleet on the coast of China (1518), and opened commercial intercourse with that country.

Andrada e Silva, JOSÉ BONIFACIO, de: a distinguished Brazilian; b. at Santos, June 13, 1763. He acted a prominent part in the revolution by which Brazil became independent in 1822, and was prime minister in 1822-23. He wrote some scientific treatises and poems. D. near Rio, Apr. 3, 1838. See BONIFACIO, JOSÉ.

Andral, GABRIEL, M. D.: French physician; b. in Paris, Nov. 6, 1797; married a daughter of Royer-Collard. He published an able work called *Clinique Médicale* (4 vols., 1824-27). In 1839 he succeeded Broussais as Professor of Pathology and Therapeutics in Paris, and in 1842 became a member of the Institute. Among his works is a *Summary of Pathological Anatomy* (3 vols., 1829). D. at Chateaufieux, Feb. 13, 1876.—His father, GUILLAUME ANDRAL, was a celebrated physician.

Andrássy, JULIUS, Count: Hungarian statesman; b. at Zemplin, Mar. 8, 1823, of an ancient and noble family. He took a prominent part in the revolution of 1848 as an adherent of the popular cause, and was condemned to death in 1850, but he escaped and went into exile. When the right of self-government was restored to Hungary, in Feb., 1867, Andrássy was appointed premier of a new Hungarian ministry by the emperor. He succeeded Von Beust 1871-79, as minister of foreign affairs in the common ministry of the whole empire. D. at Volosca, Feb. 18, 1890.

An'dré, JOHN: British officer; b. in London, of Swiss parents, in 1751; entered the army in 1771. Having obtained the rank of lieutenant, he was sent to America in 1774. His superior talents and fine personal qualities procured for him a rapid promotion to the important position of adjutant-general, with the rank of major (1779). He was a good scholar, an artist, a versifier, and a man of varied accomplishments. Benedict Arnold having offered to betray West Point, Major André was selected by Sir Henry Clinton, the British commander, to make the necessary arrangements for carrying out the plot. André, assuming the name of Anderson, ascended the Hudson, and, having had a private interview with Arnold (Sept. 21, 1780), by whom he was furnished with maps and plans of West Point and a pass through the American lines, was, while returning to New York city by land, intercepted near Tarrytown by three armed Americans (John Paulding, David Williams, and Isaac Van Wart), who, discovering by incautious remarks on his part that he was a British officer, took him prisoner. On searching his person they found the plans in his boots. He made an unsuccessful effort to bribe his captors, who conducted him to Lieut.-Col. Jameson, who, with singular obtuseness, resolved to send him to Gen. Arnold, but was dissuaded by Major Tallmadge. Major André was tried as a spy by a board of six major-generals and eight brigadier-generals and condemned to be hung. Sir Henry Clinton made earnest efforts to save his life, but they were unavailing, and he was executed at Tappan, N. Y., Oct. 2, 1780. He behaved with dignity and fortitude on this occasion, and his fate excited deep and general sympathy. The day before his death he drew with a pen and ink a portrait of himself, which is now in the Trumbull Gallery of Yale College. A monument was erected to his memory in Westminster Abbey. Another monument on the scene of his execution at Tappan, erected by Cyrus W. Field, was destroyed by the neighbors. See his life by Winthrop Sargent (Boston, 1861), and *Arnold and André* by Wm. Abbatt (1899).

Andrea del Sarto: See SARTO.

Andrea Pisano, or **Andrea da Pisa**: sculptor; b. at Pontedera, near Pisa, in 1217; d. about 1348. He was a pupil of Giovanni Pisano, and continued the work of that master in its semi-Gothic character. His most important remaining works are the bronze doors in the south doorway of the baptistery at Florence; these are of extraordinary beauty, and of a delicacy of finish never surpassed in similar work. Shortly before his death he became architect of the cathedral at Orvieto, succeeding Lorenzo Maitani.

RUSSELL STURGIS.

Andre'æ, JACOB, D. D.: German Protestant theologian; b. at Waiblingen, in Württemberg, Mar. 25, 1528. He became chancellor of the University of Tübingen in 1562. He was incessantly active in efforts for the more complete organization of the Lutheran Church in Germany, participat-

ing in probably more theological conferences than any other Lutheran theologian, and traveling over all parts of Germany and into other European countries in pursuance of his mission. In April, 1561, he went to Paris to confer with King Antony of Navarre concerning the Lutheran faith. He is the principal author of the *Formula of Concord*. He left over 150 writings. D. at Tübingen, Jan. 7, 1590. See his life by J. A. Mosapp (Barmen, 1890).

HENRY E. JACOBS.

Andreæ, JOHANN VALENTIN: German writer; b. at Herrenberg, in Würtemberg, Aug. 17, 1586; became pastor at Calw in 1620, and chaplain or court-preacher at Stuttgart in 1639. He wrote numerous pamphlets attacking with satire the corruptions and formalism of the religious life of his times. He has been regarded as the founder of the order of Rosicrucians, but without sufficient evidence. D. at Stuttgart, June 27, 1654. "Andreæ," says Hallam, "was a man above his age."
H. E. J.

Andreæ, LAURENTIUS (in Swedish, *Lars Anderson*): a Swedish reformer; b. at Strengnäs, 1480. He was converted to Protestantism, and in 1524 was appointed Chancellor of Sweden by Gustavus Vasa. He produced in 1526 a Swedish translation of the New Testament. D. at Strengnäs, Apr. 29, 1552.

Andreani, ANDREA: engraver on wood; b. at Mantua about 1540; d. 1623. His most remarkable work is in chiaro-scuro, in which branch of the art he is one of the great masters.

An'dree, KARL THEODOR: German writer; b. in Brunswick, Oct. 20, 1808; was from 1838 to 1853 editor of several periodicals, as the *Bremer Zeitung* and *Deutsche Reichszeitung*, and was, 1858, appointed consul to Chili. Among his principal works are *Nordamerica* (2d ed. 1854); *Buenos Ayres und die Argentin Republik* (1856); *Geographische Wanderungen* (1859); and *Geographie des Welthandels* (1863-69). D. Aug. 10, 1875.

Andrée, S. A.: See the Appendix.

Andréossy, an'-dray'ô-se, ANTOINE FRANÇOIS, Count: French military engineer; b. at Castelnaudary, Mar. 6, 1761. He served in Egypt as general of brigade in 1798, and became a member of the Institute of Egypt. He was the chief of Bonaparte's staff on the 18th Brumaire, 1799, obtained the rank of general of division, and was sent as ambassador to England in 1802. Between 1804 and 1814 he represented France at the courts of Vienna and Constantinople. In 1826 he was chosen a member of the Academy of Sciences. He wrote, beside other works, *Constantinople and the Thracian Bosphorus during the Years 1812-14* (1828). D. at Montauban, Sept. 10, 1828.

An'drés, JUAN: Spanish Jesuit distinguished for learning; b. at Planes, Feb. 15, 1740. He was versed in Hebrew, Greek, Latin, Italian, and French. On the expulsion of the Jesuits from Spain in 1767 he removed to Italy. He produced in 1776 an able *Essay on the Philosophy of Galileo*, in Italian. His principal work is *On the Origin, Progress, and Present State of all Literature* (in Italian, 7 vols., 1782-99). He was appointed keeper of the royal library at Naples in 1806. D. Jan. 13, 1817.

An'drew, SAINT: one of the twelve apostles; was, like his brother Simon Peter, a fisherman of Galilee. He is supposed to have been the first disciple of Christ. The latter part of his life is involved in obscurity. According to tradition, he preached the gospel in Greece and Scythia, and suffered martyrdom in Patræ, in Achaia. He is the patron saint of Scotland. A cross formed by oblique beams, thus, X, is called St. Andrew's cross, because he is said to have been crucified upon one so shaped. St. Andrew's day is Nov. 30.

Andrew (or Andrés) I.: King of Hungary; was of the family of Arpad. He began to reign in 1046, and waged war against the Emperor Henry III. D. in 1058.

Andrew II. of Hungary: b. about 1176, and became king in 1205. He conducted an unsuccessful crusade against the Mohammedans in 1217. In 1222 he convoked a diet, to which he granted the Golden Bull, called the Magna Charta of Hungary. It confirmed the rights and privileges of the Hungarian bishops and nobility, whose revolts had disturbed his reign. D. Mar. 7, 1236.

Andrew III. of Hungary: grandson of the preceding; b. in Venice. He succeeded Ladislas III. in 1290, and was the last king of the dynasty of Arpad. His claim to the throne

was opposed by the pope, who supported Charles Martel (son of Charles II. of Naples) as the rival of Andrew. The latter defeated Charles Martel in battle in 1291. D. Jan. 14, 1301.

Andrew, JAMES OSGOOD, D. D.: bishop of the Methodist Episcopal Church South; b. in Wilkes co., Ga., May 3, 1794. He entered the itinerant ministry in the South Carolina Conference of the Methodist Episcopal Church Dec. 12, 1812, and was consecrated bishop at Philadelphia in May, 1832. By his second marriage, in 1844, he became the owner of a few slaves. The General Conference of the same year adopted resolutions requesting him to resign from his office of bishop. Thirteen of the southern conferences protested this action, and finally withdrew, forming the Methodist Episcopal Church South. He presided over this organization as senior bishop till his death, in Mobile, Ala., Mar. 2, 1871. In Apr., 1866, he was placed upon the retired list at his own request. He published *Family Government* and *Miscellanies*.

Andrew, JOHN ALBION, LL. D.: statesman; b. at Windham, Me., May 31, 1818; graduated at Bowdoin College in 1837, studied law, and was admitted to the bar of Boston in 1840. Having distinguished himself as an opponent of slavery, he was elected Governor of Massachusetts by the Republicans in 1860. In answer to the President's call for volunteers, Apr. 15, 1861, he dispatched five regiments in one week from that date. He was again elected Governor in 1861, and was afterward thrice annually re-elected. During the civil war he rendered important services to the cause of the Union by his eloquent speeches and messages, and gained great popularity by his assiduous attention to the welfare of the soldiers. D. in Boston, Mass., Oct. 30, 1867. A meeting of the members of the Legislature of Massachusetts adopted a resolution "that in his decease the Commonwealth and the nation alike have suffered an irreparable loss; that his reputation had become national, and we might well have hoped for him the highest national offices and honors."

Andrew, ORDER OF SAINT: a Scottish order of knighthood (called also *The Order of the Thistle*), named in honor of St. Andrew, the patron saint of Scotland. It was founded in the reign of James V., was revived by James II. of England in 1687, and re-established by Queen Anne in 1703. The star of the order of the Thistle consists of a St. Andrew's cross of silver embroidery, with rays emanating between the points of the cross, in the center of which is a thistle of gold and green. On a circle which surrounds this thistle is inscribed the motto "Nemo me impune lacessit" (literally, No one provokes me with impunity).

Andrew, ORDER OF SAINT: a Russian order founded by Peter the Great in 1698; the highest in the empire; bestowed only on the imperial family, princes, generals-in-chief, and persons of high rank. The badge of this order bears on one side a cross enameled in blue, and in the four corners of the cross the letters S. A. P. R. (*Sanctus Andreas Patronus Russiae*). On the reverse is a spread-eagle, with a legend signifying "For religion and loyalty."

Andrews, CHARLES, LL. D.: b. at Whitestown, Oneida co., N. Y., May 27, 1827; studied law in Syracuse, N. Y.; was admitted to the bar in 1849. He was in partnership with the Hon. Charles R. Sedgwick from 1851 until he was elected, May 17, 1870, associate judge of New York Court of Appeals. Prior to this he had held various official positions. He was district attorney of Onondaga co., N. Y., 1853-56; mayor of Syracuse in 1861, 1862, and 1868; was a delegate-at-large to the constitutional convention of 1867-68, and was appointed chief judge of New York Court of Appeals in 1881.

Andrews, CHRISTOPHER COLUMBUS: general of volunteers during the civil war (1861-66); b. at Hillsborough, N. H., Oct. 27, 1829; appointed brigadier-general of volunteers Jan. 5, 1864, mustered out Jan. 15, 1866. Was U. S. minister to Sweden 1869-76, and became U. S. consul-general for Brazil, 1882.

Andrews, EDWARD GAYER, D. D., LL. D.: preacher and bishop of Methodist Episcopal Church; b. in New Hartford, N. Y., Aug. 7, 1825; graduated at the Wesleyan University, Connecticut, in 1847; entered the ministry in 1848; became teacher in the Oneida Conference Seminary, Cazenovia, N. Y., in 1854; was elected its president in 1855; resumed the pastorate in New York East Conference in 1864; and was elected bishop in 1872. Since 1888 he has resided in New York city.

Andrews, ELISHA BENJAMIN, D. D., LL. D.: chancellor of Nebraska University; b. at Hinsdale, N. H., Jan. 10, 1844; prepared for college, but entered the army in 1861 and served till 1864, rising from private to second lieutenant; was wounded at Petersburg, Aug. 24, 1864, suffering the loss of an eye; graduated at Brown University, Providence, R. I., 1870; at Newton Theological Institute, Newton, Mass., 1874; principal of Connecticut Literary Institute, Suffield, Conn., 1870-72; pastor of First Baptist church, Beverly, Mass., 1874-75; president of Denison University, Granville, O., 1875-79; Professor of Homiletics in Newton Theological Institute 1879-82; Professor of History and Political Economy in Brown University 1882-88, spending one year in studying at Berlin and Munich; Professor of Political Economy and Finance in Cornell University 1888-89; president of Brown University 1889-98 (resigned on account of criticism by the faculty of his attitude on the silver question); superintendent of Chicago public schools 1898-1900; chancellor of the University of Nebraska, Lincoln, August, 1900; member for U. S. of International Monetary Conference, Brussels, 1892; author of *Institutes of Our Constitutional History, English and American* (1887); *Institutes of General History* (1889); *Institutes of Economics* (1889); *Institutes of Our Economical History and An Honest Dollar* (1894); *History of the United States* (1894); *Wealth and Moral Law* (1894); *History of the Last Quarter Century in the United States* (1896). C. H. THURBER.

Andrews, ETHAN ALLEN, LL. D.: scholar; b. at New Britain, Conn., Apr. 7, 1787; graduated at Yale College in 1810, and taught until 1839, when he retired to his native town and gave himself to the production of text-books in Latin. His most important work was his Latin-English lexicon (1850), based on Freund. With Stoddard he brought out a well-known Latin grammar. D. at New Britain, Conn., Mar. 25, 1858.

Andrews, GEORGE L.: general; b. at Bridgewater, Mass., Aug. 31, 1828; graduated first in his class at West Point in 1851. He was acting assistant Professor of Engineering at West Point (1854-55), and for distinguished services in the Army of the Potomac became brigadier-general and brevet major-general of volunteers. In 1871 he was appointed Professor of French, and in 1882 Professor of Modern Languages, at West Point. D. Apr. 4, 1899.

Andrews, GEORGE P.: See the Appendix.

Andrews, JAMES PETIT: historical writer; b. near Newbury, in Berkshire, England, in 1737. He published an amusing *Collection of Anecdotes, etc., Ancient and Modern* (1789). His most important work is a *History of Great Britain in Connection with the Chronology of Europe* (1 vol., 1794, unfinished). D. Aug. 5, 1797.

Andrews, or Andrewes, LANCELOT: a learned English theologian; one of the most illustrious of English prelates; b. in London, Sept. 25, 1555; educated at Cambridge and Oxford. He was one of the chaplains of Queen Elizabeth, who appointed him Dean of Westminster. He was one of the divines selected to translate the Bible under the auspices of James I., and became Bishop of Chichester in 1605. In 1609 he was translated to the see of Ely, and appointed a privy counselor; was considered the most learned English theologian of his time, except Ussher, and had a high reputation as a pulpit orator. His works, though uncritically edited and but fragmentary, place him in the front rank of English theologians. He became Bishop of Winchester in 1618; he was the author of religious works, among which was a *Manual of Private Devotions and Meditations for Every Day in the Week*. In polemics he assailed Bellarmine in his *Responsio ad Apologiam*, a treatise never answered. On Nov. 23, 1600, Andrews preached at Whitehall his memorable sermon on justification, maintaining the evangelical view as opposed to the sacerdotal. Andrews, in the Lambeth Articles, which mark an epoch in English Church history, adopted the doctrine of St. Augustine as modified by Aquinas. D. in London, Sept. 25, 1626.

W. S. PERRY.

Andrews, LORRIN: b. in East Windsor, Conn., Apr. 29, 1795; educated at Jefferson College, Pa., and at Princeton; sailed as a missionary to Hawaii in 1827; founded in 1831 the Lahainaluna Seminary, which became the Hawaii University, in which he was a professor. He was long a judge and privy counselor under the Government, and published parts of the Bible in the native tongue, wrote a Hawaiian dictionary, and various works on the history, etc., of the Sandwich islands. D. at Honolulu, Sept. 29, 1868.

Andrews, NEWTON LLOYD, Ph. D., LL. D.: Baptist educator; b. at Fabius, N. Y., Aug. 14, 1841; graduated at Colgate University, 1862, and Hamilton Theological Seminary, 1864; principal of Preparatory School, Colgate University, 1864-69; Professor of Greek Language and Literature, Colgate University, since 1868; Dean of Faculty, Colgate University, from 1880 to 1892. W. H. W.

Andrews, THOMAS, LL. D.: chemist; b. in 1813, and d. at Belfast, Ireland, Nov. 26, 1885. From 1835 to 1844 he practiced medicine, and from 1845 to 1879 was Professor of Chemistry in Queen's College, Belfast. His principal work was on ozone, and on the continuity of the liquid and gaseous conditions of matter. He was an honorary LL. D. of the Universities of Dublin, Glasgow, and Edinburgh, a F. R. L. and F. R. S. E., etc.

Andrews, THOMAS, F. R. S., F. C. S.: engineer; b. in Sheffield, 1847; educated at Broomhank School and by private tutors, and was carefully trained by his father in metallurgy, mining, and engineering. In 1871 he succeeded his father as proprietor of the Wortley iron-works and Silkstone colliery. He has devoted much research to questions involving the resistance of metals in railway construction, electro-magnetism, and heat dilatation of metals, and is the author of numerous scientific papers.

An'dria: a town of Southern Italy; in Bari, 14 miles by rail E. of Canosa (see map of Italy, ref. 6-G). It is the seat of a bishop, and has a fine cathedral, built in 1046; also a college. In the vicinity are numerous caverns (in Latin, *antra*), from which the name is said to be derived. Pop. 39,493.

An'dro, or An'dros: an island of Greece; in the archipelago, about 10 miles S. E. of Eubœa; is the most northern of the Cyclades. Length, 21 miles; width, 8 miles; area, 156 sq. miles. The surface is hilly, the soil is fertile. Andros is also the name of a town and port on the eastern coast. Lat. of Cape Guardia, its N. W. point, 37° 58' N., lon. 24° 43' E. Pop. of the island, 22,256.

An'drocles, or An'droclus: a Roman slave, whose adventures and friendship with a lion are mentioned by Aulus Gellius. He ran away from his master into Africa, and there entered a cave in which he met a lion that was lame. The lion presented to him a paw, from which Androcles extracted a thorn. To recompense him for this service the lion afterward supplied the man with food as long as he remained in that region. Androcles finally was captured and was condemned to fight with a lion in the amphitheater of Rome. This lion proved to be the same that he had met in the cave, and, though purposely kept from food to increase his ferocity, he instantly recognized his benefactor as a dog would his master. The man was then pardoned, and both the man and the lion were liberated.

Androm'ache (Gr. *Ἀνδρομάχη*): a celebrated and beautiful Trojan; wife of Hector, and one of the most admired characters of the *Iliad*. After the destruction of Troy she became the captive of Pyrrhus, and finally the wife of Helenus, a son of Priam. She is the subject of a tragedy of Euripides of that name.

Androm'eda (Gr. *Ἀνδρομέδη*): in classic mythology, a daughter of Cepheus, King of Ethiopia, and of Cassiopeia. She boasted that she was more beautiful than the Nereids. Neptune, to avenge this affront, sent a sea-monster to plague the Ethiopians. The oracle of Ammon having declared that the sacrifice of Andromeda would appease Neptune, she was chained to a rock, but was rescued by Perseus, and after death was transformed into a constellation. The constellation Andromeda may be seen during the autumn and early winter, and recognized by three stars of the second magnitude extending in a row from the N. E. corner of the square of Pegasus toward Perseus. S. N.

Andromeda: a genus of shrubs of the order *Ericaceæ*, found in America, Europe, and Asia. The *Andromeda polifolia*, common to both hemispheres, has fine rose-colored flowers. The *Andromeda floribunda* of the U. S. also has abundant and very fine flowers, appearing in April. The *Andromeda nitida* of the Southern States has fragrant blossoms. The U. S. has at least eight species, some of which are reputed poisonous to cattle.

Androni'cus I., COMNENUS (Gr. *Ἀνδρόνικος Κομνηνός*): a Byzantine emperor; grandson of Alexis I., Comnenus. He had superior talents, but was profligate and cruel. In his

youth he engaged in treasonable intrigues against the Emperor Manuel, who confined him in prison many years. Having been appointed regent during the minority of Alexis II., he murdered that prince and usurped the throne in 1183. He abused his power by the execution of many Greek nobles, victims of his revenge or jealousy, and carried his cruelty to such excess that his subjects revolted and tortured him to death Sept. 12, 1185.

Andronicus II., PALÆOLOGUS: a son of the Emperor Michael; b. about 1260. He began to reign at Constantinople in 1283. He waged war against the Turks without decisive result. His reign was inglorious, and he was dethroned in 1328 by his grandson, Andronicus III. D. Feb. 13, 1332.

Andronicus III., PALÆOLOGUS: a grandson of the preceding; became Emperor of Constantinople in 1328, and was defeated by the Turks in 1330. His reign was disastrous, and the Turks conquered several of his provinces. D. June 15, 1341.

Andronicus Rhodius (i. e. of Rhodes): a Greek Peripatetic philosopher who lived about 60 B. C. He collected and arranged the works of Aristotle.

Audropogon [from Gr. ἀνήρ, ἀνδρός, man + πῶγων, beard, i. e. having a beard like a man]: an extensive genus of grasses (according to Hackel, 193 species), mostly coarse and many of them tropical. The U. S. has about nineteen species, some of which are known as blue-stem grasses, and are valuable for hay upon the plains. As extended by Hackel, the genus includes sorghum cane, and broom corn, *A. sorghum*, of many varieties. *A. schoenanthus* is extensively cultivated in Ceylon and other Oriental regions for its oil. It is called oil of citronella, and is chiefly used in perfuming the so-called "honey-soap." Other foreign species are cultivated for their oils, which are sold as "oil of verbena," "lemon-grass," "geranium," etc.

Revised by CHARLES E. BESSEY.

Audros, Sir EDMUND: an English governor; b. in London, Dec. 6, 1637. He was Governor of New York from 1674 to 1682, and was appointed Governor of New England in 1686. His arbitrary and oppressive conduct, which rendered him very unpopular, may be accounted for by the fact that he was compelled to carry out the orders of his royal master, the Duke of York. His private character was excellent. On Apr. 18, 1689, the people of Boston revolted and deposed him. He was sent to England for trial the next year, but was never tried. He governed Virginia from 1692 to 1698. From 1704 to 1706 he was governor of the island of Jersey; afterward he lived in London; died there Feb. 24, 1714. S. M. J.

Audros, THOMAS: b. at Norwich, Conn., May 1, 1759; joined the American army at Cambridge, Mass., in 1775, and was engaged in the battles of Long Island, White Plains, and also in other engagements; enlisted in a New London privateer in 1781; was taken prisoner and confined at New York in the Jersey prison-ship, but soon after escaped; studied theology at Plainfield, and preached at Berkley, Mass., from 1788 to 1834, and there died Dec. 30, 1845.

Audroscoggin: a river which rises in Umbagog Lake, and flows southward through Coos co., N. H., to the western boundary of Maine, which it crosses. Running then in a general S. E. direction, it passes through Oxford and Androscoggin counties in Maine, and enters the Kennebec river 4 miles above Bath. Its length is 145 miles.

Audujar' (anc. *Illitur'gis*): a town of Spain; in the province of Jaen, on the Guadalquivir, at the foot of the Sierra Morena, 27 miles N. W. of Jaen (see map of Spain and Portugal, ref. 18-F). It has a trade in grain, fruit, and porous jars and pitchers, of which great numbers are made here, for the purpose of cooling water. Pop. 15,865.

Anel, DOMINIQUE: French surgeon and oculist; b. at Toulouse in 1678; practiced in Paris. He invented a probe and syringe, and was skillful in the treatment of aneurism and *fistula lachrymalis*. D. about 1728.

Anemometer [from Gr. ἄνεμος, wind + μέτρον, measure]: an instrument for measuring the velocity of the wind. It has taken very many forms, but the most usual, called Robinson's anemometer, from its inventor, consists of four hollow cups, on equal horizontal arms, turning on a vertical axis. The rotation of the cups is supposed to bear a fixed relation to the velocity of the wind, and a dial indicates

the miles of wind on this principle. Unfortunately this relation is not so simple, but varies with the instrument and with the velocity of the wind itself, and in practice a corresponding reduction is used. When a continuous record of the velocity is made automatically, the instrument is called an *anemograph*. A novel form of the instrument is one which measures only vertical currents and these have been found to be not infrequent. An instrument giving the direction of the wind only (that is a wind-vane) is sometimes called an anemoscope. MARK W. HARRINGTON.

Anemone [Gr. ἀνεμώνη, the wind-flower; from ἄνεμος, wind]: a genus of herbaceous plants of the family *Ranunculaceae*, natives of Europe, Asia, and North and South America. The species of anemone are numerous, and mostly have beautiful flowers, the size of which is increased by cultivation. The *Anemone hortensis*, or garden anemone, is highly prized and is extensively cultivated in Holland. It prefers a light soil. Among the other beautiful species are the *Anemone coronaria*, sometimes called poppy anemone; the *Anemone japonica*, a native of Japan; the *Anemone pratensis*, which has blue flowers; the *Anemone pulsatilla* (pasque flower), which grows wild in England, and has purple flowers; and the *Anemone nemorosa* (wood anemone), which has white flowers. In North America are found several species peculiar to this hemisphere, besides some which are common also in the Old World. Pulsatilla, a favorite remedy with homœopaths, is produced by a plant of this genus.

Anemone, properly **Sea-anemone**: a marine radiated animal belonging to the class *Actinozoa*. See ACTINIDÆ.

Anemoscope [from Gr. ἄνεμος, wind + σκοπός, observer, used as final element of compounds in sense "observing"]: an instrument which indicates the direction of the wind, as a vane or weathercock. Sometimes the vane turns a spindle which descends through the roof of the house into the chamber of the observer. An index fixed to the spindle indicates the direction of the wind on a compass-card fixed to the ceiling.

Aneroid Barometer: See BAROMETER.

Anet: a town of France; department of Eure-et-Loir, 9 miles N. E. of Dreux (see map of France, ref. 3-E). Near it is the plain of Ivry, where Henry IV. gained a decisive victory over the army of the League in 1590. Pop. about 1,500.

Aneurism [from Gr. ἀνευρυσμός, a widening; ἀνα-, back + εἶρύς, wide. The spelling with *-ism* for *-ysm* is due to false association with suffix *-ism*]: a pulsating tumor filled with blood, and communicating more or less directly with an artery, the tunics of which are wholly or partially destroyed. A "true" aneurism has one or more arterial coats in its wall. A "false" aneurism has a wall of condensed areolar tissue, the arterial coat having disappeared. A "traumatic" aneurism originates in a wound or other accidental injury. A "varicose" aneurism communicates with both an artery and a vein. When such dilatations occur in groups or knots, it is a "cirroid" aneurism. When the blood gets between the coats of an artery, and thus forms a tumor, it is a "dissecting" aneurism. The heart and its valves are liable to aneurismal dilatations.

Aneurisms, not due to injury, may usually be traced to degeneration of the coats of the artery. They are most frequent in the aorta near the heart, and give rise to a variety of distressing symptoms due to pressure, and may cause sudden death by rupture. Sometimes clots become deposited in the sac, and thus temporarily or permanently arrest the disease, but this is rare. The different methods of treatment all have this one common aim, to promote clotting in the sac. This may be accomplished by ligation of the vessels above or below the sac, or both; it may be similarly induced by digital pressure; or it may be brought about by introduction of foreign bodies, or in various other ways. The volume of the blood may be lessened, and the distension of the sac decreased, by prolonged fasting.

Revised by WILLIAM PEPPER.

Angara', or **Upper Tungus'ka**: a river of Siberia; divided into the Upper and Lower. The Upper falls into Lake Baikal; the Lower flows from the lake about 30 miles S. of Irkutsk. Passing by that town, it flows first northward, and afterward in a westerly direction, and enters the Yenisei, of which it is the principal tributary. Length, about 1,000 miles.

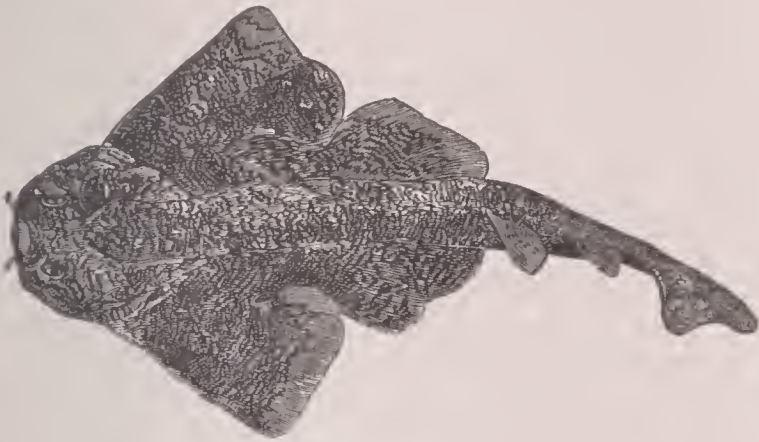
Angel [from Lat. *angelus* = Gr. ἄγγελος, messenger]: a ministering spirit; a spiritual, intelligent being employed

by God to carry commands, to announce glad tidings, and administer comfort to men. The Scriptures record many instances in which angels became visible to men (e. g. Gen. xviii.; xxxii. 1, 2). The ancient Hebrews believed in the existence of several orders of angels, among which were the seraphim and cherubim, and archangels. The only angels mentioned by name in the Bible are Michael and Gabriel. Raphael is mentioned in Tobit, a book of the Apocrypha. The popular notion that angels have wings is rather a poetical invention than a revealed truth. The belief in guardian angels has been cherished by Jews and Christians of all ages. Cf. Matt. xviii. 10.

ANGEL, an ancient English gold coin, so called from the figure of the archangel Michael piercing the dragon, which was on its obverse. The value of the angel (which continued to be coined until 1650) varied from 6s. 8d. to 10s.

An'gela Merici, or **Angela of Brescia**: b. at Desenzano, on Lake Garda, Lombardy, Italy, Mar. 21, 1470; founder of the order of the Ursulines (an order of celibate women in the Roman Catholic Church); entered a Franciscan convent, but returned to the world and began to teach young children; was called for that occupation to Brescia, where she spent the rest of her life. With eleven other maidens she organized, Nov. 25, 1537, at Brescia, an association under the patronage of St. Ursula for teaching small children, nursing the sick, and helping the poor, and she became its superior in 1537. It was at first not strictly a religious order, but soon became so. D. at Brescia, Jan. 27, 1540; canonized 1807. The order was confirmed by Paul III. in 1544.

Angel-fish (*Squatina angelus*), called also **Monk-fish**: a kind of shark with the flattened body of a ray, found on the coasts of Europe and on both shores of North America.



The angel-fish.

Its expanded pectorals suggest the conventional form of the wings of angels, hence the name. It is a sluggish and inoffensive fish. The name angel-fish is also applied to *Chaetodipterus faber* of the South Atlantic and Pacific coasts of North America, and to other chaetodont fishes of the tropics distinguished by bright coloration. D. S. J.

Angelica [Mediæv. Lat. *herba angelica*, angelic herb, on account of supposed beneficent properties]: a genus of plants of the family *Umbelliferae*, natives of the north temperate zone. They are mostly herbaceous and perennial, having bipinnate or tripinnate leaves. The *Angelica archangelica* (garden angelica) grows to the height of 6 feet, has greenish flowers, is aromatic, and contains resin and essential oil. Its root is used in medicine as an aromatic stimulant and tonic. This plant was formerly cultivated for the table, being blanched and used as celery. The U. S. has several species of *Angelica* and *Archangelica*, a kindred genus. It yields angelica balsam and angelic acid.

Angelica-tree, or **Hercules's-club**: a small tree or large shrub, found from Florida to Pennsylvania and westward. It is the *Aralia spinosa* of the family *Araliaceae*. It has a stout trunk, covered, like the branches, with prickles, and its leaves are very large and decomposed. Its flowers appear in July and August in great clusters, composed of very numerous umbels. This tree is common in cultivation.

Angelico, FRA: See FIESOLE. FRA GIOVANNI DA.

An'gell, JAMES BURRILL, LL. D.: author and scholar; b. at Scituate, R. I., Jan. 7, 1829; graduated at Brown University; studied two years in Europe; was Professor of Modern Languages and Literature at Brown University (1853-60); editor of the *Providence Daily Journal* (1860-66);

president of the University of Vermont (1866-71); and became president of the University of Michigan in 1871. He is the author of various articles in the *North American Review* and other quarterlies, as well as of a *Manual of French Literature* (1857), and *Progress in International Law* (1875). U. S. envoy extraordinary and minister plenipotentiary to China 1880-82. He was appointed a member of the U. S. Fishery Commission by President Cleveland, Sept., 1887. Minister to Turkey 1897-98, returning to University of Michigan.

Angell, JOSEPH KINNICUT: lawyer; b. at Providence, R. I. Apr. 30, 1794; graduated at Brown University in 1813. Among his works are a *Treatise on the Right of Property in Tide Waters* (1826), and *The Limitation of Actions at Law and in Equity and Admiralty*. D. in Boston, Mass., May 1, 1857.

Angelo: See MICHELANGELO.

An'gelus (or *Angelus Domini*, i. e. angel of the Lord): in the Roman Catholic Church a devotion in memory of the Annunciation, consisting of three descriptive scriptural texts alternating with the salutation "Hail Mary" (Ave Maria), followed by a versicle and response with prayer. Hence the bell tolled in the morning, noon, and evening to indicate the hour for the devotion. It was formerly rung at sunrise, noon, and sunset, but now more generally at the appointed time of six o'clock at morning and evening, and at noon. The sound of the angelus bell reaching the ears of a man and woman working in a field is the subject of the celebrated painting by Millet. C. H. T.

Angelus Silesius (properly *Johann Scheffler*): prominent German poet; physician to the Duke of Würtemberg; b. at Breslau, Silesia, 1624; was brought up a Protestant, but in 1653 joined the Roman Catholic Church, being led thereto by his studies in mediæval mysticism. He took priest's orders and changed his name as above. He presents the philosophic views of Meister Eckhart and Tauler in his mystical devotional works, among which may be mentioned the *Cherubic Traveler* (1674), and the *Sensuous Description of the Four Last Things* (1675). But it is as a poet that he lives, and some of his devotional songs still belong to the treasures of German hymnology. English translations of selections from his famous rhymed proverbs will be found in the *Massachusetts Quarterly* (Sept., 1849), and *Journal of Speculative Philosophy* (vols. iv., xii.). D. at Breslau, July 9, 1677. Special works on him have been written in German by Kahlert (1853), Schrader (1853), and Treblin (1877). Revised by JULIUS GOEBEL.

An'germann: a navigable river of Sweden; rises in the mountains between Sweden and Norway, collects the water of several lakes, and flowing southeastward enters the Gulf of Bothnia near Hernösand. Length, about 250 miles. Its banks abound with beautiful scenery.

Angers, formerly **Angiers** (anc. *Juliom'agus*): a city of France; capital of the department of Maine-et-Loire, and once the capital of the province of Anjou. It is on the Mayenne river, 4 miles N. of the Loire, and on the railway which connects Tours and Nantes, 60 miles by rail S. W. of Le Mans (see map of France, ref. 4-D). The old walls are converted into boulevards lined with handsome houses. It has a cathedral, a college, a library of about 35,000 volumes, a museum, and a school of arts and trades; also manufactures of linen and woolen stuffs, hosiery, silk twist, leather, etc. Here are the ruins of an ancient castle of the Dukes of Anjou, and the Hospice of St. Jean, founded by Henry II. of England. Lord Chatham and the Duke of Wellington attended a military school in Angers. Pop. of commune (1881) 68,049; (1886) 73,044; (1896) 77,164.

Angers, AUGUSTE REAL: Canadian statesman; b. in Quebec, Oct. 4, 1838; educated there and at Nicolet College; admitted to the bar 1860; appointed queen's counsel 1874; was a member of the Legislative Assembly 1874-79; and solicitor-general from Sept. 22, 1874, until March, 1876, when the ministry was dismissed by Lieut.-Gov. Letellier de St. Just. He was appointed judge of the Superior Court of the Province of Quebec, Nov. 13, 1880, and lieutenant-governor Oct. 20, 1887, an office which he held until Dec., 1892, when he entered the Dominion cabinet as Minister of Agriculture. NEIL MACDONALD.

Anghe'ra, PIETRO MARTIRE, de: Italian scholar and historian; b. of a noble family at Arona, on Lake Maggiore, in 1455. He emigrated to Spain in 1487, and became a priest. In 1501 he was sent by King Ferdinand on a mission to the

Sultan of Egypt, and in 1505 he was appointed prior of the church of Granada. He was also a member of the Council of the Indies. His most important work is a history of the New World and American discovery, entitled *De Rebus Oceanicis et Orbe Novo Decades* (1530), which is highly esteemed. D. in 1526.

An'gilbert, or En'gilbert, SAINT: statesman and Latin poet; b. in Northwestern Gaul. He married Bertha, a daughter of Charlemagne, and afterward became a confidential minister of that monarch. In the latter part of his life he entered a monastery. He wrote several short poems, and was called the Homer of his time. D. Feb. 18, 814 A. D.

Angi'na [Lat. *an'gina*, a choking, quinsy; from *an'gere*, strangle]: any disease attended by a sense of suffocation. See next article.

Angi'na Pec'toris (angina of the breast); called also **Breast Pang** and **Heart Stroke**: an intense pain occurring in paroxysms, and usually commencing in the region of the heart or at the lower end of the breast-bone, and extending along the left arm, more rarely going toward the right side. It is characterized by a sense of suffocation, faintness, and by the apprehension of approaching death. This symptom has been called the "spasm of a weakened heart," and is very seldom experienced by any but persons with an organic disease of that organ. The exciting cause is not unfrequently a strong and sudden emotional disturbance. Men over fifty years of age are most frequently attacked. Sometimes death occurs in a paroxysm. Morphia, nitrite of sodium, nitrite of amyl, and other sedatives are useful in the attack. Glass beads containing nitrite of amyl may be broken on a handkerchief and inhaled. Between the paroxysms a quiet, tranquil life is requisite.

Revised by WILLIAM PEPPER.

Angiosperms: those flowering plants whose seeds are inclosed in a pod of some kind—always, however, composed of one or more carpels. All ordinary flowering plants are angiosperms. Pines, spruces, cedars, etc., having naked seeds, are gymnosperms. See VEGETABLE KINGDOM.

CHARLES E. BESSEY.

Angle [from Lat. *an'gulus*, a corner]: the figure formed by two straight lines going out from the same point. The term, however, is extended to the case when the lines are curved, and to distinguish angles formed by straight from those formed by curve lines the former are sometimes called rectilinear, and the latter curvilinear. The lines which form an angle are called its sides, and the point where they meet is called its vertex. When a straight line, standing upon another straight line, forms two equal angles, each of them is called a right angle. The usual unit of measure of angles is the degree, which is defined as the ninetieth part of a right angle. The word angle is also extended to the case of planes meeting either in a line or a point; when two planes meet they are said to form a dihedral angle; when three or more meet, the angle is called solid or polyhedral.

S. NEWCOMB.

Angle, JAMES LANSING: jurist; b. at Henrietta, Monroe co., N. Y., Dec. 19, 1818; received an academic education, and was admitted to the bar in 1845. In 1877 he was appointed a justice of the Supreme Court of New York to fill a vacancy, and in 1883 he was elected for a full term, retiring on account of the constitutional limit of age, Jan. 1, 1889. D. at Greece, N. Y., May 4, 1891.

HENRY WADE ROGERS.

Angle-iron: a wrought-iron or steel bar rolled with a section shaped like an L. They are extensively used in the construction of buildings and bridges, being riveted to plates so as to form beams and columns. The largest angle-irons regularly in the market have legs about 6 inches long, and are nearly an inch in thickness, but special sizes and forms are made for use in ship-building. When in the shape of double angles, angle-irons are called channel-irons. See GIRDER.

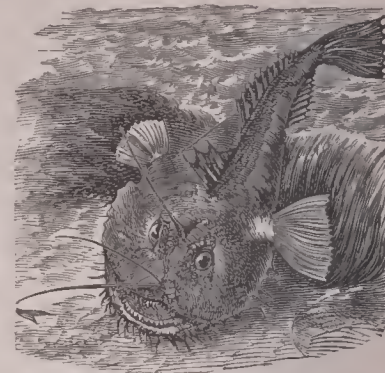
MANSFIELD MERRIMAN.

Ang'ler (*Lophius piscatorius*): a fish found on the coasts of North America and Europe, and called the all-mouth, fishing-frog, or goose-fish. It belongs to a family of the spiny-rayed fishes called *Lophiidae*. It is from 3 to 5 feet long, has an enormous head and a very large mouth, furnished with a fringe of barbels. By means of these, and the first three spines of the dorsal fin, which are isolated, tentacle-like, and rise from the top of its head, it is sup-

posed to attract the fishes on which it preys. The *Lophiidae* are remarkable for the elongation of the carpal bones, the most striking character of the order *Pediculati*, to which they belong.

Revised by D. S. JORDAN.

Angles (Lat. *An'gli*): an ancient Low German tribe, from which England derives its name (*Angle-land*, England). They occupied a narrow district in the south of Schleswig, between the Schlei and Flensburg, whence some of them passed over in the fifth century in conjunction with other Saxon (or Low German) tribes into Britain, where they conquered the native Britons and established the Anglo-Saxon Heptarchy. That the Anglian settlers of Britain should have given their name to the island is due, possibly, to the fact that the tribal name "Angles" had come to be used as a generic term for the Saxon or (Low German) tribes; just as the word "Yankee" has come to signify to a European any citizen of the U. S.; but more probably to the fact that the Anglians were the first of the Low German settlers of Britain to accept Christianity, and hence to be recognized in the Latin literature of the period. See ANGLO-SAXONS.



Angler, or fishing-frog.

Ang'leseay, or Ang'lesea (anc. *Mo'na*): an island and county of North Wales; in the Irish Sea; about a mile from Caernarvon, from which it is separated by the Menai Strait (see map of England, ref. 8-D). It is about 20 miles long and 17 miles wide. The surface is nearly level and the scenery rather tame; the soil is generally fertile, producing wheat, barley, oats, and potatoes. The principal rocks are mica-schists and limestone. Here are rich mines of copper and lead. The island is connected with the mainland by the Menai suspension bridge and the great Britannia tubular bridge, over which the Chester and Holyhead R. R. passes. The ancient *Mona* was an important seat of Druidical power. Area, 302 sq. miles. Pop. (1891) 51,098; (1901) 50,475.

Anglesey, EARLS OF, and Barons Newport-Pagnell, in the English peerage (1661), Viscounts Valentia and Barons Mountnorris in the Irish peerage. The earldom was established in the Annesley family by Charles II., but became extinct in 1761 in Richard Annesley, the sixth earl of this family. The title had been borne by Christopher Villiers, brother of the Duke of Buckingham, and his son Charles.

Anglesey, HENRY WILLIAM PAGET, Marquis of: British general and statesman; b. May 17, 1768; eldest son of the Earl of Uxbridge. He entered the army, gained distinction as a cavalry officer, and became a major-general in 1808. He inherited the title of Earl of Uxbridge on the death of his father in 1812, and entered the House of Lords. At the battle of Waterloo, 1815, he commanded the British cavalry, and lost a leg. Soon after this event he received the title of Marquis of Anglesey. In 1828 he was appointed Lord-Lieutenant of Ireland, but, having become an advocate of Catholic emancipation, was removed by Wellington in 1829. He held the same office from 1831-33, and was raised to the rank of field-marshal in 1846. D. April 29, 1854.

Anglesey, Marquesses of (1815, in the United Kingdom), Earls of Uxbridge (1784, in Great Britain), Barons Paget (1550, in England), and baronets (1730, in Ireland).—HENRY WILLIAM GEORGE PAGET, the third earl, was born Dec. 9, 1821, and succeeded his father in 1869. He was M. P. for South Staffordshire from 1854 to 1857. D. Jan. 30, 1880.

Ang'lesite: a sulphate of lead produced by the decomposition of galena; was so named because first observed in Anglesey. It occurs in rhombic prisms with dihedral terminations, and of a white, gray, or yellowish color.

Anglia, East: kingdom in the eastern part of Central England, comprising the present counties of Norfolk and Suffolk. Founded by the Angles in the sixth century; was successively dependent upon Kent, Mercia, and Wessex until formed into a Danish kingdom under Guthrum (878); was forced by Edward, the son and successor of Alfred, to acknowledge his authority (921), and henceforth formed a part of the kingdom of England.

Ang'lican Church: the Established Church of England; sometimes called the Anglo-Catholic Church; and, with its

colonial and missionary churches, and the Scottish, Irish, and American (Episcopal) Churches, often spoken of as the Anglican Communion. The creeds of this great division of Christendom are *The Apostles'*, *The Nicene*, and *The Athanasian*. The last mentioned creed is not included in the liturgy of the American Episcopal Church, although its doctrinal teaching must be considered as comprised in the avowal found in the preface to the American Book of Common Prayer: "This church is far from intending to depart from the Church of England in any essential point of doctrine, discipline, or worship, or further than local circumstances require." The creed of the Anglican Church was legally defined in the Thirty-nine Articles, first adopted in 1562. These articles, although retained in the English and American Prayer-Books, are not regarded as of equal authority with the Catholic creeds. See ENGLAND, CHURCH OF.

W. S. PERRY.

An'gling [deriv. of *angle*, a fishing-hook < O. Eng. *angul*; O. H. Ger. *angul* (> Mod. Ger. *angel*); related with Lat. *uncus*, hook, Gr. *δγκος*, barb, Sanskr. *anká-s*, hook; to be distinguished from Engl. *angle*, corner, which is a loan-word from Fr. *angle* < Lat. *angulus*]: the taking of fish with an "angle," as a hook was called in old English (see Habakkuk i. 15), was practiced by prehistoric man, as can be seen by the hooks of bronze found among the remains of lake-dwellers of Switzerland, which, in many respects, closely resemble some of the hooks made to-day, e. g. in having the point of the barb in the line of draft. A simpler, if not older, form of taking fish with a line, if not with an angle, was practiced by this prehistoric people, and also by the tribes of Greenland and Alaska; a double-pointed piece of wood, horn, or bone was used, with the line tied in the middle, so that when baited and swallowed by the fish it would set crosswise in the throat (see collection in U. S. National Museum, Washington, D. C.).

Angling as a sport originated in Great Britain, and naturally came to the colonies in America, and it is in the English-speaking countries that it has received its highest development, and where it has taken rank with such field-sports as shooting and fox-hunting. In many parts of the Continent of Europe angling has a few devotees, and in Japan there are also a few fly-fishers, but it is not recognized as a sport by the masses, who regard it merely as a means of catching fish for food. In Great Britain and the U. S. enthusiastic anglers travel long distances to kill a few salmon which they could buy at home for one-hundredth of the cost of their capture, an act which would cause them to be thought lunatics by many people in continental Europe, where they shoot for sport but fish only for food. Angling is practiced by our market-fishermen for cod, halibut, mackerel, and other fishes of salt water, and for lake trout, pike, etc., in fresh water, but by them it is called line or "trawl" fishing, to distinguish it from net-fishing.

The principal fresh-water fishes which are angled for are, in the sportsman's order of value, the salmon, brook and brown trout, black bass of two species, mascalonge and the pikes, lake trout, white and yellow perch, and then the smaller and less gamy species. In Great Britain they rank much the same, only there they have no mascalonge and no white perch. The fish are taken in two ways, with hand-lines or with a rod; and there are several variations of these modes. Natural baits, such as angleworms, minnows (alive and dead), frogs, grasshoppers, maggots, crickets, crayfish, and pieces of meat or fish are used. The artificial lures used are imitation flies and insects, rubber frogs and crickets, spinning metal plates (called "spoons"), artificial mice, etc. Angling for sport may be divided into classes, as fly-fishing, bait-fishing, trolling, skittering, and still-fishing. In fly-fishing a pliant rod is used, its length for salmon being from 15 to 20 feet and for trout and black bass from 8 to 11 feet; a reel and line of water-proofed silk, terminating in a leader or casting-line, of silkworm gut, which is from 6 to 15 feet long, proportionate to the length of rod, and from one to three hooks, which are variously dressed with feathers, tinsel, and other substances to imitate different insects on which trout and salmon feed, or are fanciful creations which resemble nothing. These are cast upon the surface in a manner which requires skill, and the fish rise to take them. In bait-fishing a rod may be used or the line cast and hauled by hand. Trolling implies towing either a live or dead minnow or a spinning metal bait behind a boat, which is propelled by sail, steam, or oars, and may be done with either rod or hand-line. In skittering, which requires a long, stiff rod, a

minnow, frog, or metal spoon is cast from boat or shore, and made to ricochet upon the surface of the water as the rod is smartly moved from one side to the other, and is mainly used to decoy the pike or pickerel. Still-fishing, as the name implies, is done from boat or bank with bait, and the fisher waits for a fish to find his bait and take it. This is also called "drop-line" fishing when done from a boat in salt water.

Reels are first mentioned in Baker's *Art of Angling* (London, 1651). He says: "Within two foot of the bottom of the rod there was a hole made for to put in a wind, to turn with a barrell, to gather up his line and loose it at his pleasure." Walton, in the second edition of his *Compleat Angler* (1655), says: "Note also that many use to fish for salmon with a ring of wire on the top of their rod, through which the line may run to as great a length as needful, when he is hooked. And to that end, some use a wheel about the middle of their rod, or near their hand, which is better observed by seeing one of them than by a large demonstration of words." These quotations show that the use of the reel is less than three centuries old, and it is believed that Walton never saw one.

In salt water flies are not used, the lures being natural baits or some bright, moving object equally attractive. Angling for striped bass, or "rockfish" as it is called south of Philadelphia, is considered the highest form of angling in salt water, and its devotees sometimes rank it with fly-fishing for salmon. Along the islands which form Buzzard's Bay, off the coast of Massachusetts, at Newport, and on the eastern end of Long Island, there are clubs composed of anglers who fish for the striped bass in the surf. Some of the clubs have elegant houses, such as the Squibnocket, Cuttyhunk, and Pasque island clubs, and have seats on the rocks bolted in and secured by an iron rail to keep the angler from being swept off while he, clad in an oilskin suit, casts his bait of menhaden or lobster tail out into the surf, hoping at some time to beat the record by taking a bass of 80 lb. on a rod and reel. Of late years angling for the tarpon, or tarpum, in Florida waters has attracted much attention, and fish of 160 lb. weight are reported to have been caught; but, in the opinion of scientific anglers this fish, while fighting gamely, has not the surroundings which give zest to the capture of a striped bass of less weight. The bluefish, or "taylor" of the Southern coast, is another gamy fish much sought for by anglers. It is taken by an ivory or leaden "squid," with a large hook at the end, by trolling it behind a sailboat going about 6 miles an hour; but the most sportsmanlike way to take it is by "chumming," which is done by cutting the oily menhaden into fine pieces, or "chum," and casting it on the water in a tide-way where the boat is anchored, to attract a school of fish which are taken on a rod and line baited with menhaden.

The literature of angling is voluminous, volumes sometimes being devoted to the capture of a single species of fish. The oldest English book on the subject is by Dame Julyano or Juliana Barnes, Bernes, or Berners, for in the twenty editions from 1486 to 1875 the name is variously spelled. It originally appeared as a portion of the *Boke of St. Albans*, which treated of "hawkyng and huntynge, etc." About 1500 an edition was issued with the title, *Here begynneth a treatyse of fysshynge wyth an angle*; the colophon reading, "Here endeth the boke of Fysshynge with other dyuers matters. Imprinted at London, by Wynkyn de Worde, dwellynge in Flete-street, at the sygne of the Sonne." Since then hundreds of books on angling have appeared. See *Bibliotheca Piscatoria*, T. Westwood and T. Satchell (London, 1883). *The Compleat Angler, or the Contemplative Man's Recreation*, by Izaak Walton, is a classic, and has gone through over 100 editions between 1653 and 1880.

The modern literature of angling is voluminous. Among the best works published in the U. S. are: *The American Angler's Book* (Phila., 1865); *Fishing in American Waters*, 1875; *Fishing with the Fly* (Troy, 1885); *American Fishes*, G. Brown Goode (New York, 1888); and *American Game Fishes*, by twenty writers (Chicago, 1892). Besides these there are works on special subjects, as *The Black Bass*, by Dr. Henshall; trout, salmon, and other fishes by many well-known writers.

FRED MATHER.

Anglo-Cath'olics: those members of the Anglican communion who are Catholic, but neither Roman nor Oriental. They are sometimes called "Puseyites," from one of their leaders, Dr. Pusey, and are otherwise known as **Tractarians**, from the series of ninety tracts issued by them be-

tween 1833 and 1841. They emphasize these four "Catholic principles": apostolic succession, baptismal regeneration, the real presence in the Eucharist, and the authority of tradition.

An'glo-Sax'on Language, now commonly called **Old English**: See ENGLISH LANGUAGE.

Anglo-Saxon Literature: The pagan Anglo-Saxons had their poets and orators, and after their conversion to Christianity there were good scholars in England. Most of their writings are, however, in Latin. The story of their learning and literature is not one of development. There were schools with bright beginnings, but decay followed soon, or quick destruction from pagan or other foes. Most of the books remaining in Anglo-Saxon are translations from Christian Latin. *The Oldest English Texts* (H. Sweet, 1885) contains all the Anglo-Saxon prior to 900, except the *Chronicle* and Alfred's works. It is mostly glossaries, inscriptions, and lists of names, but has some charters, a psalter, and two or three pages of poetry.

The prose writings in the Anglo-Saxon language may be classified as follows:

1. *Theological*.—The Gospels were read in the native tongue as part of the church service, and several manuscripts are preserved. Editions have been printed by Parker (1571), Marshall (1665), Thorpe (1842), reprinted in the U. S. by Klipstein, Bouterwek (1857), Surtees Society (1854-63). Bosworth (1865) has the Gothic, Anglo-Saxon, Wycliffe, and Tyndale in parallel columns. The standard edition is *The Holy Gospels in Anglo-Saxon, Northumbrian, and Old Mercian versions*, with collations of all the MSS. and the Latin versions, W. W. Skeat (1891). Ælfric's translation of the Heptateuch was published by Thwaites (1698), and Grein, *Bibliothek der A.-S. Prosa* (1872.) We have also versions of the Psalms: Thorpe (1835); Grein, *Bibliothek der A.-S. Poesie* (1858); Buelbring, Early English Text Society (1891). There are many *Homilies*. Ælfric, an eminent scholar, compiled or translated a series of eighty of them about A. D. 990, which were edited by Thorpe for the Ælfric Society (1844-46). The Early English Text Society has published *The Blicking Homilies* (R. Morris, 1874-80), and the *Rule of St. Benedict* (Logeman, 1888).

2. *Philosophical*.—King Alfred translated Boethius, *De Consolatione Philosophiæ*. It is freely rendered, with large additions and omissions by the royal author. Editions are by Rawlinson (1698), Cardale (1829), and Fox, in Bohn's Library (1864.)

3. *Historical*.—The most illustrious of the Anglo-Saxon scholars, Beda, known to many generations as "the Venerable Bede," wrote in Latin an *Ecclesiastical History of the Angles and Saxons*, which was translated by King Alfred into Anglo-Saxon. It abounds in picturesque details of the heroic adventures and characters of his time, and has been often reprinted and its best scenes repeatedly rendered into verse. (See, for some of them, Wordsworth's *Ecclesiastical Sonnets*.) The Anglo-Saxon translation was edited, with a Latin translation, by Abraham Wheloc (folio, 1644), by Dr. John Smith (1722), and for the Early English Text Society by Dr. Thomas Miller (1890-91).

The Anglo-Saxon Chronicle gives an outline of the history of Britain from the earliest times to Henry II., A. D. 1154. Copies were kept at the monasteries as early as the time of Alfred. As far as Beda's history extends, the *Chronicle* has been drawn from it or a common source. It is in general a meager affair. There are many editions: Thorpe's (1861) has seven parallel texts, a translation, and indexes. Earle's *Two of the Saxon Chronicles Parallel* (1865) has been revised by C. Plummer (1892).

The general *History of the World*, by Orosius, was translated by Alfred, with additions of some value. It has often been printed. Thorpe's edition in Bohn's Library has a translation and glossary (1857). H. Sweet's for the Early English Text Society (1883), Anglo-Saxon and Latin, reprints the Alfredian MS.

Many brief biographies are found in Beda and the *Homilies*, and some separate lives. That of St. Guthlac (see Wright's *Biographia Literaria*) has been several times printed; Goodwin, London (1848). That of St. Neot contains the story of Alfred's letting the cakes burn; Gorham (1820-24). Ælfric's *Lives of Saints* has been edited by W. W. Skeat for the Early English Text Society (1881-91).

4. *Law*.—A considerable body of laws has been got together. They begin with those of Æthelbirht, who was King of Kent at its conversion. Those of Alfred have an intro-

duction on the history of law, the laws of Moses, and their relations to Christ and Christian nations. The laws are full of valuable knowledge. The ecclesiastical rules relating to confession, penance, and the like are particularly suggestive. The best editions are Thorpe's and that of Schmid (Leipzig, 1858). The latter has translations into Latin and German, and valuable notes and a glossary.

5. *Natural Science and Medicine*.—Such are in *Popular Treatises of Science*, Wright (1841); *Leechdoms, Wortcunning and Starcraft of Early England*, Cockayne (1864-66). *Byrhtferth's Handbook*, Kluge (1855), contains weights and measures, numbers, etc. Translations of Beda's Latin treatises on science are in Cockayne.

6. *Grammar*.—There is a grammar by Ælfric in Somner's Dictionary (1659), J. Zupitza (1880). A Colloquy and glossaries, Wright (1857), R. P. Wülcker (1884).

ANGLO-SAXON POETRY is very different in metrical structure from the English. It is like the Old Icelandic, the Old Saxon, and the Earliest German. It is marked off into verses by alliteration, the recurrence of the same initial sound in the first accented syllables of words. A perfect verse of the common narrative kind has three alliterating syllables—two in the first section and one in the second; but the first section has but one in many verses. Each section has two principal beats or metrical accents, marking time for its two nearly equal divisions or feet. The beat prevailing falls on the first syllable of its foot, making a falling (trochaic, dactylic) rhythm, but it varies freely to rising (iambic, anapaestic), the number and position of the unaccented syllables changing more freely than in Modern English verse.

Þærpæs hæl' eôð hleah'tor;	hlyn' spyn'sôde,
word' pæron wyn'sume,	Eôde Wealh'ðeôp forð',
cpên' Hrôð'gâres,	cyn'nâ gemyn'dig,
grêt'te gold'-hroden	gum'an on heal'le,
and þâ freô'lic pif'	ful' geseal'de,
ær'est Eâst'-Denâ	êðel-pear'de,
bæd' hine blið'ne	æt þære beôr'-þeg'e.

There was lordly laughter;	there the lute resounded,
words were winsome.	Forth yode Wealhtheow.
queen of Hrothgar,	of courtesies mindful,
greeted gold-arrayed	the guests in the hall,
and then the cup of grace	gave the gentle wife
first to the sovereign liege,	lord of the East-Danes,
blithe she bade him be	at the beer-drinking.

Knowledge of the popular poetry was universal. It was disgraceful not to be able to chant in turn at the feasts. Beda, Aldhelm, Alfred learned and loved the old ballads, and made verses. Most of the poetry has perished. The early Christians condemned whatever was mixed with the old superstitions, and the Normans despised or neglected all Anglo-Saxon literature. But we have specimens of various kinds:

1. *The Ballad Epic*.—The old ballads are brought together, beautified, exalted, and fused into a long poem. *Beowulf* is the *Iliad* of the Anglo-Saxons. The exploits celebrated in it are for the most part combats with monsters after the manner of Hercules, but it has the usual epic variety—the wrath of the monster, the rousing of the hero, the fitting out of the ship, the voyage, the banquet, the wordy war of rivals, woman's graceful presence, the arming for fight, and desperate and long-drawn struggles. Only one manuscript of it remains. Little notice of it was taken till the late revival of Anglo-Saxon scholarship; but the interest in it has risen to a great height, and many editions, translations, and essays of elucidation and interpretation have appeared in Germany, England, and Denmark. We may mention Kemble (1833-37); Ettmüller (1840); Thorpe (1855); Grein, two editions (1857-67); Gruntvig (1861); Heyne, four editions (1863-79); and Socin-Heyne. Text by the MS., Wülcker (1881); Holder (1882). An autotype and transliteration by J. Zupitza, Early English Text Society (1882); an American edition by James A. Harrison and Robert Sharp (1883). Translations into imitative prose, by J. M. Garnett, Boston (1882); into imitative meter, John Leslie Hall, Boston (1892). Translations into Latin, Thorckelin (1815); portions, Conybeare (1826); G. S. Sandras (1859).

There are a few fragments to be classed with *Beowulf*. Such are the *Traveler's Song* and the *Fight at Finnsburg*,

both of which are given with *Beowulf* in many editions; *King Waldere*, G. Stephens (1860); R. P. Wülcker's *Kleinere Angels. Dichtungen* (1882).

2. *The Bible Epic* is a treatment of the Bible narrative similar to that of the ballad epic. The great master in this sphere is Cædmon, who is often called the Anglo-Saxon Milton. Beda, who lived in the same region, and may have seen him, tells us that he was an unlearned man, who could not sing the common secular ballads, and that a vision appeared to him and directed him to sing the Creation, and that his success was esteemed inspiration. He had many imitators, and whether the poems which remain are his is not known. These are four poems, called, by Grein, *Genesis*, *Exodus*, *Daniel*, *Christ* and *Satan*. Similar are a fragment of *Judith*, Cynewulf's *Christ*, *The Harrowing of Hell*, and some fragments. Of all these we have a critical edition and translation by Grein, and of Cædmon editions by Thorpe (1832); Bouterwek (1849-54). The manuscript is illuminated, and the illuminations were copied and published in 1833. There are American editions of Cædmon's *Exodus* and *Daniel*, T. W. Hunt (1883); *Judith*, A. S. Cook (1888); translation by Garnett (1889).

3. *Ecclesiastical Narratives*.—These are versified lives of saints and chronicles. We have *Andreas* (1,724 lines), *Juliana* (731 lines), *Guthlac* (1,353 lines), *Elene* (1,321 lines). American editions are *Andreas*, W. M. Baskerville (1892); *Elene*, C. W. Kent (1889); and a translation of *Elene* by Garnett (1889).

4. *Psalms and Hymns*.—Translations of a large part of the Hebrew Psalms, and a few Christian hymns and prayers.

5. *Secular Lyrics*.—A few from the *Chronicle*, celebrating the kings or others.

6. *Allegories, Gnomic Verses, and Riddles*.—*The Phoenix* (677 lines), *The Panther* (74 lines), *The Whale* (89 lines), Gnomic Verses and Riddles; *Dialogue between Solomon and Saturn*, in Grein, vol. ii., pp. 339-407—a favorite style with the Anglo-Saxons.

7. *Didactic, Ethical*.—Alfred's *Metres of Boethius* are versifications of parts of Boethius referred to under Prose Writings above. The best edition is Grein, vol. ii., pp. 295-339. Grein's *Bibliothek der Angelsächsischen Poesie* (Göttingen, 1857), with his translations and complete glossary, gives apparatus for the study of all these poems. New edition by R. P. Wülcker (1880-83).

Outlines of this literature are to be found in Morley's *English Writers* (London, 1867); Wright's *Biographia Brit. Literaria* (London, 1842); Eittmüller's *Scopas and Boceras* (Qued. and Lips., 1850); *Early English Literature* (to Wielif), translation from Bernhard ten Brink (1877), by H. M. Kennedy (1883); *Syllabus of Anglo-Saxon Literature*, J. M. Hart (1881), adapted from ten Brink: *Grundriss zur Geschichte der A.-S. Literatur*, R. P. Wülcker (1885); B. ten Brink, in *Grundriss der germanischen Philologie*, ii., i. 5 (1892).
F. A. MARCH.

Anglo-Saxons: a name given to the people which resulted from the consolidation of the different Low German tribes which in the fifth century overran Southern Britain. The name would seem to point to a blending of two distinct races, the ANGLES (*q. v.*) and the Saxons; but according to Latham (*Ethnology of the British Islands*) there is no distinction to be made between the Angles and the Saxons on the ground of the difference in name. "If," says he, "the Saxons of Anglo-Saxon England were other than Angles under a different name, they were North Frisians." According to the *Saxon Chronicle*, which is, with reference to these events, a mere paraphrase of Bede's *Ecclesiastical History of Britain*—the latter work being written about one hundred and fifty years after the last of the Saxon invasions, which the *Chronicle* records as if it were contemporaneous with them—there were seven distinct Teutonic "invasions" of Britain, beginning A. D. 449, and including parties of Jutes, Frisians, Saxons, and Angles. That Jutes, in the sense of people from Northern Denmark or people of Scandinavian stock, were the first of the Germanic invaders to land in Southern Britain is highly improbable; and the topographical nomenclature of Kent, where Hengist and Horsa, with their party of Jutes, are said to have settled, bears no traces of Danish influence. By "Jutes" we are probably to understand, generically, "Goths." Indeed, in Alfred's Anglo-Saxon translation of the passage in Bede which the *Chronicle* manifestly follows, the Latin *Jutis* is rendered by *Geatum* (Goths), a term which is elsewhere applied to Alfred himself. The *Chronicle* itself, by

the way, explicitly asserts (Bohn's ed., p. 341) that 787 was the first year when ships of Danish men sought the land of the English nation; one manuscript of the *Chronicle* says that Hengist landed with a party of *Angles*, while tradition calls him a Frisian, which he probably was.

The Saxon settlement of Britain was probably participated in by all the Low German tribes between the Elbe and the Schlei, although, on the ground of linguistic affinity, the Frisians would seem to have been most prominent. (See Latham's *Ethnology of the British Islands*; Marsh's *Origin and History of the English Language*; Nicholas's *Pedigree of the British People*; *Proceedings of the London Philological Society*, vol. v.) As soon as the Saxons had subjugated the Keltic inhabitants of Britain (who resolutely opposed the invaders, and many of whom were driven before them into the fastnesses of Wales, and across the sea into Armorica, though most of them were, doubtless, amalgamated with the invading race), they began to contend with each other. The various kingdoms forming the famous "Heptarchy" (or, to speak more correctly, the "Octarchy") were at length, in 827, reduced by Egbert, King of Wessex, into a single monarchy, which attained its highest point of power and glory under Egbert's grandson, Alfred the Great (871-901). The Saxon power was completely overthrown by William the Conqueror at the battle of Hastings, in 1066. For a full account of the Anglo-Saxons, their history, their laws, customs, etc., see Sharon Turner, *History of the Anglo-Saxons*; J. M. Kemble, *The Saxons in England*; also Lappenberg's *History of the Anglo-Saxon Kings*; and Freeman's *Old English History*.
J. H. GILMORE.

Ango'la: the name now given to the Portuguese territory on the west coast of South Africa, a part of which used to be called Lower Guinea. It extends on the coast from the mouth of the Congo southward to about lat. 17° S. and inland to a distance which is not well defined, though the territory claimed usually extends east of long. 20° E. It has the Congo Free State on the N. and N. E., and German Damaraland on the S. The eastern boundary is nominally the southward course of the Zambezi and the northward course of the Lubilash or the Kassai, both streams of the Congo system. It is subdivided into four districts, at least along the coast: the Congo district in the N., with the port Ambriz as capital, then in order Loanda, Benguela, and Mossamedes, each with a seaport-town of the same name as capital. Loanda is the capital of the colony, and is on the cable from Europe to the Cape. The area is about 600,000 sq. miles, and the population is variously estimated from 2,000,000 to 10,000,000.
M. W. H.

Angola: capital of Steuben co., Ind. (for location of county, see map of Indiana, ref. 1-G); on Fort Wayne and Jackson branch of the Lake Shore R. R., 45 miles N. of Fort Wayne; seat of State Normal College with 800 students during 1892; has three churches—Christian or Disciple, Congregational, and Methodist—and a high school; woolen, model, and barrel factories; founded in 1840. Pop. (1870) 1,072; (1880) 1,280; (1890) 1,840; (1900) 2,141. Steuben County has about seventy-five fresh-water lakes, some of them very beautiful and well stocked with fish.

EDITOR OF "REPUBLICAN."

Ango'ra, or **Angho'ra** (anc. *Ancy'ra*; Turk. *Engoor'*): a town of Asiatic Turkey, about 217 miles E. S. E. of Constantinople (see map of Turkey, ref. 5-F). It is situated on an elevated plain adapted to pasturage, and is celebrated for its breed of goats having long silky hair which is manufactured into shawls and a stuff called mohair. Large quantities of this hair are exported, and goats of this breed have been successfully introduced into the U. S. Here are remains of Greek and Byzantine architecture. The most remarkable is a white marble temple which was built by the ancient inhabitants in honor of Augustus; it has on its wall a famous inscription, much of it still legible, stating the most important events in the emperor's life. On July 20, 1402, a decisive victory was gained near Angora by Tamerlane, the Tartar conqueror, over Bayazeed (Bajazet), the Turkish sultan, who was taken prisoner. It was recovered by the Turks under Mohammed I. in 1415, and from that time has continued to be a part of the Ottoman empire. Pop. (1885) 30,000, one-third of whom are Armenians. See ANCYRA.

Angor'nu: See NGORNU.

Angostu'ra (i. e. narrows), or **Bol'ivar City**: an important city of Venezuela; capital of the state of Bolivar; on

the right bank of the Orinoco river, 263 miles S. E. of Caracas (see map of South America, ref. I-D). It is advantageously situated for trade, and exports cotton, indigo, coffee, tobacco, cattle, etc. It contains a college, a hospital, and a fine hall in which the congress of Angostura met in 1819. Pop. 8,484.

Angostura Bark: a bitter bark derived from *Galipea cusparia*, a moderately high tree growing near the Orinoco river. It occurs in flat or curved pieces of from 1 to 3 inches in length, half as wide, and about $\frac{1}{10}$ th inch thick. The color is reddish brown, and the inner surface smoother and lighter than the outer surface, which has a cork-like appearance. Angostura bark is used as an astringent tonic.

Angoulême, an'-goo-lām' (anc. *Inculis'ma* or *Iculis'ma*): a city of France, capital of the department of Charente, on the river Charente, and on the Paris and Bordeaux R. R., 83 miles by rail N. E. of Bordeaux (see map of France, ref. 6-D). It is situated on a hill, and has a cathedral, college, theater, public library, and several paper-mills. Linen and woolen stuffs are manufactured here. This town was the birthplace of Marguerite de Valois and of Balzac. Pop. (1896) 38,068.

Angoulême, CHARLES DE VALOIS, Duke d': a natural son of Charles IX. of France; b. Apr. 28, 1573. Having formed a plot against King Henry IV., he was imprisoned from 1604 to 1616. He had the chief command of the royal army when it began the famous siege of Rochelle in 1628. D. Sept. 14, 1650.

Angoulême, LOUIS ANTOINE DE BOURBON, Duke d': b. at Versailles, Aug. 6, 1775; eldest son of the Comte d'Artois; afterward Charles X. of France. He emigrated with his father in 1789, and in 1799 married his cousin, Marie Thérèse Charlotte, a daughter of Louis XVI., with whom he lived in exile until 1814. He commanded the French army which intervened against the Spanish liberals in 1823, and restored Ferdinand VII. to absolute power. His abilities were mediocre. D. at Göritz, June 3, 1844.

Angoulême, MARIE THÉRÈSE CHARLOTTE, Duchess d': wife of the preceding; b. at Versailles, Dec. 19, 1778; a daughter of Louis XVI. In Aug., 1792, she was confined in the Temple with the king and her mother, Marie Antoinette. She was released in 1795, and exchanged for Camus and others who had been captured by the Austrians, after which she passed many years in exile. She appears to have had more energy than the other Bourbons. She became again an exile in 1830. D. in Vienna, Oct. 19, 1851.

An'gra (i. e. creek or bay): a seaport-town, and the capital of Terceira, one of the Azores; lat. 38° 39' N., long. 27° 12' W. It has a beautiful situation and a good harbor. It contains a cathedral, a military college, and an arsenal. Wine, grain, honey, etc., are exported from this town. Pop. about 11,000.

Angra Pequena, an-gra-pā-kān'ya: a bay and harbor in Great Namaqualand on the west coast of South Africa, between Walvisch Bay and the mouth of the Orange river.

Anguil'la: See EEL.

Anguilla, or **Snake Island**: an island in the Leeward group, in the West Indies, 4 miles N. of St. Martin (see map of West Indies, ref. 5-L). Area, 34 sq. miles. The island is low and covered with forests; it belongs to Great Britain. The staple products are sugar, tobacco, and cotton. Pop. (1891) 3,699.

Anguillula, an-gwil'yu-la [i. e. little eel; from Lat. *anguilla*, an eel]: a genus of minute animals belonging to the nematoid worms. Best known are those called "vinegar eels," *Anguillula aceti*, found abundantly in cider vinegar. They are remarkable for tenacity of life. *Anguillula fluviatilis*, after being dried until it becomes brittle, will recover its activity when placed in water. *Anguillula tritici* is found on blighted wheat. The dried embryos fall with the wheat, and grow in the damp earth, from which they make their way to the growing plant, remaining in it till the ears grow, when they take their place in the grains in which they complete and deposit their eggs. D. S. JORDAN.

An'guis [Lat., a serpent]: a genus of serpent-like lizards having the maxillary teeth compressed and hooked, and the palate not armed with teeth; body covered with smooth, bony scales, head with larger plates. See BLINDWORM.

Angular Motion of a point or a body is the same as that of the line or radius vector joining the moving point to some fixed point. The *angular velocity* of the body in

reference to the fixed point is the ratio of the angle described by the radius vector to the time occupied by its description.

Angus, EARL OF: See DOUGLAS.

Angus, Rev. JOSEPH, D. D.: Baptist minister and educator; b. at Bolam, Northumberland, England, Jan. 16, 1816; educated at the University of Edinburgh; became president of Regent's Park College (Baptist), London (1849). Author of *The Bible Handbook*, *Handbook of English Literature*, *Handbook of the English Tongue*, and other works; and editor of the best edition of Butler's *Analogy* (1855, 12mo, pp. 551). He was one of the revisers of the English New Testament for the American Bible Union; was a member of the committee of the convocation of Canterbury for revising the New Testament, and is a prominent member of the Evangelical Alliance, as a delegate of which he visited the U. S. in 1873.

Angus, SAMUEL: naval officer; b. in Philadelphia in 1784. He commanded the vessel which in 1814 conveyed Adams and Clay to Ghent on a diplomatic mission, and became a captain in the U. S. navy (1816). He served with distinction in the French troubles of 1800, in the war of 1812, and was four times wounded. D. at Geneva, N. Y., May 29, 1840.

An'halt: a duchy of Germany, almost completely surrounded by the Prussian province of Saxony; consists of two larger parts and four enclaves, having together an area of 906 sq. miles. The duchy is traversed by the Saale, the Elbe, and the Selke. While the eastern part is level, the western is mountainous and wooded. The soil is generally fertile. Cattle-raising is extensively and successfully carried on. Here are also mines of silver, copper, iron, and lead. The duchy has five gymnasia and three seminaries. Pop. (1895) 293,298. Capital, Dessau. According to the budget of 1891-92 the receipts and the expenses were both estimated at 11,082,000 marks. The Dukes of Anhalt claim to have descended from ALBERT I. (surnamed THE BEAR) (*q. v.*), the first Margrave of Brandenburg. In 1212 Anhalt was divided into three parts; it was united in 1570 by Joachim Ernst, and again divided into four branches—Dessau, Bernburg, Köthen, and Zerbst—upon his death in 1586. In 1793, after the extinction of the house of Anhalt-Zerbst, its dominions were divided by the remaining three. In 1807 the three houses joined the Confederation of the Rhine, and in 1814 the German Confederation. In 1847 the house of Anhalt-Köthen became extinct, and the Duke of Anhalt-Dessau took the administration of its dominions upon himself; and when, in 1863, the house of Anhalt-Bernburg also became extinct, Anhalt was again united under one ruler. See the works of Heine (1865); Kause (5 vols., 1861-66); and Siebigk (1867).

An'halt-Bern'burg, CHRISTIAN, Prince of: German general; b. in 1568; a man of superior abilities. He was the chief promoter of a league of Protestant princes formed against the emperor in 1608. He commanded the army of Frederick Elector Palatine which was defeated at Prague in 1620. D. in 1630.

An'halt-Des'sau, LEOPOLD, Prince of: an able German general; b. in 1676; commanded the Prussian troops under Prince Eugène in Italy and Flanders in 1706-12, and was second in command of the Prussian army which opposed Charles XII. of Sweden in 1715. D. in 1747.

Anhinga, an-hing'ga: the snake-bird, darter, or water-turkey (*Anhinga anhinga*); a swift, wary water-bird, allied to the cormorants; found in tropical rivers and ranging northward to the mouth of the Ohio.

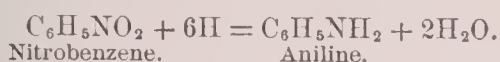
An'holt: an island of Denmark; in the Cattegat; 7 miles long and about 4 miles wide; lat. of the lighthouse, 56° 44' N., lon. 11° 39' E. It is surrounded by dangerous shoals. Pop. 200.

Anhy'drite [from Gr. ἀν-, without + ὕδωρ, water (cf. ἀνυδρῶς, waterless) + suffix -ite]: a mineral composed of anhydrous sulphate of lime. It is harder and heavier than common sulphate of lime (gypsum), into which it is slowly converted by the absorption of water. It occurs in several varieties—viz., granular, fibrous, radiated, and translucent, sparry anhydrite or cube-spar, and compact anhydrite.

An'il: one of the plants from which indigo is obtained; a kind of indigo said to be a native of America, but now cultivated in the East Indies. It is very similar to *Indigofera tinctoria*.

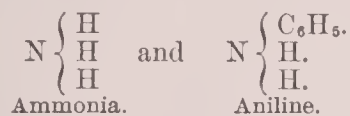
Aniline [from Portug. *anil*, indigo = Arab. *annil*; *al*, the + *nīl* = Sanskr. *nīlī*, indigo, deriv. of *nīla-s*, dark blue]: *Phenylamine*, or *Amido-benzene*: discovered in 1826 by Unverdorben as a product of the distillation of indigo, and called by him *krystallin*, on account of the ready crystallization of its salts. It attracted much attention from chemists, and was made the subject of many researches, which contributed greatly to enlarge the facts and theories of modern chemistry. It did not acquire any commercial importance till 1856, when Perkin prepared from it the beautiful purple dye *mauve*. The brilliancy and intensity of this color attracted the attention of chemists and dyers, and in a short time an entirely new series of colors was discovered, by which the art of dyeing has been almost revolutionized.

Aniline is found among the products of the distillation of bituminous coal (in "coal-tar"), of peat, bones, etc. It is prepared, however, from benzene derived from the more volatile portions of coal-tar. The benzene, C_6H_6 , is converted by the action of nitric acid into nitrobenzene, $C_6H_5NO_2$, and this compound is changed to aniline by the action of iron and water together with some hydrochloric acid. The relation between nitrobenzene and aniline is indicated in the equation below:



Aniline is a colorless, mobile, oily liquid, having a faint vinous odor and aromatic burning taste. Its specific gravity is 1.002; boiling-point, $182^\circ C$. It is very poisonous. It dissolves very slightly in water; in all proportions in ether, alcohol, wood-naphtha, bisulphide of carbon, and in oils, fixed and volatile. The aqueous solution is faintly alkaline, and precipitates many metallic bases from solutions of their salts. With bleaching-powder it produces a violet-blue color, with sulphuric acid and potassic bichromate a bluish-black precipitate, and when treated with arsenic acid, stannic chloride, etc., it is converted into rosaniline. When exposed to the air, aniline acquires a yellow or red color, which is always noticed in commercial "aniline oil." It forms a numerous class of salts, most of which crystallize readily.

Aniline belongs to the class of compounds known as substituted ammonias, its chemical behavior showing that it is closely related to ammonia, the relation being shown by the formulæ:



Aniline is ammonia, one hydrogen atom of which has been replaced by phenyl, C_6H_5 .

Aniline is now manufactured in enormous quantities for the preparation of the different colors. *Aniline for red* is a mixture of aniline with two other compounds which resemble it closely. These bear to toluene, C_7H_8 , the same relation that aniline bears to benzene. They are called **TOLUIDINES** (*q. v.*). For *Aniline Pink*, see **SAFFRANINE**.

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Aniline Colors: In 1835 Runge noticed the violet-blue color produced by chloride of lime with aniline, and Fritzsche subsequently showed that chromic acid formed with aniline a blackish-blue precipitate. In 1853 Beisenhirtz obtained a blue by acting upon aniline with potassic dichromate and sulphuric acid. It remained for W. H. Perkin to develop this reaction, and to lay the foundations of the great aniline industry which is now so extensive. In 1856 he isolated the color found in the last-mentioned reaction, called it *mauve*, and showed that it could be used as a dye. Many chemists at once turned their attention to the subject, and a great number of new colors of almost every tint and shade were discovered, which have taken the place in dyeing, and to a considerable extent in calico-printing, of the animal and vegetable colors in previous use. The chemical composition of many of these colors has been established, and many chemical facts of great importance have been developed by their study. See **COAL-TAR COLORS**.

ANILINE REDS.—*Rosaniline* salts are the most important of all the aniline colors. They are not only used for the production of brilliant tints on cotton, wool, and silk, but they constitute the material from which many of the other colors are prepared. Rosaniline is a colorless base of the

formula $C_{20}H_{21}N_3O$. It is produced by the action of oxidizing agents on a mixture of aniline and toluidine.

Medlock's process for the preparation of aniline red is as follows: The aniline oil, 1 part, is heated with $1\frac{1}{2}$ parts of a 75 per cent. solution of arsenic acid in a closed iron still provided with a stirrer. The product is boiled with water and filtered, and on adding to the solution common salt in excess, the crude hydrochlorate of rosaniline is precipitated. This is dissolved in boiling water, filtered, and allowed to crystallize. This salt of rosaniline, $C_{20}H_{19}N_3.HCl$, is known as *aniline red*, *magenta*, *fuchsin*, *solferino*, *roseine*, *azaleine*, etc. It appears in magnificent green crystals, with a metallic luster like that of the wing-covers of Brazilian beetles or cantharides. It is soluble in water and in alcohol, with a color varying from a beautiful cherry red to a crimson.

Coupiér's process for the preparation of fuchsin consists in treating with iron and hydrochloric acid a mixture of nitrobenzene with aniline and toluidine. This method has the advantage of avoiding the use of compounds of arsenic. It is now extensively employed.

ACID FUCHSIN, OR ACID MAGENTA.—When fuchsin is treated with fuming sulphuric acid an acid product is formed. The sodium or ammonium salt of this is known as *acid fuchsin* or *acid magenta*. It has the advantage that it dyes wool and silk in acid baths.

ANILINE VIOLETS AND BLUES.—By introducing alcoholic radicals into rosaniline in place of a part of the hydrogen, new dyes are formed. In 1863 Hofmann patented processes for the manufacture of dyes which have come into the market under the names *Hofmann's violet*, *dahlia*, *iodine violet*, etc. Since that time many other similar dyes have been added to the list. *Aniline blue* is prepared by treating aniline in the presence of certain organic acids at a temperature of about $180^\circ C$. with an excess of aniline. The final product of this treatment is triphenylrosaniline, which is pure aniline blue, *bleu de Lyon*, the only blue that has come into extensive use. This blue is insoluble in water, which rendered its application somewhat troublesome, as an alcoholic solution was necessary. Nicholson found that sulphuric acid produced a compound analogous to sulph-indigotic acid, soluble in water; this is now extensively manufactured under the name of "Nicholson's blue" or "soluble blue."

ANILINE GREENS.—*Aldehyde green*, called also *aniline green*, *viridine*, and *emeraldine*.—In 1861 Lauth obtained a beautiful but fugitive blue by the action of aldehyde on a solution of a rosaniline salt in sulphuric acid. A young chemist, Cherpin, endeavored to fix the color, and was advised by a photographer's apprentice to use sodic hypo-sulphite, a salt used for fixing photographs, on account of its property of dissolving argentic chloride, bromide, and iodide. Cherpin followed the unscientific advice, and obtained the most beautiful green. The original process of Lauth and Cherpin is still pursued, and is so simple that many dyers prepare the color for themselves. Aldehyde green is principally employed in silk-dyeing.

Malachite green is produced by the action of benzo-trichloride on dimethylaniline. It appears in commerce as a double salt with zinc chloride. Salts of its sulpho-acids are known as *Helvelia green*.

ANILINE BROWNS AND MAROONS.—Several browns have been produced directly or indirectly from aniline. De Laire obtained a maroon by adding rosaniline hydrochlorate to fused aniline hydrochlorate. Schultz prepared a fine garnet color by passing nitrous vapors through a solution of soda holding rosaniline in suspension. Jacobsen prepares a rich brown by heating picric acid and aniline together, dissolving the product in hydrochloric acid, and precipitating with caustic soda. He obtains another by heating ammonium chromate with aniline formate. Koechlin produces a brown on wool by printing on a mixture of rosaniline hydrochlorate (fuchsin), oxalic acid, and potassium chlorate, and on cotton by adding to this mixture some cupric sulphide. Browns are generally made from the residue of rosaniline.

ANILINE GRAY.—Castelhas has patented a process by which a beautiful gray is produced, which has, however, found little favor among dyers on account of its high cost. He subjects mauveine (Perkin's violet) to the action of sulphuric acid and aldehyde. Carves and Thierault prepare a rich gray, called by them *murein*, by mixing aniline, hydrochloric acid, potassic dichromate, copperas, and sulphuric acid.

ANILINE BLACK.—No one has yet succeeded in producing a good black dye from aniline, though the color produced on cotton, silk, or wool by immersing first in a solution of an

aniline salt, and then in potassic dichromate, is very near a black. In calico-printing, however, blacks of great intensity and durability have been discovered, which are now extensively used; in fact, except for mourning goods, in which the black predominates over the white, the aniline black is now used almost exclusively. Lightfoot discovered the first aniline black in 1863. He printed on the cotton a mixture of aniline hydrochlorate, potassic chlorate, cupric chloride, sal-ammoniac, acetic acid, and starch paste; exposed the cloth to the air for two days, and fixed the color with an alkali. Lauth improved the process by substituting cupric sulphide for the cupric chloride. Cordillot substituted potassium ferricyanide for the copper salt. Alfred Paraf in 1865 introduced a mixture of aniline hydrochlorate, potassic chlorate, and hydrofluosilicic acid, properly thickened. On exposing the goods in the "ageing-room" to a temperature of 32° to 35° C., the chloric acid is liberated, and oxidizes the aniline to a black.

APPLICATION OF ANILINE COLORS IN DYEING AND CALICO-PRINTING.—In silk-dyeing no mordant is required; to produce an even color, however, it is found best to use a weak soap solution with the dye; and sometimes a little acid is added, sulphuric or tartaric. For printing on silk the colors are thickened with gum-senegal, printed from blocks, and when dry the goods are steamed and washed. A discharge style may be produced by dyeing silk with a rosaniline salt, then printing on zinc dust thickened with gum. The rosaniline is reduced to colorless leucaniline, producing white figures on a colored ground. By mixing with the zinc colors which are not affected by it, colored figures are produced. For dyeing wool no mordant is required; the goods are simply handled in hot solutions; except in the case of Nicholson's blue, which is dissolved in an alkali, the goods after passing through the solution being subjected to an acid bath. For dyeing cotton, mordants are necessary. By subjecting the goods to (1) a decoction of sumach, (2) to sodic stannate, and finally (3) to dilute sulphuric acid, a stannic tannate is produced on the fiber which has a great affinity for aniline colors. For printing, the colors are thickened with albumen, or a solution of aluminum arsenate in aluminum acetate, and fixed by steaming.

Aniline colors are also used for inks, for coloring leather, soaps, vinegar, candies, ivory, horn, etc.; and lakes are prepared from them for paper-staining, printer's ink, etc.

The high cost of aniline colors is counterbalanced by the brilliancy of their tints and the simplicity of dyeing. The aniline color industry has acquired greater proportions in Germany than in any other country.

For further details, see Watt's *Dictionary of Chemistry*; Wurtz, *Dictionnaire de Chimie*, and specially *Die Farbstoffe*, von M. P. Schützenberger; *Deutsche Uebertragung*, von Dr. H. Schröder (Berlin, 1868-73). Special works on the subject are Becker's *Anilin-Färberei* (Berlin, 1871); Reimann's *Aniline and its Derivatives* (New York, 1868); Krieg's *Theorie und praktische Anwendung von Anilin in der Färberei und Druckerei* (Berlin, 1866); Schultz's *Chemie des Steinkohlenthurs* (Brunswick, 1887-90). Wagner's *Jahresbericht der chemischen Technologie*, from 1858 to date, contains the record of the progress of this important branch of chemical industry.

C. F. CHANDLER.

Revised by IRA REMSEN.

Au'imal [Lat., living creature; from *a'nima*, breath, life]: a member of that division of organisms which, among the higher forms, are clearly distinguished from plants. The growth of our knowledge of both divisions, however, renders it impossible to form a scientific definition which shall include all forms agreed upon to be animals, and exclude all known to be plants. Any line of division drawn between the two kingdoms is an artificial one. Any one character possessed by all animals belongs also to some plants, and *vice versa*. Among the lower forms of organisms, some exhibiting animal characters in the main possess also those belonging usually to plants. Among such forms some possess such different degrees of combination of those characters which are generally taken as diagnostic of animals on the one hand, and of plants on the other hand, as to make it impossible to say in which division the organism should be placed. To meet this difficulty a third division of organisms has been proposed, to which the name *Protista* has been given. While there are grounds for establishing such a division, naturalists have regarded it as an undesirable one, in that it practically increases the difficulty, in having three indistinct groups to decide among instead of two. In gen-

eral, it may be said that animals have a definite form; do not have chlorophyll in their cells, or cellulose in their cell-walls; have the power of voluntary motion; ingest their food (which must include some proteid substances in a solid form); possess a digestive cavity or canal, and organs of excretion.

DAVID S. JORDAN.

Animal Charcoal: See BONE-BLACK.

Animal'cule [Lat. *a'nimal'culum*, diminutive of *a'nimal*]: literally a "minute animal," commonly one whose figure can be discerned only by the aid of a microscope. In popular language it is mostly applied to the microscopic animals which zoölogists include in the classes of the *Protozoa*. Many of the so-called animalcules are now known to belong to the lower ranks of the vegetable kingdom.

Animal Electricity: See ELECTRICITY, ANIMAL.

Animal Heat: the temperature which each animal possesses during life. In reptiles, batrachians, and fishes among the vertebrates, and in all the invertebrates as far as has been observed, the temperature of the body may vary through a wide range, being at least slightly above the temperature of the medium in which they are found. These have been called *cold-blooded*, for which inaccurate term *eurhythmal* or *poikilothermal* has been proposed. In mammals and birds the temperature is very nearly constant for each species. Such animals are known as *warm-blooded*, *stenothermal*, or *homoiothermal*.

For each species of animals there is a degree at which the tissues of the animal best perform their activities, its *optimum* temperature. Cold-blooded animals must depend mainly upon their surrounding medium for this temperature, being able to produce but little heat for themselves. They possess the power, however, of withstanding great departures from the *optimum*, becoming in the mean time more or less inactive, especially in the lower temperatures. Warm-blooded animals, on the contrary, by having developed means for the production of heat in considerable quantities, are able to constantly maintain within their bodies the *optimum* temperature. This gives them the advantage of being capable of activity through all changes of temperature of their media. Their tissues have lost the power, however, of being able to endure, except in particular cases, any but slight departures from the *optimum* temperature. The exceptional cases are those of animals which have the power to pass into a state, that of *hibernation*, in which their temperature may become greatly reduced, being not far above the surrounding medium in the few cases studied. These animals become in this state like cold-blooded animals, in that their temperature may vary through wide intervals. The temperature of warm-blooded animals, while it is nearly constant in the species, varies with the species; for example: it is in man, 98.6° F.; the horse, 98.6°; the rat, 101.8°; the dog, 102°; the mouse, 106°; the goose, 107°; the turkey, 108°; the swallow, 111°. In man, in whom the temperature has been most carefully studied, it is found that even in health there is a slight variation from the mean of 98.6° for different times of the day, for different conditions of the body, and in different periods of life. The different tissues also range a little above and below the mean.

The heat which is produced in any one organ during its activity is distributed to other parts of the body by means of the circulation of the blood. The circulation of the blood also will distribute the effect of the cooling of any part of the body. The problem of keeping the animal body at a constant temperature is a very complicated one, and includes a means of nervous control of the production of heat on the one hand and of its loss on the other. The exact mechanism for the nervous control of the production of heat has not yet been made out. Loss of heat takes place mainly at the skin by radiation and by evaporation of the perspiration. The greater the amount of blood passing through the skin, the greater the loss of heat by radiation; the loss by this source being greatly increased by the evaporation of perspiration. Nervous reflex mechanisms control both the amount of blood flowing through the skin and the amount of perspiration secreted.

DAVID S. JORDAN.

Animal Magnetism: See HYPNOTISM.

Animal Mechanics: See LOCOMOTION of ANIMALS.

An'ima Mun'di: a Latin phrase signifying "soul of the world." It was used by ancient philosophers, who supposed that nature or all matter was pervaded by an ethereal essence and vital force, which organized and actuated created beings, but was inferior to the Divine Spirit. The Atmān

(Atmā) or Pārāmātmā of the Hindus was also regarded as the soul of the world in a somewhat different sense. The Atmān was supposed to be the original life-principle from which the universe was evolved.

An'imé: a resin which exudes from *Hymenæa Courbaril*, a tree of the natural order *Leguminosæ*, and a native of Brazil. It has been used as a medicine and as incense. In England the name animé is applied to a resin known in India as copal, and obtained from the *Vateria Indica*.

An'imism: practical belief in spirits, good or bad, having power over natural occurrences and the lives of men. It seems to be the predominating philosophy and religion of all savage races (e. g. those of America, the Pacific islands, Africa, and Asia), and of many nations well advanced in civilization, e. g. Greeks, Romans, Aztecs, Hindus, Chinese, Japanese. The subject can best be considered under several heads.

I. **SPIRITISM.**—Such phenomena as dreams, sickness, and death lead the savage to distinguish the body from the ghost-soul or spirit, which is material but impalpable, and in form like the body. Objects and animals as well as men have spectral forms. The souls of men exist after the body perishes—according to some tribes suffering transmigration, according to others going on their long and perilous journey to the land of shades, or becoming malignant demons, dreadful in their power for evil—though some spirits, especially those of ancestors and little children, are as powerful for good. Thus endowed, the spirits of the dead do not differ essentially from the demons with which also savage man peoples the world around him. The spirits can be propitiated by sacrifices, gifts, food, prayers, etc., or controlled by magic. But as fear is the most powerful emotion, the demons of darkness and destruction receive almost exclusive worship. Animistic religion seldom has any moral value. In fact, most of the sin and misery of heathenism—cannibalism, human sacrifice, the revolting licentiousness of the ancient Aztec feasts and of the present Central African secret societies, the terror of demons and monsters, and the oppression and cruelty of sorcerers and priests—are either closely dependent upon or directly traceable to animism. The theory of moral retribution, with its restraining effect, scarcely has a place. The spirits may enter into human bodies, producing inspiration, demoniacal possession, disease, or death; or into animals and objects.

II. **FETISHISM.**—A spirit taking up its abode in an animal or object, whether of its own accord or compelled by some spell or by some magic property of the object, makes the object entered a fetish. Or the object itself may be viewed as possessed of occult powers, and only later distinguished from the spirit residing in it. In both these ways has arisen the worship of fire, water, trees, animals, as fetishes.

III. **MAGIC.**—As fetishism can not be clearly marked off from spiritism on one side, neither can it from magic on the other, which is occult power not only over men and things, but especially over the spirits themselves, exercised by means of sacrifices, mystic rites, charms, fetishes, incantations, etc. Those who know the way of spirits thus become medicine-men or fetish priests, and are held in awe both for their power over the spirits and for their consequent power for good and evil over men.

IV. **ANCESTOR-WORSHIP.**—Ancestor-worship has been especially developed among the Japanese (Shintoism), Chinese, Hindus, Romans (manes-worship), Greeks, and Bantu tribes of Africa. While most spirits are malignant, those of ancestors are kindly disposed; but even on this basis there is no sharp distinction from spiritism, for as the father continues to care for his family, so does the chief for his tribe, or the Chinese god of gambling (himself a deified gambler) for the art he practiced on earth. The ancestral spirits are not more powerful than others, but they will listen to us and help us, or punish us for neglecting them and doing wrong. Among the Chinese ancestor-worship pervades and shapes all social, political, and religious life. Even political honors are sought largely for the sake of one's ancestors, and all change from their customs and institutions is resisted. Among many peoples the spirit of the first ancestor is pre-eminently endowed with supernatural powers, either as lord of the dead or as supreme deity and creator. Often, however, he is thought of as too far away and little homage is paid to him.

V. **POLYDÆMONISM, NATURE RELIGION, AND POLYTHEISM.**—Polydæmonism, advancing one step from primitive animism, assigns to each river, mountain, waterfall, and fountain its

spirit or god. Nature religion personifies the vaster powers, such as Heaven, Rain, Sun, Thunder, Sea, and Fire. Whether it develops out of animism and polydæmonism, or, as is certainly sometimes the case, arises independently, it is but animism on a larger scale. Polytheism differs from nature religion only in regarding its deities more as separate personalities. It may also arise in part out of ancestor worship. Among the Hindus, Greeks, old Norse, and modern Africans we find animism, fetishism, ancestor-worship, polydæmonism, polytheism, and monotheism undeniably existing together.

VI. **MODERN SURVIVALS OF ANIMISM ARE**—(a) of spiritism: belief in ghosts and haunted houses, feelings aroused in the dark after a ghost story, fear of darkness, spiritualism entire; (b) of fetishism: charms, veneration of sacred relics, holy water, lucky coins; (c) of magic: signs (such as dropping shears and spilling salt), incantations and charms against warts, omens on All-Halloween, the notion that a priest or ordained minister has peculiar religious authority and power, throwing rice at weddings, lucky and unlucky days and numbers, spiritualistic seances; (d) of ancestor worship: regard for the curse or blessing of parents or of the aged as possessed of supernatural potency, the thought that perhaps a sainted mother's presence is still with one; (e) of polydæmonism and polytheism: the worship of saints, haunted woods, streams, and wells, and personification in poetry and under the influence of strong emotion. In view of such survivals, it must be strenuously insisted that our own civilized human nature does not altogether differ from that of the savage, that his so-called superstitions are neither wholly foreign to us nor altogether to be despised, and that there is in him the same raw material of manhood and the same possibility of spiritual life and growth as in us.

ROBERT J. KELLOGG.

An'io (the modern *Tevero'ne*): a river of Latium (Italy); flowed nearly westward, passed by Tibur, and entered the Tiber 4 miles N. of Rome. Length, about 55 miles. Ancient Rome was in part supplied with water from the Anio by two aqueducts, respectively 43 and 62 miles long.

An'ion: See ANODE and ELECTROLYSIS.

An'ise, Oil of: an essential oil obtained by distilling anise-seeds or star-anise with water. Oil of fennel, from *Anethum feniculum* and *Artemisia dracunculus*, is of a similar chemical composition. Oil of anise and of fennel contain a hydrocarbon oil, said to be isomeric with oil of turpentine, and an oxidized oil, $C_{10}H_{12}O$, called anethol or anise camphor, which solidifies at temperatures below $10^{\circ}C$.

Anise-seed: the fruit of the *Pimpinella anisum*, an annual herbaceous plant of the family *Umbelliferae*; a native of Egypt. It is cultivated in Syria, Malta, Spain, and Germany. Anise-seed is used in medicine as a stimulant and a carminative, and is also used to flavor liqueurs and as a condiment. Anise-seed contains a volatile oil which is employed for similar purposes. A large part of the anise oil of commerce is from star-anise, the fruit of *Illicium anisatum*, a small tree of the order *Magnoliaceae*. The whole plant is carminative and is used by the Chinese as a spice. Its properties are those of the *Pimpinella*. It is imported from Annam and China. This latter is largely used for flavoring the Dutch aniseed and the anisette de Bordeaux.

L. H. BAILEY.

Anise-tree [so named from the smell, which resembles that of anise]: either of two small trees or large shrubs of the order *Magnoliaceae*, growing in the Gulf States—the *Illicium floridanum* and the *Illicium parviflorum*. Both are evergreen, the former with dark purple and the latter with small yellow flowers, appearing in May and June. The star-anise oil of commerce is the product of the *Illicium anisatum* of Eastern Asia, and it is believed that the same oil might be obtained from the *Illicium floridanum*. The *Illicium parviflorum* has a taste and smell resembling those of sassafras. The *Illicium religiosum* of China yields a fragrant incense for temple-worship.

Anisol Red: See AZO-COLORS.

Aniu'y, GREATER: a river of Northeast Siberia; rises about lat. $67^{\circ}N$., and, after a course of 270 miles, enters the Kolyma near lat. $68^{\circ}N$. The LESSER ANIUY rises in lat. $66^{\circ}30'N$., and falls into the Kolyma near the mouth of the Greater Aniu'y. Length, about 250 miles.

Anjer: seaport of Java; on the Sunda Straits; 69 miles W. of Batavia (see map of East Indies, ref. 8-C); formerly often touched at by vessels bound to China and Japan, or for Batavia, to take in provisions, and to land the mails and

passengers which go to Batavia overland; was destroyed by the Krakatoa eruption in 1883. Its site is now occupied by a high-peaked hill, and the port has been removed to New Anjer, 10 miles N. E.

Anjou: a former province and duchy of France, intersected by the river Loire; was inhabited in ancient times by the Andegavi, who were conquered by Cæsar. It now forms the department of Maine-et-Loire and part of Sarthe, Mayenne, and Indre-et-Loire. Its capital was Angers. Geoffroy, Count of Anjou, married Matilda, a daughter of Henry I. of England, and was the founder of the royal house of Plantagenet. His son Henry was Count of Anjou and King of England. Anjou was annexed to the crown of France about 1204, and was bestowed as a fief on Charles (a brother of St. Louis), who became King of Naples. Louis, a son of King John, was the first Duke of Anjou, which was erected into a duchy about 1360. Anjou was finally annexed to the French crown in 1480, after which the younger sons of several kings bore the honorary title of Duke of Anjou. Pop. about 550,000.

An'karström, JOHAN JAKOB: Swedish regicide; b. May 11, 1762; was a partisan of the aristocracy. Having formed a conspiracy with Count Horn and others, he assassinated Gustavus III. at a masked ball in Stockholm, Mar. 16, 1792. He was condemned to death, and, after he had been publicly whipped for three successive days, was beheaded on Apr. 29 of that year.

Anker, ang'kér: an old European liquid measure (now disused, except in Denmark and Norway), having different values in different countries. The anker of Copenhagen is a little more than $9\frac{1}{4}$ U. S. gal., or a little less than $8\frac{1}{4}$ imperial gal. The anker of Hamburg was 9.54 gal.; of Bremen, 9.57; of Lübeck, 9.89; of Amsterdam, $10\frac{1}{4}$; and of Berlin (old measure), 12.45; later measure, 9.07.

An'klam: a town of Prussia; in Pomerania; on the Peene; 109 miles by rail N. of Berlin (see map of German Empire, ref. 2-G). It has manufactures of linen and woolen goods. It belonged formerly to the Hanseatic League. Pop. (1890) 12,917.

Anko'bar: a town of Abyssinia; capital of Shoa; 8,200 feet above sea-level, and about 265 miles S. E. of Gondar (see map of Africa, ref. 4-G). It contains a royal palace, and is a favorite residence of the monarch. Pop. 7,000.

Ankylo'sis, or **Anchylosis** [from Gr. ἀγκύλωσις, stiffening of joints, deriv. of ἀγκύλος, crooked]: in surgery, a stiffened and more or less fixed and immovable joint, so called from the crookedness often seen in limbs with such joints. Ankylosis may result from suppurative inflammation, as in "white swelling" of the knee, and is to be regarded as a favorable termination of such disease. These cases result often in neo-plastic exudations—new tissues—adhering to the cartilages of both articulating bones; and not unfrequently these new growths are partly or completely ossified, converting the two bones into one. The cartilages or ligaments of a joint may become shrunken from disease, the opposing synovial membranes may adhere to each other, or other important structural changes may prevent motion. "Spurious ankylosis" is a case in which a spasm or cicatricial contraction of the muscles, or even of the skin, prevents motion, while the joint itself is not the seat of disease. Cases of so-called hysteria sometimes are accompanied by a stiffness of one or more joints; but such cases are readily detected after the administration of an anæsthetic, when the joint at once becomes movable.

The prospect of recovery of motion in an ankylosed joint is small indeed. Joints stiffened at an inconvenient angle may be put into better shape during anæsthesia, and then be allowed to become ankylosed again in the desired position. Excision of joints has been considerably practiced, and with some success as a means of cure.

An'na: on Illinois Central R. R., Union co., Ill. (for location of county, see map of Illinois, ref. 11-E); situated in the midst of a fruit-growing region, 37 miles N. of Cairo. Pop. (1880) 1,494; (1890) 2,295; (1900) 2,618.

Anna, SAINT: supposed to have been the mother of the Virgin Mary, but not mentioned in the Bible. The Roman Catholic Church celebrates an annual festival in her honor July 26; the Greek Church Dec. 9.

An'naberg: a mining-town of Saxony; in the Erzgebirge, 18 miles S. of Chemnitz (see map of German Empire, ref. 5-G). It has mines of silver, cobalt, and tin, and manufactures of lace and silk ribbons. Pop. (1890) 14,960.

Anna Carlov'na: Regent of Russia; b. at Rostock, Dec. 18, 1718; daughter of the Duke of Mecklenburg, and a niece of Anna Ivanovna, Empress of Russia (*q. v.*). She was married in 1739 to Anton Ulrich, Duke of Brunswick-Wolfenbüttel, and had a son, Ivan, whom Anna Ivanovna designated as her successor. Soon after the death of that empress, in 1740, Anna Carlovna assumed the office of regent. She was deprived of power by a conspiracy which raised Elizabeth to the throne in Dec., 1741. D. in exile at Cholmogory on the Dwina, Mar. 18, 1746. See Brückner's *Die Familie Braunschweig in Russland* (St. Petersburg, 1876).

Anna Comne'na: learned Byzantine princess and writer; b. Dec. 1, 1083; daughter of Alexis I., Emperor of Constantinople. She was carefully educated in poetry, science, and Greek philosophy, was famous for her beauty and talents, and became the wife of Nicephorus Bryennius. On the death of her father, in 1118, she conspired against her brother John, and attempted to usurp the crown or to place it on the head of her husband, but failed. She afterward became engaged in literary pursuits, and wrote in Greek a life of her father, entitled the *Alexiad*, which is an important historical document. It covers the period 1069-1118, including that of the first crusade. The style is rather affected; best edition by Reifferscheid (2 vols., Leipzig, 1884). D. in a convent after 1148.

Anna Ivanov'na: Empress of Russia; b. at Moscow, Jan. 25, 1693; daughter of Ivan, a brother of Peter the Great. She was married in 1710 to the Duke of Courland, who died in 1711. She succeeded Peter II. on the throne in 1730, and permitted her favorite Biren to control the empire. He abused his power with great cruelty, and executed and banished many thousand persons. She died Oct. 28, 1740, and was succeeded by Ivan.

An'nals: in Roman history, official chronicles of events kept by the Roman *pontifex maximus* down to 131 B. C. When Rome was sacked by the Gauls, 390 B. C., all the existing annals were destroyed except a few fragments, which is one cause of the obscurity of early Roman history. History in the form of annals was afterward written by private citizens. The Chinese claim similar annals of the history of their nation back as far as 3000 B. C. See Nitzsch, *Die römische Annalistik* (Berlin, 1873).

Annam' (literally, peaceful south): an empire in South-eastern Asia, on the east coast of the Indo-Chinese peninsula, now under French protectorate. It is a part of what used to be called Cochin-China, and is a strip of coast about 1,400 miles long by sometimes only 50 broad, though the western boundary is not well defined, the tribes between Annam and Siam being fairly independent. Tonking lies to the N. of this country, and Lower Cochin-China to the S. The area of Annam proper is about 27,000 sq. miles, and of the independent tribes nominally under it about 20,000 sq. miles. The population is estimated at about 5,000,000. The capital is HUÉ (*q. v.*).

INHABITANTS.—The Annamese are confined, for the most part, to the coast region. They form an ancient and rather ill-favored race of Mongolian relationship. They are short, tawny, with low forehead, flat face, and very projecting high cheek-bones. The nose is flat and small, mouth large, teeth blackened by the use of the betel-nut, the areca-nut, and lime; the neck is short, shoulders sloping, body thick-set and clumsy. But they are especially characterized by two features well known to their neighbors. The first is a curious swagger in the gait, described as theatrical, and due to the structure of the pelvis and the femur; the second, a greater separation of the great toe from the rest than is found in any other people walking habitually barefoot. The Chinese annals refer to this over 4,000 years ago. They are generally Buddhists, but there is a sprinkling of Roman Catholics. The language is allied to Chinese. See Frey, *L'annamite, mère des langues* (1892).

Among the Annamese live many Chinese and Cambodians, and in their hands is nearly all the commerce of the country. In the hills of the W. and forests of the S. W. live several wild tribes; the Mois in the S., a wretched race in the scale of civilization; the Chams, a people of Mohammedan religion and Arab characteristics, apparently degraded from a higher status; the Laos in the N. W., and many others. The inland regions are but little known.

PRODUCTIONS.—The principal productions are rice, cotton, tobacco, sugar, silk, pepper, cardamoms, ivory, lac, ornamental woods, bamboos, cinnamon bark, tea, and coffee. The chief imports are rice, cottons, yarn, paper, and opium.

Gold is washed out of the hills, and a French company was formed in 1891 for working the coal mines at Turane. Fishing is an important industry. The trade is chiefly with China and France, a little with Japan, Siam, and Burma.

WEIGHTS AND MEASURES: (1) *Weight*.—The cân or catti = 1·3775 lb. av., or 624·913 grammes. Multiples, 10 cân = 1 yen; 5 yen = 1 binh; 2 binh = 1 ta; 5 ta = 1 quăn. Sub-multiples, $\frac{1}{2}$ cân = 1 nen; $\frac{1}{10}$ nen = 1 luong; $\frac{1}{10}$ luong or liang = 1 dong; $\frac{1}{10}$ dong = 1 phan; $\frac{1}{10}$ phan = 1 li. The li = 0·602 grain = 0·03905 gramme, and is fancifully subdivided decimally to the millionth part.

(2) *Length*.—For merchants' measure the thuoc = 25·58 inches = 649·7 mm., is the unit base. Multiples, 10 thuoc = 1 truong; 3 truong = 1 that; 10 that = 1 gon = 213·17 yards = 194·92 meters. Sub-multiples, $\frac{1}{10}$ thuoc = 1 tac; $\frac{1}{10}$ tac = 1 phan; $\frac{1}{10}$ phan = 1 li = 0·258 inch. For builders' measure, the thuoc = 19·18 inches = 487·16 mm. Multiples, 5 thuoc = 1 ngu; 3 ngu = 1 sao; 10 sao = 1 mau = 79·92 yards = 72·8775 meters. Sub-multiples, as before, the li being $\frac{1}{1000}$ thuoc, or 0·01918 inch = 0·487 mm. For road-measure, the dam = about 0·55 mile = 0·885 km., is the unit; sub-multiple, $\frac{1}{2}$ dam = 1 li = 0·275 mile = 0·4476 km.

HISTORY.—The people claim to have come from the south of China. About 2357 B. C. Chinese annals mention them under a name meaning "the people with the big toe." They were vassals to other nations, chiefly the Chinese, until about the tenth century of our era, when they threw off this yoke and remained practically independent until they came under the French. In 1787 the King of Cochinchina made a treaty of alliance with France, with a small cession of territory. This gave France predominant influence, and Christianity made rapid progress until 1820, when a party hostile to foreigners prevailed. In 1858 the execution of a French subject gave occasion for a war with Annam, which resulted in the seizure of Saigon, in the present French Cochinchina. In 1862 the Annamese Government abandoned three provinces to France; in 1867 three more; in 1872 two ports were opened to foreign commerce; and in 1886 a French protectorate was established over what remained. The present king is Bun Can, proclaimed in 1889. French troops occupy the citadel of the capital; Annamite officials administer internal affairs. There are 23,230 soldiers, of whom 11,830 are natives. The capital is Hué, near the coast, in about lat. 16° 30' N. See **INDO-CHINA**.

MARK W. HARRINGTON.

An'ndale: See **DUMFRIES**.

Annandale, THOMAS, M. D., F. R. C. S.: English surgeon; b. at Newcastle-on-Tyne, Feb. 2, 1838; M. D., University of Edinburgh, 1863; acted as assistant and lecturer in University of Edinburgh until 1877, when he was appointed Regius Professor of Clinical Surgery in the same; author of *Abstracts of Surgical Principles* (1868-70); *On the Pathology and Operative Treatment of Hip Disease* (1876), etc.

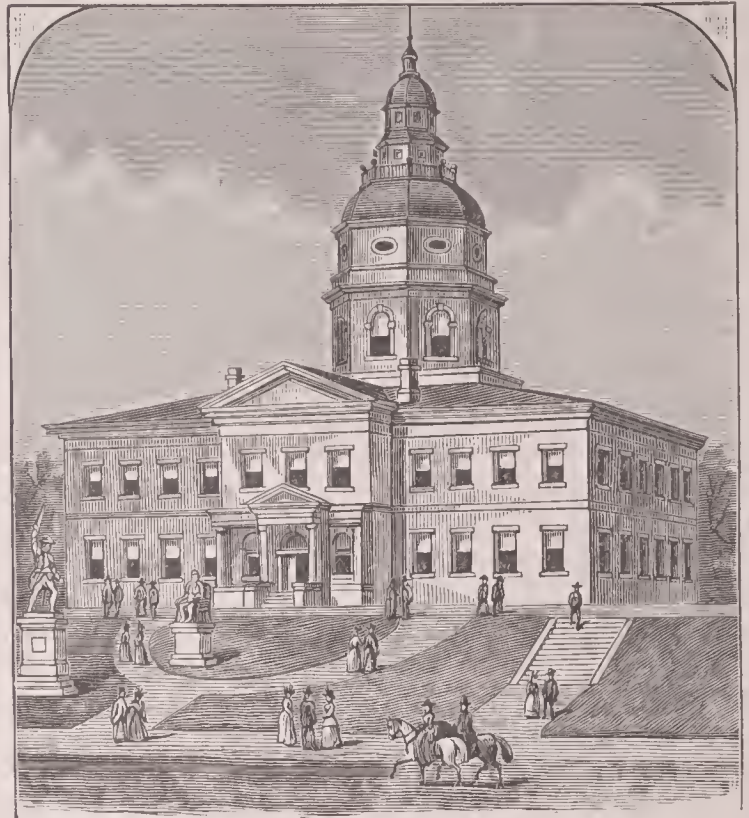
An'na Peren'na: a goddess of the Roman mythology. According to Vergil and Ovid she was a daughter of Belus and sister of Dido. She went to Italy, and was received kindly by Æneas. Her favor was invoked by the Romans to obtain health and long life.

Anna Petrov'na: eldest daughter of Peter the Great of Russia and the Empress Catharine; b. in 1708; was married to Frederick Charles, Duke of Holstein, in 1725. She was mother of Peter III. of Russia. D. in 1728.

Annap'olis, or Annapolis Royal: a seaport of Nova Scotia; at the mouth of the river Annapolis (see map of Quebec, ref. 2-A). It is one of the oldest settlements in North America, and was founded in 1604 by the French, who called it Port Royal. The harbor is good, but difficult of access. This town was the capital of the province until 1750. Pop. 2,800.

Annapolis: city; capital of Maryland, and county seat of Anne Arundel County (for location of county, see map of Maryland, ref. 3-F); is a port of entry on the south bank of the Severn river, 2 miles from its entrance into Chesapeake Bay, 20 miles S. by E. of Baltimore, and 22 miles E. by N. of Washington, and 40 miles by rail to the latter city by the A., W. and B. R. R., and 26 miles from Baltimore by the A. and B. Short Line. The Eastern Shore R. R. also passes through this city to Ocean City via Bay Ridge, across the Chesapeake Bay. It has also water communication with Baltimore daily by steamboat. Annapolis contains a State-house, Governor's mansion, court-house, land-office, comptroller and treasurer's buildings, and jail. It is also the

seat of St. John's College and the U. S. Naval Academy. (See **NAVAL ACADEMY**.) A bronze statue of Maj.-Gen. John de Kalb was unveiled here Aug. 16, 1886. There is also a



State Capitol, Annapolis, Md.

bronze statue in front of the State-house of the late Chief Justice Roger B. Taney. It is also the seat of the Court of Appeals. The harbor, or Annapolis Roads, is one of the finest in the country, there being a depth of 60 feet in the channel up to Round Bay in the Severn river, 7 miles from the city. The city has both gas-works and water-works. Pop. (1880) 6,642; (1890) 7,604; (1900) 8,402. **EDITOR OF "CAPITOL."**

Ann Ar'bor: city and important railroad center; capital of Washtenaw co., Mich. (for location of county, see map of Michigan, ref. 8-J); on the Huron river; 38 miles W. of Detroit. The situation is elevated and pleasant. Here is the State University, one of the most flourishing institutions in the country, founded in 1837. (See **MICHIGAN UNIVERSITY**.) Ann Arbor has manufactures of furniture, organs, agricultural machines, wagons and carts, etc., and several flouring-mills. Pop. (1870) 7,363; (1880) 8,061; (1890) 9,431; (1900) 14,509.

An-Nā'sir (or Al-Nassir) Ledinil'lah (i. e. the defender of the religion of God): one of the Abassid caliphs; began to reign at Bagdad in 1180. He was a liberal patron of learning, and successfully defended his dominions against several aggressive enemies. D. in 1225.

An'nates [from mediev. Lat. *anna'ta*, a year's (*annus*) work]: the tax of "first-fruits" imposed by the popes on all bishops on their accession, and equal to one year's revenue of the benefice. The Council of Pisa (1409) complained of the custom; that of Bâle (1435) called it simony; that of Trent (Nov. 11, 1563) prohibited it, but it was recognized by concordat with Naples in 1818. In England, annates were first levied in 1213. In 1534 they were made payable to the king (Henry VIII.) instead of the pope. Queen Mary gave them up on her accession to the throne, but in the first year of Elizabeth's reign they were resumed by the crown, and continued to form part of the royal revenue until Queen Anne restored them to the Church under a scheme for their appropriation to the increase of poor livings. See **QUEEN ANNE'S BOUNTY**, under **BOUNTY**. W. S. PERRY.

Annatto: See **ANNOTTO**.

Anne: Queen of Great Britain and Ireland; the last sovereign of the house of Stuart; b. at St. James's Palace, London, on Feb. 6, 1665. She was the second daughter of James II. and Anne Hyde, who was a daughter of the famous Lord Clarendon. She was educated in the Protestant religion, to which she afterward manifested a constant devotion, although her father, after his accession to the throne, attempted to convert her to the Roman Catholic faith. On July 28, 1683, she was married to Prince George

of Denmark, a brother of Christian V. At an early age she formed an intimacy with Sarah Jennings (afterward the Duchess of Marlborough), who exercised an almost unbounded influence over her, both before and after her accession to the throne. Anne was the mother of seventeen children, all of whom died young and before she became queen. In the revolution of 1688 she supported the cause of the Prince of Orange, but was afterward implicated in intrigues for the restoration of her father. Anne succeeded William III., who died Mar. 8, 1702, at a time when the strife of parties was extremely violent. She pursued the foreign policy of the late king, which involved England in the long war of the Spanish succession as the ally of Austria and the enemy of France. Among the important events of her reign were a number of signal victories gained by the Duke of Marlborough over the armies of Louis XIV., and the union of England and Scotland in 1707. Her political principles, if she had any, were favorable to royal prerogative rather than constitutional liberty, and rendered her partial to the Tories. Anne became gradually alienated from the Duchess of Marlborough, who was a Whig, and transferred her favoritism to Mrs. Masham, whose intrigues undermined the Whig party so effectually that the Tory statesmen, the Earl of Oxford and Lord Bolingbroke, came into power in 1710. The queen and these Tory ministers concurred in designs and intrigues to secure the succession to her brother, the Pretender. The European war was ended by the treaty of Utrecht, April 11, 1713. Lord Bolingbroke became prime minister in place of the Earl of Oxford in July, 1714. Anne died of apoplexy on Aug. 1, 1714, and was succeeded by George I. The period of her reign, illustrated by the genius of Newton, Addison, Pope, Bolingbroke, Swift, De Foe, and Arbuthnot, was almost as celebrated in literature as the Augustan age of Rome, although she did little to make it so. See Oldmixon, *Life of Queen Anne* (1716); Strickland, *Lives of the Queens of England*; Ashton, *Social Life in the Reign of Queen Anne* (1883).

Anne of Austria: daughter of King Philip III. of Spain; b. Sept. 22, 1601; married Louis XIII. of France, Nov. 9, 1615; mother of Louis XIV. and Philip, founder of the House of Orleans; made regent after the death of her husband 1643; put the government in the hands of Mazarin; after his death (1661) retired to Convent of Val de Grâce. D. Jan. 20, 1666. Weak as a ruler, her regency was disturbed by the civil war of the Fronde. See Freere's *Regency of Anne of Austria* (2 vols., London, 1866).

Anne of Brittany: Queen of France; b. at Nantes, Jan. 26, 1476; daughter and heiress of Francis II., Duke of Brittany; married Charles VIII. of France, Dec. 6, 1491, Brittany, her dowry, then becoming united to France. After her husband's death (1499) she married his successor, Louis XII., whom she ably assisted. She was left a widow a second time in 1512, and died Jan. 9, 1514.

Anne of Cleves: b. Sept. 22, 1515; daughter of John, Duke of Cleves; became the fourth queen of Henry VIII. of England, who, on Thomas Cromwell's advice, married her to please the German Protestants Jan. 6, 1540. She was divorced July 9 of the same year, and retired to private life on a pension of £3,000 per annum. D. at Chelsea, July 16, 1557, and was buried in Westminster Abbey.

Anne of Denmark: wife of James I. of England; b. at Skanderborg, Jutland, Dec. 12, 1574; married at Upslo, Norway, Nov. 23, 1589; died at Hampton Court, Mar. 2, 1612. She was rather frivolous, very fond of pageants and masquerades, given to expensive building, and leaned toward Romanism, but was prevented from public avowal.

Anneal'ing [from Old Eng. *on-alan*, set on fire, make hot, burn]: a process of tempering glass and certain metals by heating them and then cooling them slowly, in order to render them less brittle and more tenacious. The extreme brittleness of glass that has not been annealed is seen in the glass toys called "Prince Rupert's drops," which, if scratched with a file, will collapse into powder or small fragments. Glass vessels are annealed in a long oven, one end of which is hotter than the other, and the trays in which the vessels are placed are slowly drawn into cooler and cooler parts. The operation of annealing large vessels requires several days. Iron, steel, brass, and other metals which are hammered into plates or drawn into wire become brittle during the process, and require to be annealed by cooling them slowly in water or air. Steel is tempered and hardened by a process of annealing, being placed in an oil-

bath or surrounded by a metallic compound which has a low fusing-point. The soft metals are annealed by immersion in water, which is boiled and then cooled slowly.

Annecey: a town of Eastern France; in Upper Savoy; pleasantly situated at the N. W. extremity of Annecey lake, 22 miles by rail S. of Geneva (see map of France, ref. 6-I). It has a cathedral, a bishop's palace, a church in which are preserved the relics of St. Francis de Sales, an old castle (formerly the residence of the Counts of Geneva), glass-works, cotton-mills, etc. It was once the capital of the Counts of Geneva. It passed from them to the Counts of Savoy, afterward Kings of Sardinia, who ceded it to the French in 1860. It shows traces of Roman origin. Pop. (1881) 11,334; (1891) 11,947; (1896) 12,894.

Annecey, Lake of: in Upper Savoy, 22 miles S. of Geneva, about 24 miles W. of Mont Blanc, and 1,426 feet above the sea. It is about 9 miles long and from 1 to 2 wide. Its waters are discharged through the Fieran into the Rhône.

Anneke, aan'ne-ke, JANS: See BOGARDUS, EVERARD.

Anneke, MATHILDE FRANCESKA GIESLER: b. on the estate of her grandfather, near Blankenstein, Prussia, Apr. 3, 1817. Early in life she engaged in literary pursuits, and took a deep interest in the political and social freedom of her country. When her husband, a Prussian officer and powerful leader in the revolution of 1848, was imprisoned under sentence of death at Cologne, Madame Anneke put a printing-press into her parlors, and herself edited a paper in the interests of the revolution. She served on the battle-field as one of her husband's staff. When the revolutionists were overpowered she, with her family, sought refuge in America, where she has been one of the most earnest champions of woman's enfranchisement. She edited the *Frauen Zeitung* at Milwaukee, Wis., in 1850, where she became principal of an academy for young ladies. SUSAN B. ANTHONY.

Annel'ida (from Lat. *annellus*, a little ring): a class of animals in which the long cylindrical body is divided into a series of rings or segments, each like its fellows. These segments each contain a portion of the internal organs, but they lack jointed appendages. (See ARTHROPODA.) There is usually a well-developed circulatory system consisting of dorsal and ventral vessels and communicating transverse branches. The nervous system consists of an anterior brain connected with a series of ventral ganglia (a pair in each segment) by two nerve-cords, one passing on either side of the throat. The mouth is ventral, the alimentary canal usually straight. Respiration takes place either by the general body-surface or by gills which may be developed upon the head or upon the segments of the body. In some there are also paired outgrowths from the body, strengthened by bristles, which serve as locomotor organs. The reproduction is usually by eggs, a few forms dividing spontaneously into two new individuals. Most of the Annelids are marine, but some occur in fresh water and a few (see EARTHWORMS) in moist earth. The Annelids include (1) the *Hirudines* (see LEECH); (2) the *Chatopods* (*q. v.*), and (3) the *Myzostomata*, a group of peculiar forms parasitic on the crinoids. J. S. KINGSLEY.

Annenkoff, MICHEL: See the Appendix.

An'ni, or Ani (anc. *Ab'nicum*): a ruined city of Asiatic Turkey; on the Arpa-Chai river; 28 miles E. by S. of Kars; capital of the Bagratian Kings of Armenia until taken by Alp-Arslân (1064); destroyed by an earthquake in 1319. Here are ruins of an ancient palace and citadel; also some Armenian churches nearly entire. These ruins plainly show the former importance of the city.

Annihila'tionist: one who denies the existence of the soul after death. Annihilationists are of two classes: those who believe that annihilation is the final doom of the incorrigibly wicked, and those who believe that immortality is not a natural attribute of man, but is specially conferred by God on those who through faith and obedience become part-takers of the divine nature. See FUTURE STATE.

C. K. ADAMS.

Anniston: city and railroad junction, Calhoun co., Ala. (for location of county, see map of Alabama, ref. 3-E); has cotton-factory, iron-works, car-factory, rolling-mills, pipe-works, six furnaces, etc. Pop. (1880) 942; (1890) 9,998; (1900) 9,695. EDITOR OF "WATCHMAN."

An'nius of Viter'bo (It. *An'nio da Viter'bo*): a learned Italian Dominican monk, whose proper name was GIOVANNI NANNI; b. at Viterbo about 1432. He wrote a Latin *Trea-*

tise on the Empire of the Turks (1471). He published at Rome, in 1498, *Seventeen Volumes of Various Antiquities with Commentaries*, containing extracts from the lost works of Berosus, Manetho, and other ancient historians, which proved to be forgeries. D. in 1502.

Anniver'sary [from Lat. *anniversaria*, adj., sc. *dies*; *annus*, year + *ver'tere*, *versus*, turn]: the annual return of a memorable day; the day on which some remarkable event is annually celebrated. Among the Jews the Passover was an anniversary in commemoration of the exodus from Egypt. The principal religious anniversaries of Christians are Christmas, Epiphany, and Easter. Anniversary days in the Roman Catholic Church are days on which an office is annually performed for the souls of the deceased.

Annobom', or **Annabon'**: island; 4 miles long and 2 wide; in the Gulf of Guinea (see map of Africa, ref. 6-C); was discovered Jan. 1, 1473, by the Portuguese, and has a population of about 3,000. Area, 6.6 sq. miles.

Annolied: a German poem in praise of Anno, a local saint of the city of Cologne. The poem, which is of great literary and linguistic value, was probably written in 1073, soon after the death of Anno, Archbishop of Cologne. It was edited for the first time by Martin Opitz (1639). See Wilmann's *Ueber das Annolied* (Bonn, 1886). JULIUS GOEBEL.

Annonay (Lat. *Annonæum*, or *Annoniacum*): a town of France; department of Ardèche; 37 miles S. S. W. of Lyons, at the junction of the rivers Cance and Déaume (see map of France, ref. 7-G). It has a suspension bridge and large manufactories of glove-leather. Paper of fine quality is made here. The Montgolfiers, who invented balloons, were natives of the town. Pop. (1896) 17,028.

Annot'to, or **Annat'to**: a red coloring-matter; is the pulp of the seeds of the *Bixa orellana*, an exogenous shrub which grows in South America and the West Indies, and belongs to the natural order *Flacourtiaceæ*. It is soluble in alcohol, ether, and in potash and soda, either caustic or carbonated. It contains a yellow principle called bixin. It is used as a dye, but its colors are fugitive. The pulp is used to color cheese, is an ingredient in some varnishes, and is employed in medicine to color ointments and plasters. In South America annotto is mixed with chocolate to improve the flavor.

An'mal (*annua'lis*, deriv. of *an'nus*, year): a plant which lives only one year; a plant which within the space of a year passes from a seed into a perfect plant, bears its fruit, and perishes. The duration of the life of annuals is generally much less than a year. Some plants which are annuals in one climate are perennials in another, as the castor-oil plant.

Annual Layers of Wood: In ordinary trees there is one period of growth each year, and this produces one layer of wood on the stem for each year's growth. When there are two periods of growth in a year, there are two wood layers. In cool climates, as there is rarely more than one growth period, the rings of wood are as many or about as many as the years during which the stem has lived, but as we go to warmer climates there is greater irregularity.

CHARLES E. BESSEY.

Annu'ity [from Fr. *annuité* < Mediev. Lat. *annuitas*, deriv. of *an'nus*, year]: a rent or sum of money which a person is entitled to receive every year. If the payment is to be continued through a period of uncertain length, it is called a *contingent annuity*; if it is payable for a definite number of years, it is an *annuity certain*. A person who has unemployed capital may find it advantageous to convert it into an annual income, which he is entitled to receive as long as he lives, and which is called a life annuity. The person who receives an annuity is called an annuitant. An annual income which is not to be paid until a number of years have elapsed is a deferred annuity. Those who invest money in the public funds of Great Britain are entitled to an income which is virtually a perpetual annuity, so that when each annuitant dies he may leave it to his heir. The accurate determination of the value of annuities in present money is a complex question of great importance and considerable difficulty, for the solution of which correct tables of vital statistics are requisite. The rate of interest is also an important element in the calculation of annuities. Great labor has been expended by several learned men in the formation of tables of the value of life annuities at all the different ages of human life.

ANNUITY, in the law of England, is a sum of money pay-

able every year, and charged on the person or personal estate of the individual who is bound to pay it; thus differing from a rent-charge, which is charged on real estate. Annuities are often paid by a person who borrows money (who is called the grantor) to the person who lends the money (who is the grantee). An annuity is either for a term of years, for a life or lives, or in perpetuity; and the last, although charged on personal property, may descend as real estate.

Revised by HENRY WADE ROGERS.

An'nulus [Lat., a ring]: a botanical term used in several senses. In mosses it denotes a rim external with respect to the peristome; in ferns it is an elastic rib which girds the theca or spore-case, and by its contraction disperses the spores: the collar which surrounds the stipes of some fungi just below the hymenium is also called an annulus.

Annuncia'da (the Order of Knights of the Annunciation): founded by Amadeus VI. of Savoy in 1362; an order originally called the Order of the Collar. The reigning King of Italy is grand master of the order.

Annuncia'tion, Feast of: a festival of the Church, observed at least as early as the tenth Council of Toledo (A. D. 656), and noticed in the acts of the Council in Trullo held A. D. 692, in commemoration of the announcement of the conception of the Saviour to the Virgin Mary by the angel Gabriel. It is celebrated on March 25, which is called Lady Day. A synod held at Worcester, England, A. D. 1240, forbade all servile work on this festival.

Ann'ville: village on Philadelphia and Reading R. R., Lebanon co., Pa. (for location of county, see map of Pennsylvania, ref. 5-H); is a manufacturing town in a farming district, and is the seat of Lebanon Valley College. Pop. (1880) 1,431; (1890) 1,283; not returned separately in 1900.

Ano'a: a small species of wild buffalo (*anoa depressicornis*), having the horns erect; it was originally classed with the antelopes, to which it has no close affinity. It lives in Celebes.

An'ode [from Gr. *ἀνοδος*, way up; *ἀνά*, up + *ὁδός*, way]: in electrolysis, the positive pole, or that surface by which the galvanic current enters the body (electrolyte) undergoing decomposition. The negative pole, or the surface by which the current goes out, is called *cathode*. The elements of electrolytes are called *ions*, and those which go to the anode are named *anions*. Thus in the decomposition of water by a galvanic battery, water is the electrolyte, the platinum plate connected with the positive pole is the anode, and the oxygen is the anion.

An'odyne [from Gr. *ἀνώδυνος*, painless; *ἀν-*, not + *ὀδύνη*, pain]: a medicine which diminishes pain. Opium, morphine, the anæsthetics, cannabis Indica, etc., are the chief anodynes—most of which tend actively to cause sleep. Some hypnotics, or sleep producers, however, like chloral, are not anodynes.

Anoint'ing [from O. Fr. *enoint* < Lat. *in-unctus*, partic. of *in-ungere*, anoint]: an Oriental custom of pouring aromatic oil on the head as a mark of honor. It was practiced at the coronation of kings and the consecration of high priests and prophets, as in the case of Saul, David, Aaron, and his sons. Spikenard, myrrh, and olive oil were sometimes used for this purpose. Anointing forms a part of the ceremonial of various sacraments in the Roman Catholic and the different Oriental churches. In the form used for the coronation of English kings and queens, the anointing is done by the Archbishop of Canterbury.

Revised by W. S. PERRY.

Anoka: city on railroad, capital of Anoka co., Minn. (for location of county, see map of Minnesota, ref. 9-F); on both sides of Rum river at its junction with the Mississippi, 15 miles N. N. W. of Minneapolis; has good water-power on Rum river. Flour, lumber, sash, doors, blinds, starch, shoes, carriages, machinery, etc., are manufactured. The city is connected with Champlin, on the other side of the Mississippi, by an iron bridge 900 feet long, and has a business college, high school, etc. Pop. (1880) 2,706; (1885) 4,629; (1890) 4,252; (1900) 3,769.

EDITOR OF "HERALD."

Ano'lis (Lat. form of *anoli*, name native in Antilles): a genus of lizards of the family *Iguanidæ*, natives of the warm parts of America, remarkable for their power of inflating the skin of the throat. They move with great agility, and exhibit great brilliancy of color, which is susceptible of change, and has consequently caused them to be popularly called chameleons, from which, however, they are very dis-

tinct. About 100 species are known; one of them (*Anolis carolinensis*) is common in the forests of the Southern States.

Anomalis'tic Year: the interval of time in which the earth completes a revolution with respect to any point in its orbit, or the interval which elapses between two successive passages of the earth through its perihelion. It is 4 minutes and 39 seconds longer than a sidereal year, and its length is 365 days, 6 hours, 13 minutes, and 45 seconds.

Anomaly [Gr. ἀνωμαλία; ἀν-, not + ὁμαλός, even]: in astronomy, the angular distance of a planet from its perihelion. The anomaly as above defined is the *true anomaly*. If we suppose a fictitious planet to set out from perihelion with the true planet, and to revolve uniformly about the sun at such a rate as to return to perihelion at the same time as the true planet, the anomaly of the fictitious planet is called the *mean anomaly*.

Anomia [from Gr. ἀνομος, irregular; ἀ-, not + νόμος, law]: a genus of lamellibranchiate mollusks related to the oyster. The shell consists of two unequal, irregular thin valves, of which the flatter one is deeply notched at the cardinal margin. Numerous species, living and fossil, are found in various parts of the world.

Anona [Sp., the custard-apple]: a genus of exogenous trees of the family *Anonaceae*, natives of hot climates. *Anona reticulata* bears an edible fruit called the custard-apple, because its seeds are surrounded by a whitish, sweet, cream-like pulp. The cherimova, an excellent fruit of Peru, is produced by the *Anona cherimolia*.

Anonymous [from Gr. ἀνόνομος, nameless; ἀν-, not + ὄνομα name]: literally, nameless; a term applied to books published without the name of the author. Those which appear under an assumed name are called *pseudonymous*. The political articles of the English journals are generally anonymous, and so are the critical articles in the great quarterly reviews. Anonymous books cause much difficulty and perplexity to bibliographers and the compilers of catalogues. The best account or catalogue of such works is Barbier's *Dictionnaire des Ouvrages Anonymes et Pseudonymes* (3 vols., Paris, 1822-24); Halkett and Lang, *Dictionary of Anonymous and Pseudonymous Literature* (4 vols., Edinburgh, 1881-87).

Anoplothe'rium [Lat. form, from Gr. ἀνοπλος, unarmed; ἀν-, not + ὄπλον, weapon; + θηρίον, wild beast]: a genus of extinct artiodactyle quadrupeds, found in the strata of the Upper Eocene formation near Paris, and in Lapland, India, etc. They are characterized by their shortness and small size of the canine teeth, have the teeth arranged in a continuous series without vacant interspaces, and of uniform height—a structure which occurs in no existing animal except man. The *Anoplotherium commune* was about the size of a wild boar.

Anor'thite: a felspathic mineral found at Vesuvius and elsewhere; essentially an anhydrous silicate of lime and alumina.

Anotto: See ANNOTTO.

Anquetil du Perron, ănk'teel'dü-păr'rôn', ABRAHAM HYACINTHE: Oriental scholar; b. at Paris, Dec. 7, 1731. He began early to study Hebrew, Arabic, and Persian, and in 1754 he conceived the idea of visiting India, chiefly in order to gain from the priests a knowledge of the Zoroastrian books. Being without means, he enlisted as a common soldier in a regiment bound for India. He spent seven years in India, collected MSS., learned the language of the religious books of the Parsees, and returned to France in 1762. In 1763 he became a member of the Academy of Inscriptions. In 1771 he published his *Zend-Avesta, ouvrage de Zoroastre* (Paris, 3 vols.), the first translation of the sacred books of the Parsees that ever appeared in any European language. (See AVESTA.) Anquetil also wrote two volumes on *l'Inde en Rapport avec l'Europe* (Paris, 1798). He published a Latin rendering of a Persian version of the Sanskrit *Upanishads* under the title *Oupnek'hat* (2 vols., 1804). This work is interesting on account of its influence on Schopenhauer and his philosophic system. D. at Paris, Jan. 17, 1805.

Revised by A. V. WILLIAMS JACKSON.

Ansaries: See NUSAIRIEH.

Ans'bach (Fr. *Anspach*, anc. *Onolzbach*): a fortified city of Bavaria; on the Rezat, 27 miles S. W. of Nuremberg (see map of German Empire, ref. 6-E). It has a castle, the former residence of the margraves of Ansbach-Baireuth, a

public library, and manufactures of cotton and half-silken stuffs, tobacco, earthenware, cutlery, etc. Pop. 14,234.

Anscha'rins, or **Ans'gar**, SAINT: called the "Apostle of the North"; b. in Picardy, Sept. 8, 801. He propagated Christianity with success in North Germany, Denmark, and Sweden, and became the first Archbishop of Hamburg in 832. D. at Bremen, Feb. 3, 865.

Anschütz, CARL: musician; b. at Coblenz, Germany, in Feb., 1813; studied first under his father and then under Friederich Schneider, of Dessau, whose daughter he married; was appointed successively conductor of the Royal Musical Institution at Coblenz and the orchestra of the theater, receiving the title of Royal Musical Director. In 1848 he resigned and went to Nuremberg; in 1849 to Amsterdam, and in the same year to London, where he conducted operas and concerts. In 1857 he removed to New York and conducted Italian opera for three years. In 1862 he introduced German opera in that city. All of his life was spent in conducting orchestras and singing societies, in which he was very successful. D. in New York, Dec. 29, 1879.

D. E. HERVEY.

Ans'dell, RICHARD: English painter of animals; b. in Liverpool in 1815; obtained gold medal in Paris (1855). D. at Farnborough, Apr. 20, 1885.

Anse de Panier [Fr., handle of a basket]: an epithet applied to an elliptical or three-centered or five-centered curve when used for an arch.

An'selm: Archbishop of Canterbury and the father of Scholastic theology; b. at, or near, Aosta in Piedmont in 1033; d. at Canterbury, Apr. 21, 1109. He studied in the monastery of Bec, Normandy, which had obtained a great reputation under the priorship of his countryman Lanfranc. In 1078 he was himself elected Abbot of Bec, and added new luster to the institution both as a teacher and as a writer. In 1093 he was made Archbishop of Canterbury; but, though he was a man of great humility, having adopted the Gregorian views of the relation between Church and state, he was willing to brave exile (1097) rather than submit to the demands of the king. His principal works are the tract *De Veritate* which contains the ground-work of his theory of knowledge, and the *Monologion* and *Proslogion*, all written while he was at Bec. The *Monologion* demonstrates the real existence of God on the ordinary grounds of realism; while the *Proslogion* sets forth the ontological evidence of the existence of God. The *Monologion* and *Proslogion* have been translated and annotated by Bouchitté, *Le Rationalisme Crézien* (Paris, 1842). It is the celebrated *Cur Deus Homo*—the greatest of Anselm's writings (Eng. translation by Prout, 1887)—which has laid the foundation of the orthodox doctrine of the atonement. The second volume of Hasse's *Anselm von Canterbury, Philosophie* (1852), is devoted to Anselm's Scholastic writings. Anselm had originally studied law, and the fundamental conceptions on which he based his doctrine of atonement were derived from, or at least influenced by, the *jus Romanum*. He also wrote a number of devotional books distinguished by the ease and naturalness of his Latin style. The best collected edition of his works is that by Gerbcron (Paris, 1675; 2d ed. 1721); and in Migne, *Patrologiæ Cursus Completus*, vol. clv. See also the translations in the *Bibliotheca Sacra* (viii., ix. and xii.). His *Life*, by Hasse (1843), was translated from the German by W. Turner (Lond. 1850). *St. Anselm*, by R. W. Church (Lond. 1870, and frequently reissued), is a monograph of great value. Möhler's *Anselm* was translated into English in 1842. Remusat's *Anselm de Cantorbéry* appeared in 1855, and a second edition in 1868. See *Life and Times of St. Anselm*, by Martin Rule (2 vols., 1883).

Revised by W. S. PERRY.

Anseres [Lat. pl. of *anser*, a goose]: an order of birds comprising the geese and ducks; the equivalent of *Lamellicornes* (q. v.) or *Chenomorphæ*.

Anson, GEORGE, Lord: b. at Colwich, in Staffordshire, Apr. 23, 1697; became a post-captain in the royal navy in 1724, after which he passed several years on the Carolina station. In 1740 he was appointed commander of an expedition to the South Sea, in which he exhibited great prudence and courage amid disasters and dangers caused partly by the unseaworthiness of his vessels. Having circumnavigated the globe and made some important discoveries, he returned in 1744 with several Spanish prizes to the value of £500,000. He defeated a French fleet in May, 1747, and for this service was rewarded with the title of Baron

Anson of Soberton. He was First Lord of the Admiralty from 1751 to 1756, and admiral of the fleet in 1761. D. at Moor Park, Hertfordshire, June 6, 1762. A narrative of his voyage round the world was published (1748).

Anso'nia: railroad center, formerly in the town of Derby, New Haven co., Conn., on the Naugatuck river, 12 miles W. N. W. of New Haven (for location of county, see map of Connecticut, ref. 11-F). It has a variety of manufactures of brass and iron, etc. Pop. (1890) 10,342; (1900) 12,681.

EDITOR "SENTINEL."

Ansonians, or Ansyreeh: See NUSAIRIEH.

Ansoerge, CHARLES: b. at Spiller, Silesia, in 1817; graduated at the collegiate institute of Breslau; became a teacher and editor, and was banished by the Prussian Government on account of his liberal opinions; removed to Boston, Mass., in 1849; was organist and chorister of the First church, Dorchester, Mass., thirteen years; also taught music for several years in the asylum for the blind in South Boston, Mass.; removed to Chicago, Ill., in 1863, where he died Oct. 28, 1866.

Ansoerge, CONRAD: pianist; b. in Bachwald, Siberia, Russia, Oct. 15, 1862; studied there and at the Leipzig Conservatory. In the season of 1886-87 made a success in recitals at Berlin; made his first appearance in New York in January, 1888, and has since played in all the large cities of the U. S. He has composed considerably for the piano.

D. E. HERVEY.

Anspach, ELIZABETH BERKELEY, Margravine of: daughter of Augustus, Earl of Berkeley; b. in 1750. She was accomplished, and remarkable for versatility of genius. In 1767 she was married to Mr. Craven, who became Earl of Craven, and died September, 1791. She was married in the following month to the Margrave of Anspach, but then she had been separated from Lord Craven since 1780. She wrote and performed dramas, and published entertaining autobiographic memoirs. D. at Naples, Jan. 13, 1828.

An'sted, DAVID THOMAS, F. R. S.: English geologist; b. in London in 1814; educated at Cambridge. He became in 1840 Professor of Geology in King's College, London, traveled in America and elsewhere, and published a great number of works, among which are *Geology, Introductory, Descriptive, and Practical* (2 vols., 1844); *The Ancient World, or Picturesque Sketches of Great Britain*; *The Great Stone Book of Nature* (1863); and *The World We Live In* (1869). D. near Woodbridge, Suffolk, May 20, 1880.

An'ster, JOHN, LL. D.: b. in Cork co., Ireland, 1798; was a friend of Coleridge, and regius Professor of Civil Law in the University of Dublin. He produced *Poems and Translations from the German* (1819), and a translation of *Faust* (1835), and contributed many articles to *Blackwood's Magazine*. D. at Dublin, June 9, 1867.

An'stey, CHRISTOPHER: English humorist; b. Oct. 31, 1724. He was educated at King's College, Cambridge, where he held a fellowship from 1745 to 1754. He translated Gray's *Elegy* into Latin; but his principal work was the *New Bath Guide* (1766), a series of letters in verse satirizing society at that fashionable watering-place. D. at Bath in 1805.

HENRY A. BEERS.

Anstey, F.: See GUTHRIE, THOMAS ANSTHEY.

An'swer [O. Eng. *and-*, against + *swarjan*, swear, affirm]: the reply given to a question or request; specifically in the law of evidence the reply of a witness to a question put to him. It also means a pleading interposed in a court of equity by the defendant to the bill or information of the plaintiff. In New York, since the adoption of the code of procedure, and in a number of the other States, it is the name given to the defendant's pleading in all cases, except where he resorts to a demurrer. See DEMURRER.

Ant, or Emmet: a hymenopterous insect, closely allied to the bees and wasps; remarkable for industry, ingenuity, and muscular strength. There are numerous species, widely distributed in temperate and tropical countries. They live in societies composed of males, females, and neuters, the last of which are sterile females and are destitute of wings. The neuters do the work of the community, building and repairing the nests, nursing the young, etc. In some cases they have their jaws greatly enlarged, and serve the community as soldiers. The males and females have wings, and are larger than the neuters, but less numerous. After the

pairing season is past the females lose their wings, and are carefully waited on by the workers until the eggs are laid. In winter most species remain dormant, and neither work nor eat. The popular notion that they collect in summer a hoard of grain for their subsistence during the winter seems to have been largely based upon erroneous observation. They are mostly carnivorous, and will attack a living animal many times larger than themselves. Another favorite food of some species is the honey-dew, the sweet excretion of aphides, or plant-lice. They often confine these aphides as man does his milch cows, and obtain from them, by a process like milking, a regular supply of honey-dew. Perhaps the most remarkable of all this interesting group of insects are the "honey-ants" of Mexico, New Mexico, and Arizona. They live in colonies resembling those of the common brown ant of the U. S. Certain members of the community, however, during the summer season store up honey in their abdomen, and soon become incapable of locomotion. They are then placed in subterranean galleries set apart for that purpose, and are systematically fed by the others. In time the distension of the abdomen becomes so great that the victim ants resemble small, spherical, pellucid grapes. Later in the season, when food is scarce, these fattened ants are in turn devoured by the other members of the colony. Ants appear to be endowed with greater muscular strength than almost any other insect of equal size. They display great ingenuity in the construction of their habitations, called ant-hills or ant-nests. The large ants of South America raise their ant-hills to the height of 15 feet or more. Some species, called mason ants, perforate galleries in the clay, and support by pillars and arches the roof of their house. Others, called carpenter ants, excavate cells and labyrinthine galleries in the trunks of living trees. Ants are supposed to have a faculty of conversing or communicating with each other by rubbing their antennæ together. These insects are generally very pugnacious, and often fight pitched battles with other ants. The Swiss naturalist Huber has given a detailed account of their battles, martial exploits, and predatory expeditions. Still more marvelous and paradoxical is the well-attested fact that some species, as the *Formica rufa* and the *Formica rufescens* (or amazon ant), reduce other ants to slavery, and that the principal motive of their wars and piratical excursions is to capture larvæ and pupæ or nymphs, which they carry home for slaves. "At the head of these daring slave-makers," says Pouchet, "we must put the red ant or amazon, the military expeditions of which have been most carefully observed by the naturalists of our epoch. They are so frequent that one may enjoy the sight of them any fine day during the summer season." After describing the siege and capture of a nest by these amazons, he adds: "Then the whole army laden with booty, and sometimes stretching out in a line 40 meters in length (130 feet), triumphantly returns to its city in the same order as at its departure." (*The Universe*.) These slave-holding ants have often a great aversion to labor, and when they perform a journey are carried by their slaves. In some cases they depend upon the slaves to feed them, and perish surrounded by food if left alone. The fact that ants work all through the night, and seem never to sleep, was noticed more than 150 years ago in the *Guardian* (vol. ii., No. 156). A battle of ants has been described by Huber in these terms: "I shall not say what lighted up discord between these two republics, the one as populous as the other. The two armies met midway between their respective residences. Their serried columns reached from the field of battle to the nest, and were 2 feet in width. . . . The field of battle, which extended over a space of 2 or 3 sq. feet, was strewn with dead bodies and wounded; it was also covered with venom, and exhaled a penetrating odor. The struggle began between two ants, which locked themselves together with their mandibles, while they raised themselves upon their legs. They quickly grasped each other so tightly that they rolled one over the other in the dust." At the approach of night the two armies effected a retreat, but the next day the carnage was renewed with equal or greater fury. The workers and females are provided with stings which owe their virulence to the presence of *formic acid*, secreted by a gland in connection with the sting. The carnivorous species of ants perform a useful service by devouring the carcasses of dead animals. Their voracity is such that a clean skeleton of a small animal may be obtained by burying it for a short time in an ant-hill. The termites of tropical countries, sometimes called white ants, are not prop-

erly ants, but belong to a different order of insects, the *Neuroptera*. (See TERMITES.) See P. Huber's *Traité des Mœurs des Fourmis Indigènes*.

Revised by DAVID S. JORDAN.

Antacid, ăn-tă'sid (*anti-* + *acid*): a remedy for acid in the stomach or in the blood. The alkalies, lime-water, magnesia, etc., are mostly used for this purpose, vegetable acids, like the citric (lemon juice, etc.), being often administered with them. These acids become carbonic acid in the blood, forming bicarbonates with the alkalies. This antacid treatment is much resorted to in acute rheumatism.

Antæ'us (in Gr. Ἀνταῖος): a fabulous Libyan giant; son of Neptune and Terra; famous as a wrestler. He was invincible as long as he continued in contact with the earth (Terra), but he was conquered by Hercules, who raised him into the air and strangled him to death.

Antagonism of Drugs: The expression "antagonism" is used to signify that relation of the actions of different drugs on the animal economy which is shown when the usual effects of the action of one are prevented or suppressed by the action of another. This, it will be noted, is brought about by the *opposed actions* of the different drugs, and not by any change in the chemical composition of either. The latter process is, by English-speaking writers, called "antidotal," while French authors define antagonism as a form of antidotal action. When a solution of chloride of sodium is given after nitrate of silver has been swallowed, there is a chemical reaction, by which the soluble and caustic silver nitrate is converted into an insoluble and harmless silver chloride. This is an example of antidotal action—a chemical process. Antagonism, on the other hand, becomes effective by a physiological process. An example of this may be seen when strychnia and chloral are administered together. Strychnia increases the excitability of the respiratory center in the brain and of the spinal cord, while chloral lessens their excitability; and the effect of an otherwise fatal dose of strychnia may be counteracted by means of a suitable dose of chloral. Conversely the administration of strychnia may prevent death from chloral poisoning. Another illustration of antagonism may be seen in opium and belladonna, or their active principles, morphia and atropia. One of the most manifest effects of opium is to strongly and persistently contract the pupil of the eye, while belladonna as strongly and more persistently dilates the pupil. These effects of opium and belladonna are of less importance, however, than is their action upon the respiration, which is depressed by opium and stimulated by belladonna. To present another illustration of antagonism, pilocarpine and atropine produce diametrically opposite effects upon the function of perspiration, which is markedly increased by pilocarpine and diminished by atropine.

The process by which antagonism is made effective is not clearly understood. Certain writers have held that it is, after all, like that of chemical antidotes. Dr. Lauder Brunton, a distinguished English writer on drugs, answers the natural objection, that the minuteness of the dose which is effective is an argument against the notion of a chemical change, by stating that he has, by the addition of a single drop of liquor potasse, converted a milky-looking fluid, composed of the nuclei of blood-corpuscles of fowls suspended in water and measuring 90 cubic cm. (about 3 fluid ounces) into a solid jelly-like mass. This experiment may not appear to others to furnish a true parallel to the case when but a hundredth of a grain of one of the vegetable alkaloids is taken into a human body, but it indicates what important physical changes may take place in living organisms when but a slight change is effected in their chemical surroundings.

The great majority of observers and experimenters regard the antagonism of drugs as dependent upon antagonistic physiological processes, as stated above, holding that it is an antagonism of their effects: so that the same part—nerve, gland, muscle—being by one drug stimulated and by another restrained, exhibits the usual effect of neither, or that of one or the other only because, and in proportion as, the dose of one or the other is relatively larger. The simplest form of antagonism would be presented by two drugs, one of which had the power to excite contraction of a muscle, while the effect of the second was limited to preventing contraction of muscular tissue by direct action upon its fibrils. Such an example of antagonism is unknown, however. This is due to two facts: One, that there are no two drugs the modes of action of which are precisely parallel; and the other, that the activity of physiological processes may be

increased or diminished in a variety of ways, both direct and indirect. For example, opium and belladonna, which antagonize each other, are both antagonistic to gelsemium; while the action of the heart or stomach may be influenced by immediate stimulation or repression, or by impulses conveyed from a nerve center as the result of a complicated process of nerve activity. As a result of these conditions, not a single instance of complete and exact antagonism of drugs has yet been discovered. With this statement disappears a certain part of the hope that rises at the first contemplation of the subject, that for every poison there may be a physiological antidote; nevertheless, such knowledge of the antagonism of drugs as is at hand is put to useful service to prevent the usual result of poisoning or to check the excessive action of drugs where too large a dose has been administered, or the recipient has proved to be exceptionally susceptible to their action. The well-known administration of strong coffee to persons poisoned with opium is an example of the former utilization of antagonism, and giving atropine to check excessive salivation produced by physostigma or bromal is an example of the latter.

The most important examples of antagonism of drugs, in a practical sense, are those of aconite and digitalis, of belladonna and opium, of chloral and strychnia, of chloroform and amyl nitrite, and of physostigma and atropine. Experiments now going on in many laboratories—especially in Germany—have led to the belief that certain products of disease germs may act as physiological antidotes or antagonists in a sense to other products of the same disease germs or to the products of other germs, and German investigators have produced in animals, by injecting into them various substances obtained from disease germs, two states (like those called by Pasteur refractory), which they call—one germ-proof, and the other virus-proof. This study is yet in its infancy, but the results obtained encourage the hope that something of more than speculative interest may be discovered.

CHARLES W. DULLES.

Antagonist Muscles: Every muscle or set of muscles in the animal body is opposed in its action either by some other muscle or muscles, or by elastic ligaments. Generally it is the former; thus in the human arm we have the *triceps extensor* muscle antagonized by the *biceps flexor* and the *brachialis anticus*, etc. In no case is there well-defined dilatation of a muscle. Flexor muscles predominate in power over extensors.

Antal'cidas [from Gr. Ἀνταλκίδας]: a Spartan diplomatist who was sent on a mission to Persia when Sparta was in a critical position, and negotiated a treaty called the Peace of Antalcidas, in 387 B. C. This treaty excited general indignation among the Greeks, whose interests the Spartans sacrificed to gratify their enmity to Athens and Thebes. One of the articles of this treaty stipulated that all the Greek cities of Asia Minor should be subject to the King of Persia.

Antanac'lasis [Gr. ἀνανάκλασις; ἀντί, against (and hence implying contrast) + ἀνακλάειν, bend back]: in rhetoric, a figure in which a word is repeated, but in a different sense or different inflection from the first, which gives a kind of antithetical force to the expression; as "Learn some *craft* when young, that when old you may live without *craft*."

Antanana'rivo', or **Tananarivo'** [literally, at the city of a thousand (homesteads or compounds); from Malagasy *an*, at + *tāna*, city + *rivo*, thousand]: the capital and chief city of MADAGASCAR (*q. v.*); situated in a mountainous region in the middle of the island; in 18° 56' S. lat.; 166 miles S. W. of Tamatave (see map of Africa, ref. 8-1). It is built on a series of eminences about 600 feet above the neighboring valley, and about 5,000 feet above the level of the sea. It is reported to be a large city, and to have manufactures of gold chains and silk stuffs. The private houses are mostly of wood. Pop. estimated at 100,000.

An'tar, **An'tara**, or **An'tarah-Ibn-Sheddâd'**: a celebrated Arabian prince, poet, and warrior who lived about 550 A. D. He was the author of one of the seven poems which are called Mo'allakat (suspended), because they were suspended in the Kaaba or temple at Mecca. His martial exploits were a favorite theme of Arabian poetry and romance. He is the hero of a celebrated romance, translated into English by T. Hamilton, entitled *Antar, a Bedouin Romance* (1819).

Antarc'tic [from Gr. ἀνταρκτικός, opposite the north; ἀντί, against + ἄρκτος, bear, the constellation of the Bear, and

hence the north]: opposite to Arctic. The Antarctic Circle is one of the small circles of the sphere parallel to the equator, and distant $23^{\circ} 27\frac{1}{2}'$ from the South Pole.

Antarctic Current: a drift-current which commences on the shores of Victoria Land, in the region of perpetual frost. It carries vast quantities of ice and cold water toward the N. E. and E., and becomes converted into a coast-current, washing and cooling the western shores of South America, thus performing a work nearly the converse of that performed by the Gulf Stream on the shores of Europe. It conveys drift-ice to the latitude of about 55° .

Antarctic Ocean, or Southern Ocean: the large body of water around the South Pole included within the Antarctic Circle; and also a general term designating that vast sea S. of the Atlantic, Pacific, and Indian oceans. It has not been explored so thoroughly as the Arctic Ocean, and was long considered impenetrable for ships, on account of the ice, which extends much farther from the Pole (about 10°) than in the Arctic Ocean. Area, about 7,900,000 sq. miles. Sir James Ross explored the Antarctic Ocean as far as 79° S. In Jan., 1841, he discovered in lat. $77^{\circ} 32'$ S. and lon. 167° E. a volcano 12,400 feet high, which he called Mt. Erebus. The portions of land which have been discovered in this ocean are as follows: South Georgia (1,600 sq. miles); South Orkney islands (650 sq. miles); South Shetland islands (850 sq. miles); Graham Land (39,000 sq. miles); Alexander Land (1,100 sq. miles); Victoria Land (127,000 sq. miles); Wilkes Land (64,000 sq. miles); Kemp island and Enderby Land (10,800 sq. miles). Total land area, 245,000 sq. miles.

M. W. H.

Antarctic Researches: The first navigator who explored Antarctic regions was Capt. Cook, who in Jan., 1774, reached lat. $71^{\circ} 10'$ S. in lon. $106^{\circ} 54'$ W. In 1823 Capt. Weddell penetrated to lat. $74^{\circ} 15'$ S. in lon. $34^{\circ} 16' 15''$ W., and found there an open sea. In 1839 Capt. Wilkes, of the U. S. navy, conducted an exploring expedition toward the South Pole. He discovered in Jan., 1840, a portion of a large continent in lat. $61^{\circ} 30'$ S. and lon. 161° E. He traced the coast westward to lon. 101° E., but was prevented from landing by an impassable barrier of ice. Capt. Sir James Ross, who commanded a British expedition in 1839-43, penetrated as far as 78° or 79° S. He computed the position of the southern magnetic pole to be in Victoria Land, lat. $75^{\circ} 5'$ S., lon. $154^{\circ} 8'$ E. See POLAR RESEARCH.

Antares [from Gr. *ἀντί*, against, similar to + *Ἄρης*, Mars, because this star was thought to resemble Mars]: a ruddy double star, the most conspicuous in the constellation Scorpio.

Ant-birds (*Formicariidae*): a large family of South American passerine birds; of very retiring habits, living in thorny thickets, and feeding chiefly upon ants. They are remotely related to the fly-catchers.

Ant-catcher and **Ant-thrush:** a bird of tropical and sub-tropical countries, belonging to the family *Pittidae*. The ant-catchers feed upon ants, and are nearly allied to the fly-catchers. They have very powerful voices, a straight, sub-cylindrical bill, hooked at the tip, slender legs, and short tail. The typical genus is *Pitta*, the numerous species inhabiting the Oriental and Australian regions, many of them being peculiar to individual islands of the Malay Archipelago. The giant ant-catcher of Sumatra (*Pitta gigas*) is of a fine green color.

Revised by D. S. JORDAN.

Ante: a Latin preposition, meaning before, in either space or time; now used in English as a prefix (ante-), with the same signification. It is used to form nouns (accented on the prefix) and adjectives (accented on the radical); as, antechamber, anteroom, antenup'tial, antedilu'vian.

Ant-eater: a South American mammal of the order *Edentata*. Ant-eaters have no teeth, and feed on ants and other insects, which they catch by thrusting among them the long tongue covered with a viscid saliva. The head is much elongated, and the tail, which is covered with long hair, is about as long as the body. The toes are united as far as the base of the claws, which are very large and strong, adapted for the purpose of tearing open ant-hills. The great ant-eater (*Myrmecophaga jubata*), sometimes called the ant-bear, is about $4\frac{1}{2}$ feet long, exclusive of the tail, which is about $2\frac{1}{2}$ feet. It has four claws on the fore feet, and five on the hind feet. It is a sluggish animal, and frequents swampy ground along rivers, feeding mainly on the termites or white ants. The little ant-eater (*Cycloturus didactylus*) is not more

than 20 or 21 inches in entire length. It is remarkable for a peculiar structure of the skeleton. On a side view the cavity of the chest is completely hidden by the ribs, which are greatly flattened and overlap each other. The species is arboreal in habits, and has its feet specially modified for climbing. It has two claws on the fore feet and four on the hind feet; these claws are compressed, curved, and very sharp. The name ant-eater is sometimes given to the aardvark (*Orycteropus capensis*) of South Africa,



Great ant-eater.

to the pangolins, the *Echidna*, and to other mammals which subsist on ants and other insects.

Revised by D. S. JORDAN.

Antecedent [Lat. *antecedens*; *an'te*, before + *ce'dere*, go]: that which goes before or precedes in time or in place. In grammar, the noun to which a relative pronoun refers; in logic, the first of two propositions in an enthymeme, and the first member of a hypothetical proposition; opposed to the consequent; in mathematics, the first of two terms composing a ratio. Thus in the ratio $A : B$, A is the antecedent, and B is the consequent.

The word in the plural is used in a different sense, as in speaking of a person's *antecedents*—i. e. his previous conduct and character, his early history or primordial relations.

Antedilu'vian [from Lat. *ante*, before + *dilu'vium*, deluge]: a term applied to any person or thing that existed before the Flood—i. e. the Noachian Deluge. According to the chronology of the Hebrew text of the Bible, this flood occurred 1,656 years after the creation of man. The date of this event, according to the Septuagint version, is several centuries later. Chevalier Bunsen adopted the theory that the Flood occurred about 10,000 years ago. Geologists do not recognize that the earth was ever inundated by a simultaneous universal deluge since it was inhabited by man.

Antelope [O. Fr. *antelop*, viâ Lat. from Gr. *ἀνθόλοψ*, etymol. unknown]: any member of an extensive group of hollow-horned ruminants distributed among several sections or sub-families of the family *Bovidae*. The group comprises numerous genera and species, the genus *Antelope* being the typical one, natives of Europe, Asia, Africa, and America, remarkable for their elegant figure and extreme agility. They are mostly gregarious, inoffensive, and timid animals, and vary greatly in size and form. The greater numbers of them are found in Southern and Central Africa. Asia produces numerous species. Among the various species are the gazelle (*Gazella dorcas*), the beauty of whose eye is proverbial; the addax or Nubian antelope; the stein-bok, eland, and spring-bok of South Africa; and the chamois of Europe. The antelopes are probably the fleetest of all quadrupeds. Their flesh is a favorite article of food. The Rocky Mountain goat is another antelope (*Mazama montana*). "Born in the scorching sun," says Sir S. W. Baker, "nursed on the burning sand of the treeless and shadowless wilderness, the gazelle is among the antelope tribe as the Arab horse is among its brethren—the high-bred and superlative beauty of the race. Entirely free from fat, and nevertheless a mass of muscle and sinew, the gazelle is the fastest of the antelope tribe."

The common antelope or black buck (*Antelope cervicapra*) is found in India and throughout Southern Asia. It is a very beautiful animal, and is distinguished for its timidity and swiftness. Its flesh, like that of most antelopes, is dry and rather unpalatable. The Oriental bezoar, a phosphatic concretion prized in the East for its supposed medicinal

virtues, is derived from the intestines of this animal. The horns of the antelope differ in structure from those of the deer; in the latter the horns (which are more properly called antlers) are deciduous but in the antelopes they consist of a



Antilope cervicapra, the common antelope.

horny sheath surrounding a conical support of bone. Their growth is gradual, and they are not yearly shed and renewed, but are retained during the life of the animal. In some groups of antelopes both sexes have horns; in others, only the male. The prong-buck or prong-horned antelope of America (*Antilocapra americana*) is not a true antelope, having deciduous branched horns. See ANTILOCAPRA.

Revised by D. S. JORDAN.

An'te Na'ti (Lat., born before): a term applied to such of the Scotch as were born before the accession of James I. to the throne of England, and who were considered as aliens by the English.

Anten'nae, singular **Anten'na** [from Lat., sail-yards]: jointed filaments or tubular sensiferous organs attached to the heads of insects and crustaceans. They are sometimes called feelers, and are supposed to be organs of touch (or, according to some naturalists, organs of hearing). An insect has two antennae, which are very flexible, and are composed in some species of a great number of joints. A crustacean has four antennae.

Antenna'rius [from Lat. *antenna*, feeler]: a genus of pediculate fishes of very odd fantastic shapes and colorings. The first dorsal spine is tentacle-like, the second and third dorsal spines are covered with skins, and appear as humps on the back; the body often bears numerous waving filaments. This, with the strange coloring, causes them to resemble seaweeds, mud, sand, or rocks. The pectoral fins are extended into a limb somewhat free from the body. It is used as a leg in crawling over seaweeds and rocks. The species are numerous, and found in warm seas, especially among corals, one species, *A. histrio*, frequenting floating masses of *Sargassum*.

DAVID S. JORDAN.

Antequ'ra (anc. *Antiquaria*): a city of Spain; province of Malaga; 22 miles N. N. W. of Malaga; on the left bank of the Guadalhorce (see map of Spain and Portugal, ref. 19-E). It has many monasteries and convents, and large factories of flannel, paper, silk, and soap. The population of Antequera consists largely of hidalgos, with whom the vendetta was a common practice as late as 1845. Pop. 27,201.

Ant'eros (*Ἀντέρος*): in the Greek mythology, a being opposed to Eros or Cupid, the god of Love, and fighting against him; also the deity who punishes those who do not return the love of others.

Anth'e'lia [from Gr. *ἀνθῆλιος*, opposite the sun: *ἀντί*, against + *ἥλιος*, sun]: luminous colored rings observed under certain conditions around the shadow of the spectator's own head. The conditions of the phenomenon are two: first, that the sun be near the horizon, and secondly, that the shadow be projected on a surface covered with dew-drops, as a field of grass, or on a dense fog-bank distant about 50 yards. They occur chiefly in the polar regions.

Anthelmin'tics [from Gr. *ἀντί*, against + *ἐλμινς*, -ινθος, worm]: medicines which either destroy or drive out intestinal parasites; the former are called vermicides, the latter vermifuges. The last-named are most commonly employed. Against the ordinary lumbricoid worm (*Ascaris lumbricoides*) an infusion or fluid extract of senna and spigelia (pinkroot) is safe and efficacious. To drive out the worrying seatworms or threadworms (*Oxyurus vermicularis*) nothing is better than quassia, introduced into the bowels in enema. For the more formidable tapeworm (*Tænia*) oil of turpentine, oil of fern, kousoo, pumpkin seeds, and pomegranate seeds are used. It is important that the head of the tapeworm shall pass away, as, till that happens, the joints continue to be reproduced. In all cases of worms attention is needed to the general condition of the digestive organs.

An'them [O. Eng. *antefn*, viâ Lat. from Gr. *ἀντίφωνα*, sounding in response; *ἀντί*, against + *φωνή*, voice]: a musical composition in free form; a mixture of motett and cantata, with instrumental accompaniment, adapted to scriptural words. It may contain solos, duets, etc., but the main composition is generally understood to be for chorus.

Anth'e'mius (in Gr. *Ἀνθέμιος*): Greek architect and mathematician; surnamed TRALLIANUS, from his native place, Tralles, in Lydia; was a brother of Alexander Trallianus. He was patronized by Justinian at Constantinople, and designed the celebrated Church of St. Sophia, the first stone of which was laid in 532, and which was dedicated Dec. 25, 537. He died about 534. See CONSTANTINOPLE.

Anthemius, or **Anthemius Proco'pius**: a Roman emperor, who began to reign at Rome in 467 A. D., before which he was a favorite general of Leo, the Emperor of the East. He was the father-in-law of Ricimer, who became his enemy. Anthemius was defeated in battle by Ricimer, and put to death in 472 A. D.

An'ther [from Gr. *ἀνθηρός*, belonging to the flower (*ἄθος*)]: the essential part of the stamen, is the case which contains the pollen. Morphologically considered, the anther is the lamina of a transformed leaf divided into two lobes or cells by the connective, which corresponds to the midrib of the leaf. When the anther is a direct continuation of the filament, it is said to be *innate*, as in the barberry; when it grows to the face or side of the filament, it is *adnate*, as in the magnolia; and when the apex of the filament is attached to the middle of the anther, the latter is *versatile*, as in the grasses. The anther generally opens, for discharging pollen, a longitudinal slit from top to bottom of each cell, but sometimes only at the apex or some other definite point. See FLOWER.

CHARLES E. BESSEY.

An'therid (plu. **Antherids**), or **Antherid'ium** (plu. **Antheridia**) [*anther* + diminutive suffix *-idium* (Gr. *-ιδιον*)]: the organ of cryptogamous plants, analogous in function to the anther of the phanerogamous flowers. Antheridia are variously situated on the surface of plants or within their tissue, and usually contain small bodies called antherozoids, which exhibit rapid movements.

CHARLES E. BESSEY.

Antho'dium [from the Gr. *ἄθος*, flower + *εἶδος*, likeness]: a head of flowers, the same as a capitule, applied to the flower of the thistle and other *Compositæ*, in which a number of flowers are combined in a head and surrounded by a common involuere.

CHARLES E. BESSEY.

Anthol'ogy [Gr. *ἀνθολογία*, collection of flowers; *ἄθος*, flower + *λέγειν*, collect]: in ancient literature, a collection of short pieces of poetry on amatory, convivial, or moral subjects, or a selection of beautiful thoughts and sentences in prose or verse, mostly epigrams. The first collection in Greek entitled an anthology was made by Meleager, a Syrian poet who lived about 80-60 B. C. Another collection, compiled by Constantine Cephalas in the tenth century, was discovered by Salmasius, and is now extant. This anthology, augmented by epigrams found on ancient monuments, was edited by Brunck, under the title of *Analecta Veterum Poëtarum Græcorum* (1776). A revised edition of the same was published by Jacobs, entitled *Anthologia Græca sive Poëtarum Græcorum Lusius ex Recensione Brunckii* (Leipzig, 1794-1814). Scaliger published a Latin anthology in 1573, *Catalecta Veterum Poëtarum*, greatly enlarged in Burmann's *Anthologia Latina* (2 vols. 4to, 1759). Collections of poetry which may not inappropriately be termed anthologies are also found in the literatures of Arabia, Turkey, Persia, and China.

Revised by B. L. GILDERSLEEVE.

An'thon, CHARLES, LL.D.: classical scholar; b. in the city of New York, Nov. 19, 1797; graduated at Columbia College in 1815. He studied law, and was admitted to the bar in 1819, but never practiced. In 1820 he became adjunct Professor of Ancient Languages in Columbia College, and in 1835 principal professor of the classics. He published an edition of Horace with notes (1830), and of the classical works usually read in schools; also a *Classical Dictionary* (1841). D. in New York city, July 29, 1867.

Anthony: city; capital of Harper co., Kan.; in a farming and stock-raising district; on M. Pac., St. L. and San F. and Om., H. and Gulf R. Rs.; 69 miles S. W. of Wichita. Has salt-works, 2 flouring-mills, opera-house, water-works, electric lights, etc. Pop. (1890) 1,806; (1900) 1,179.

Anthony, HENRY BOWEN: statesman; b. at Coventry, R. I., Apr. 1, 1815; graduated at Brown University in 1833; was editor of the *Providence Journal* (1838-59); Governor of Rhode Island (1849-51); and U. S. Senator from 1859 until his death; was a delegate to the Philadelphia "Loyalists'" Convention in 1866. Elected president *pro tem.* of U. S. Senate, 1883, but declined the office on account of ill health. D. at Providence, R. I., Sept. 2, 1884.

Anthony, SUSAN BROWNELL: b. at South Adams, Mass., Feb. 15, 1820; was the daughter of a Quaker. She was fifteen years a teacher in New York. Since 1852 she has been an active leader of the woman's right movement; she has also been long distinguished for zeal in the temperance and anti-slavery causes. Since the civil war she has labored mainly in the cause of woman suffrage. She is part author of *The History of Woman Suffrage* (1881-86). See biography (2 vols., 1898).

Anthony, SAINT: See ANTONY, SAINT.

Anthony's Nose: a mountain in the Highlands, E. of the Hudson river; partly in Philipstown township, Putnam co., and partly in Cortlandt township, Westchester co., N. Y. It rises 1,228 feet above the river. In making the railroad-cutting through its base many beautiful minerals were found.

An'thophytes (*Anthophyta*): the highest of the several branches of the vegetable kingdom, characterized by the production of flowers and seed. They are known otherwise under the names *flowering plants*, *spermaphytes*, and *phanerogams*. They are very naturally separated into (1) those with naked seed (*gymnosperms*), including pines, spruces, cedars, etc., and (2) those with the seed inclosed in an ovary (*angiosperms*), including ordinary flowering plants, as lilies, grasses, orchids, buttercups, oaks, roses, bellflowers, sunflowers, etc. See VEGETABLE KINGDOM. CHARLES E. BESSEY.

Anthosid'erite [from Gr. *ἄνθος*, flower + *σιδηρίτης*, iron-stone; from *σίδηρον*, iron]: a hydrated silicate of iron occurring in fine fibrous tufts, with a radiated structure. It is found at Antonia Pereira, in Minas Geraes, in Brazil.

Anthoxan'thum [from Gr. *ἄνθος*, flower + *ξανθός*, yellow]: a genus of grasses, natives of Europe. The flowers are a dull yellow when ripe. It includes the sweet vernal grass (*Anthoxanthum odoratum*) which grows in meadows and perfumes the air with an exquisite fragrance. It is naturalized in the U. S.

Anthozo'a: the class of cœlenterates which contains the coral polyps. See ACTINIDÆ.

An'thracene, or **Paranaph'thalene** (C₁₄H₁₀): a hydrocarbon existing in coal-tar, and extracted from the last portions of the distillate from this substance. The products of the distillation of coal-tar as ordinarily conducted are: (1) Crude coal-tar naphtha, containing benzene, toluene, etc., lighter than water; (2) heavy oil of coal-tar, or "dead oil," heavier than water, and containing about 10 per cent. of PHENOL (*q. v.*) and cresol, and much naphthalene; (3) green oil, which becomes semi-solid on cooling, owing to the crystallization of anthracene; (4) pitch, which remains in the still. Versemann and Fenner have patented the further distillation of pitch till only coke remains in the still. They thus obtain a much larger yield of green oil, and increase the product of anthracene from one-half of 1 per cent. to 2 per cent. of the original tar. The semi-solid green oil has been used in England to some extent as a cheap lubricator or wheel-grease, under the name of "green grease." The anthracene is separated from the green oil by chilling and pressing. In its crude state it contains considerable oil, naphthalene, pyrene, chrysene, chrysogen, retene, anthraflavic acid, etc. To purify the crude anthracene cake, it may be subjected to distillation, the first and last portions being rejected, the intermediate portion being recrystallized from benzene or

coal-tar naphtha; or the crude cake may be washed with petroleum naphtha to remove oils, etc., and then recrystallized from benzene. Thus obtained, anthracene is always colored yellow by chrysogen, which may be destroyed by exposing its solution to the direct rays of the sun. Graebe and Liebermann prepared anthracene by the action of zinc-dust on alizarin, the coloring-matter of madder, and were from this led to devise a method for preparing alizarin from anthracene—an operation which is now the basis of a very important industry. See ALIZARIN.

Anthracene is obtained in beautiful white, crystalline laminae, melting at 213° C., and distilling at 360° C. Anthracene is insoluble in water, soluble in alcohol, benzene, and bisulphide of carbon to the extent of 0.6, 0.9, and 1.7 per cent. respectively. Heat greatly increases its solubility in these liquids. It is also soluble in ether and the essential oils, especially oil of turpentine. Light petroleum naphtha, which dissolves naphthalene readily, has little effect on anthracene. Oxidizing agents, such as potassic dichromate and sulphuric or acetic acid, change anthracene into anthraquinone (C₁₄H₈O₂), which is easily converted into alizarin (C₁₄H₈O₄) by a process described in the article ALIZARIN (*q. v.*). Oil of vitriol dissolves anthracene. With bromine and chlorine, anthracene forms several substitution products. On mixing alcoholic solutions of picric acid and anthracene, beautiful ruby-red needles of picrate are obtained.

Revised by IRA REMSEN.

An'thracite [Lat. *anthracites*, from the Gr. *ἄνθραξ*, a coal]: an important fossil fuel, the hardest variety of stone-coal, consisting, when pure, almost exclusively of carbon. It has a conchoidal fracture, a black color, and an imperfectly metallic luster, from which it is sometimes called *glaucous coal*. It burns slowly, with intense heat, without smoke, and with little flame. Anthracite may be of any geological age. In China the coals are mostly, if not altogether, of Mesozoic age, and over large areas they are anthracitic. Near Richmond, Va., trap dikes bursting through the Triassic coal-beds have changed some of them locally into a spongy anthracite, a "natural coke." Near Santa Fé, N. M., and Crested Buttes, Col., outbursts of volcanic rock have, over many square miles, converted cretaceous lignite into anthracite. The Triassic coal of Los Bronces, Sonora, has been extensively metamorphosed by the action of igneous rocks, and on Queen Charlotte island, N. of Vancouver's island, a local eruption of trap has converted a cretaceous lignite into one of the most compact and brilliant anthracites known.

Although anthracite occurs, and is mined in small quantities, in Wales, it is of great industrial importance only in the U. S., the most productive beds being those of Pennsylvania, while a relatively moderate tonnage is mined in Colorado. The anthracite region of Pennsylvania is situated in the northeastern part of the State, between the Washington meridian and that of 1° 10' E., and the N. parallels of 40° 25' and 41° 40'. The area of the whole region is about 1,700 sq. miles, of which about 470, exclusive of the Loyalsock, are underlaid by workable coal-beds. It is divided into the following prominent divisions:

1. Southern or Pottsville field, with an area of about 140 sq. miles, extends from the Lehigh river at Mauch Chunk S. W. to within a few miles of the Susquehanna river, directly N. of Harrisburg. The eastern end of this field, known as the Lower Lehigh or Panther creek basin, between Tamaqua and Mauch Chunk, has generally been included by the coal-trade in the Lehigh field, because its coals resemble more closely those of the Upper Lehigh field, and because the shipments from it to market have been largely made through the Lehigh valley.

2. The Western Middle or Mahanoy and Shamokin field has an area of 90 sq. miles, and lies between the easternmost head-waters of the Little Schuylkill river and the Susquehanna. The two coal-fields, the Southern and the Western Middle, are frequently designated in a general way as the Schuylkill region.

3. The Eastern Middle or Upper Lehigh field has an area of 40 sq. miles, and lies between the Lehigh river and Catawissa creek.

4. The Northern or Wyoming and Lackawanna field, which has an area of 200 sq. miles, lies in the two valleys from which it derives its geographical names.

5. The Loyalsock is at the head-waters of Loyalsock creek. The greatest length of the anthracite regions, from its northeastern to its southwestern end, is about 115 miles,

while the greatest width, containing the first four fields, is about 40 miles between Mauch Chunk and Shickshinny.

The first organized effort to mine anthracite coal was in 1793 on the Mammoth bed at Summit Hill, but regular shipments did not begin until 1820. It was not until 1825 that it was used for the generation of steam, and not until 1839 that it was employed as an exclusive fuel in the manufacture of pig iron.

The thickness of the productive coal measures overlying the Pottsville conglomerate, and of their included coal-beds, varies so much that it is impossible to select any one section to illustrate the thickness, character, and succession of the coal-beds and their included rocks throughout the region. At Tamaqua, in the southern coal-field, the coal measures are 2,300 feet thick, and contain twenty-one coal-beds with an aggregate thickness of 126 feet, one bed, the Mammoth, being 114 feet thick a short distance E. of Tamaqua. At Pottsville there are about 3,300 feet of measures, which contain twenty-eight individual beds with an aggregate thickness of coal of 154 feet. In the Western Middle field there are in the eastern half thirteen individual beds of 110 feet thickness of coal, the Mammoth reaching over 100 feet in thickness at Shenandoah. At one point in the Black creek basin of the Upper Lehigh field the Mammoth bed is between 60 and 90 feet thick over a large area where the coal is quarried. At Scranton, in the Southern field, there are eleven beds with an aggregate thickness of 72 feet of coal, while in the vicinity of Wilkesbarre thirteen coal-beds have a total thickness of 94 feet. These coal-bed thicknesses include slate and bony coal, so that the thickness assigned to the beds does not represent the actual thickness of coal which can be mined and sent to market.

The following analyses are given as representing the average composition of Pennsylvania anthracite:

AVERAGE ANALYSES OF PENNSYLVANIA ANTHRACITES.

NAME OF COAL-BED.	Name of coal-field.	Water.	Volatile matter.	Fixed carbon.	Sulphur.	Ash.	Specific gravity.
Wharton	Eastern Middle..	3.713	3.080	86.404	0.585	6.218	1.620
Mammoth	"	4.119	3.084	86.379	0.496	5.922	1.617
Primrose	Western Middle..	3.541	3.716	81.590	0.499	10.564	1.654
Mammoth	"	3.163	3.717	81.143	0.899	11.078	1.657
Primrose	Southern.....	3.008	4.125	87.982	0.506	4.379	1.584
Buck Mountain.	Western Middle..	3.042	3.949	82.662	0.462	9.885	1.667
Seven Foot.....	"	3.410	3.978	80.868	0.512	11.232	1.651
Mammoth	Southern.....	3.087	4.275	83.813	0.641	8.184	1.631
Mammoth	Northern.....	3.421	4.381	83.268	0.727	8.203	1.575
B. Bed.....	Loyalsock.....	1.295	8.100	83.344	1.031	6.230	.....

In order to provide for its combustion, with suitable draft, anthracite coal must be broken and screened, the following being the sizes of the sieve meshes:

NAME OF SIZE.	Through.	Over.
Broken or grate.....	4 inches.	2.5 inches.
Egg.....	2.5 "	1.75 "
Stove.....	1.75 "	1.25 "
Chestnut.....	1.25 "	0.75 "
Pea.....	0.75 "	0.50 "
Buckwheat.....	0.50 "	0.25 "

Even smaller sizes are now made, locally known as "rice," "mustard-seed," etc. The waste in mining is now much smaller than formerly, being 15 to 30 per cent., and the waste in the breakers has been reduced to 6 to 20 per cent. A good many of the culm piles accumulated in former years are being worked over again, the modern improvements in dressing machinery and better methods of burning fine coal having made it profitable.

Its cleanliness and freedom from smoke have made anthracite the standard household fuel, but it is steadily losing ground for the generation of steam in competition with the better bituminous coals, and for blast-furnace use in competition with coke.

The annual report of the U. S. Geological Survey for 1899 places the total production for that year from 359 mines at 60,418,005 short tons (an increase of 7,035,361 short tons over the product in 1898), of which 53,562,030 tons were loaded at the mines for shipment, 1,281,962 tons were used by employees and were sold to the local trade at the mines, and 5,574,013 tons were used for heat and steam at the mines. The average number of days worked at the collieries was 173, the total number of persons employed being 139,608. The value of the coal at the mines was \$88,142,130, or \$1.46 per ton, including all sizes sent to market. The total ship-

ments of anthracite coal from 1820 to 1899 inclusive were 1,126,905,164 long tons—379,950,635 tons coming from the Schuylkill region, 194,438,217 tons from the Lehigh region, and 552,516,312 from the Wyoming region.

The following table shows the distribution of anthracite coal for 1899:

DISTRIBUTION OF ANTHRACITE COAL FOR 1899.

Sections.	Long tons.
Pennsylvania, New York, and New Jersey	31,000,649
New England States.....	7,143,631
Western States.....	6,207,879
Southern States.....	1,589,380
Pacific coast.....	15,868
Export.....	1,707,796
Total.....	47,665,203

The total output of the small mines of true anthracite in Colorado and New Mexico was in 1899 96,196 short tons.

See *Reports of the Second Geological Survey of Pennsylvania; Mineral Resources of the United States* (U. S. Geological Survey).

CHARLES KIRCHHOFF.

Anthrapurpurine: See ALIZARIN.

Anthraquinone: a hydrocarbon obtained by the oxidation of ANTHRACENE (*q. v.*). Alizarin is produced from it. See ALIZARIN.

Anthrax [in Fr. *charbon*; Ger. *Milzbrand*): a name formerly applied by surgical writers to ordinary carbuncle, but now restricted to an acute infectious disease caused by a specific micro-organism, the *bacillus anthracis*. It is also known as splenic fever, in its external manifestations as malignant pustule, and sometimes incorrectly as malignant œdema. Wool-sorter's disease is the same. It is especially interesting as being the first disease in which the causation by bacteria was demonstrated.

The *bacillus anthracis* appears as rods 5 to 20 micromillimeters (μ) long and 1 to 1.25 broad, square at its ends. At certain stages of its development it forms egg-shaped spores, and when growing in artificial cultures is commonly seen as long threads, often twisted or plaited together. On agar-agar (Japanese gelatin) it forms a characteristic, dry, cotton-like growth; it liquefies gelatin (ordinary bone gelatin) and forms flaky masses in bouillon. It grows rapidly on potato, forming dry, whitish colonies, which do not extend much beyond the points of inoculation. It is aerobic, non-motile, and grows best at about 98° F. It stains readily. The spores have a very persistent vitality, which in some instances is not destroyed by boiling for five minutes nor by freezing, and they retain the power of germinating and producing the characteristic bacilli for many years. When the bacilli gain admission to the sub-epithelial tissues of the body, they pass into the blood and multiply rapidly, producing the specific disease. Anthrax affects chiefly the herbivora, and especially cattle and sheep—being most prevalent among cattle in Russia, where it has been called the Siberian plague. In the U. S. it is comparatively rare. It occurs in man as the result of accidental inoculation through the skin, as in butchers or others who come in contact with the blood of infected animals, or through the alimentary canal, by eating infected meat, or through the air-passages, by inhalation of spores in the dust from hides, wool, etc. In animals it is conveyed chiefly through infected localities, such as pastures or stables, or by infected food, such as hay. External anthrax, or malignant pustule, in man usually occurs on the hands, arms, or face, following the inoculation with infected blood at a period varying from a few hours to ten days. Malignant pustule usually begins with a small, hard, red papule, which itches and soon forms a vesicle containing blood-stained serum. Around this there forms a raised ring of purplish, brawny, indurated tissue, on which successive crops of vesicles appear, while the central point forms a brown or black eschar, which becomes depressed. There is no suppuration, and comparatively little pain. The constitutional symptoms are chill, fever, headache, and in fatal cases collapse. Death may occur in from three to five days; in non-fatal cases the disease lasts from six to ten days.

Another form of the disease, which occurs on the eyelids, and occasionally on the face and neck, is an extensive œdema, resulting in gangrene, but without papules or vesicles. In the intestinal form of the disease the symptoms are those of acute poisoning, with vomiting, diarrhœa, and fever. Often several persons are attacked at once from eating infected flesh—in one case, out of twenty-five persons

thus affected, six died in from two to seven days. In the form known as wool-sorter's disease the symptoms are those of acute bronchitis, with much constitutional disturbance. The diagnosis in the internal forms is often difficult, and can be made certain only by bacteriological study and inoculation of susceptible animals with the blood of the patient. In the external forms the treatment is the destruction of the initial papule or vesicle by excision, by the actual cautery or by caustics, the free use of bichloride of mercury on the fresh surfaces thus made, and the subcutaneous injection of 5 per cent. carbolic acid into the surrounding œdema. The *bacillus anthracis* appears to produce its peculiar effects through the formation of poisonous albumoses, which are in some respects analogous to serpent venom, and probably also of a poisonous alkaloid belonging to the ptomaine group. By the injection of these products into the blood of an animal it is possible to produce a certain amount of immunity against subsequent inoculation with the organisms by which they were produced. When cultivated at a temperature a little higher than that most favorable to the normal growth of this organism, the products of its development, and indeed the organism itself, undergo a modification that robs them of the whole or a part of their virulence. When thus modified it is employed in lower animals as a vaccine to protect them against the inroads of virulent organisms.

J. S. BILLINGS and A. C. ABBOTT.

Anthrenus Scrophulariæ: See CARPET-BUG.

Anthropol'atry [from Gr. *ἀνθρωπολατρεία*, man-worship; *ἄνθρωπος*, man + *λατρεία*, worship]: the worship of man.

Anthropol'ogy [from Gr. *ἀνθρωπολόγος*, treating of man; *ἄνθρωπος*, man + *λόγος*, discourse, *λέγειν*, speak]: the science of man (see MAN). It may be divided into three departments. (1) *Somatology*; (2) *Psychology*; (3) *Ethnology*.

Somatology, or the biology of man, includes the study of man as an animal, and the classification of mankind in the zoölogical system. *Somatology* deals with man in so far as he is considered an animal in the origin and development of the human race. It also deals with the development of the individual from the germ to the adult state. It includes anatomy and physiology, the origin and nature of disease, and the methods of averting premature death.

By the new school of biology, of which Darwin is the great leader, it is maintained that man has developed from some lower form or forms of the animal kingdom; that, in fact, there is a serial development from the lowest form of animal life to man, who stands on the highest round of the ladder of evolution. This theory is accepted by a very large number of scientific men, and is rapidly spreading among all classes of authors. Many who accept the Darwinian theory of development, however, maintain that it applies to man only as an animal; that there has been a development of the animal man, but that at some stage in this development man has been endowed by the Creator with an immortal spirit, the science of which belongs to theology, or, as many maintain, to philosophy.

Psychology, as an integral part of anthropology, is the science of the human soul, though comparative psychology includes the subject of the minds of the lower animals. There is great diversity of opinion in relation to this science, but authors and investigators therein may in a broad way be grouped in two grand classes: those who believe that mental operations are functions of the brain and nervous system; and those who believe that mental operations are the functions of a spiritual soul, and that the nervous system, including the brain, is the organ of the spirit, the agency by which spirit is connected with animate matter.

By the first school psychology is claimed to be a natural science. Their methods of investigation are in part physical and physiological, and in part introspective; for as organic chemistry is the basis of biology, so the physiology of the nervous system is the basis of psychology. Plants exhibit sensitiveness to external agencies. Certain parts of the germinating plant seek the darkness, others the light. Some flowers open or close to conditions of moisture, heat, and light. Many plants are exceedingly sensitive even to touch. The lower animals have a higher degree of sensitiveness, and this increases in the scale of animal life, until man seems to be endowed with it in the highest degree. The psychologists of this school see in these facts an unbroken series of development in sensation, and in like manner an unbroken series of consciousness from a rudimentary condition to that highest state exhibited in man and represented by reason, emotion, and ethical volition.

The second school, which is the earlier in history, and still the larger, claim for the mind a spiritual and immortal existence; that it is self-active and unconditioned by time and space, and that it is thus a *causa sui*. They also cultivate physiological psychology, as the nervous system is the mediator between mind and matter. The method of investigation and exposition is metaphysical, or, as it is sometimes called, philosophical. In so far as the science is physiological, it belongs to natural science; but in so far as it is spiritual—and in chief part it is spiritual—it belongs to philosophy.

Ethnology treats of man as he engages in the arts of life, amusement, and decoration; as he employs the arts of society, by which conduct is regulated in the industries or employments of man in tribes, and nations, and in social or family life; the arts of language, by which men hold communion with one another; the arts of literature, by which they express opinions; and the arts of natural religion in which human conduct is regulated in its relation to mythical beings.

The study of man has occupied the attention of many of the greatest minds since the dawn of civilization, and many and diverse theories have been advocated from time to time. One theory represents man in a state of nature as highly intellectual and moral, and affirms that the lower tribes of mankind have become such by degeneracy, wandering away from truth and rectitude, and lapsing from a primeval stage of innocence into abhorrent degradation. The advocates of this theory are numerous, and it has been propounded in many forms. Another school, claiming to be scientific, holds that man has been profoundly under the influence of physical environment, and by it has been lifted or degraded; that the various phases of human culture exhibited throughout the earth are the effects of physical causes. Buckle is a noted advocate of this doctrine. A still more modern theory takes man where he is left in the philosophy of Darwin, as developed from lower animal life, and accounts for the evolution of mankind through the lower phases of culture to the highest exhibited in modern times by the laws of development—or of evolution, as they are called by this school—which govern in the animal domain, the chief of which is called "the law of the survival of the fittest in the struggle for existence." The leading philosopher of this school is Herbert Spencer, whose voluminous works on synthetic philosophy are chiefly devoted to the exposition of this theory. The Spencerian theory has obtained a wide popular acceptance; but among scientific men his doctrines are held to be too narrow. It is claimed that he has failed to discover the more important laws of human culture, and the active part which man himself takes in his own progress toward a higher life. Still others believe that he has failed properly to recognize the spiritual element in man, and that his doctrines are opposed by the fundamental maxims of philosophy.

On the subject of the distribution of mankind over the earth much has been written, and much speculation has been developed. The migrations of mankind have proved a prolific theme, but no real progress in the solution of the question has been made—at least no conclusions have been reached which command widespread assent. By many authors it has been held that mankind were dispersed by waves of migration from some region in Central Asia. Again, it has been held that this is true of the Aryan stock, to which the more highly cultured nations belong. Still again it has been affirmed and advocated with great skill that the Aryan stock had its primeval home somewhere in Europe. But the most general conclusion is that nothing can yet be affirmed with certainty on this subject. Many attempts have been made to prove that aboriginal America was peopled from Asia by way of Bering Straits, and a vague belief of this nature has spread widely, but little scientific evidence exists to sustain it. On the other hand, investigations in archaeology have now made it clear that man was distributed throughout the habitable earth at some very remote time or times in the lowest stage of human culture, when men employed stone tools and other agencies of industry of a like lowly character, and that from this rude condition men have progressed in culture everywhere, but some to a much greater degree than others. The linguistic evidence comes in to sustain the conclusions reached by archaeology, for a study of the languages of the world leads to the conclusion that they were developed in a multiplicity of centers; that languages of distinct stocks increase in numbers as tribes of lower culture are found; and that probably man was dis-

tributed throughout the world anterior to the development of organized or grammatic speech.

The Races of Mankind.—Many attempts have been made to classify men as animals are classified, by their biotic characteristics. The unity of the human race as one species is now generally, perhaps universally, accepted; though attempts are still made from time to time to classify mankind in varieties or races, but no such system of classification has attained to universal or even general acceptance. The facts seem to be these: that man in his primeval condition as an animal, but little lifted above the highest brute, was still subject to the laws of specialization, due to the survival of the fittest in the struggle for existence, and that in this condition varieties were developed, as shown in the color of the skin, the structure of the hair, the attitude of the eyes, the proportions of the skeleton, the conformation of the cranium, and in other biotic particulars; but that with advancing culture, tribes coalesced with tribes until nations were formed, and nations with nations; and by migrations, and the general intermixture of peoples through commerce and war, and the flux of national dominion forever expanding and contracting, such an admixture of streams of blood has been produced as in part to obliterate primeval characteristics and in part to blend them, so that no well-marked planes of demarkation can now be discovered; the black grades into the white, the curly haired into the straight haired, the black eyed into the blue eyed, the oblique eyed into the horizontal eyed, the long skull into the short skull; until in the same burial-mound skeletons are found which baffle the science of anthropometry.

J. W. POWELL.

Anthropology, in the THEOLOGICAL as distinguished from the physiological sense, is that part of the Christian system which treats of man in distinction from God. In its entire extent it includes the description of man both as created and as fallen, and therefore properly includes both the holiness and the sin of the human race. It begins with the creation of man as composed of body and soul, and thus supposes a basis in physical anthropology. It then considers the soul as created in the image of God, and thus discusses the nature of holiness and the happiness of an un-fallen creature in the paradisaical state. But inasmuch as man continued in his primitive holy condition but a brief time, his history is made up mainly of his apostasy and its consequences, so that practically the subject of anthropology relates to such topics as original and actual sin, the free and the enslaved will, the relation of the human to the divine efficiency in regeneration, and the related doctrines. The great controversies which have resulted in the several anthropologies that have a place in the history of religious opinions were concerned almost exclusively with sin, and it is in this reference that we shall examine the subject.

In the primitive Church of the first three centuries the fact of apostasy was universally acknowledged, but only in a general form. The doctrines of sin and grace in their more difficult and scientific aspects did not seriously engage the attention of the Church. The theological mind was occupied with the doctrine of the Trinity and the great controversy concerning the deity of Christ. The statements of Scripture concerning the fall of Adam and its consequences were taken without much discussion, and no acute and powerful exegesis was expended upon them for the purpose of answering the more difficult questions respecting the nature and depth of human depravity. When, however, these latter points were presented, and any direct response was given, sin in its nature was referred, to a considerable degree, to a sensuous ground, and its intensity was not regarded as so great as to deprive the human will of all power to good. The origin and development of human corruption was traced to the body full as much as to the activity of the spirit itself, and hence a remainder of energy was assumed to exist in the fallen will, by which it could co-operate with the Holy Ghost in regeneration. This view appears particularly in the writings of Clement of Alexandria and Origen, and colors the anthropology of that Alexandrine school which acknowledged those theologians as its great leaders.

It would be a mistake, however, to regard Clement and Origen as the only representatives of the anthropology of the primitive Church. In Tertullian and Cyprian a tendency appears toward that theory which was afterward elaborated by Augustine. While the part which the sensuous nature has in determining the origin and nature of sin is still asserted, yet more weight is attached to the self-determination

of the human will itself—to the purely mental and spiritual energy that originates and perpetuates it. This naturally leads to more assertion of the bondage of the will, and a more profound conception of sin as enfeebling and ruining the moral power of the soul. This tendency was strengthened by the adoption by Tertullian of the traducian view of the origin of the individual. This North African Father, in a somewhat crude and materializing manner, held that both the body and soul are propagated. Both the immaterial essence of the soul and the material substance of the body are individualized portions of human nature as created in Adam. There is no creation from nothing after the creative act on the sixth day, when "God created man male and female, and blessed them, and called their name Adam" (Gen. v. 1, 2). There is only procreation, or the deduction of individual after individual from this original unity. Such a theory of the propagation of the soul, however difficult in itself, yet made the propagation of sin more intelligible, and prepared the way for the subsequent doctrine of the propagation of sin itself, and not of mere physical evil.

The anthropology indicated in this brief statement of the views of the early Church received a subsequent modification in the later Alexandrine and Antiochian schools. The best representatives of the first were Athanasius, the two Gregories, and the two Cyrils; of the second, Theodore of Mopsuestia, Theodoret, and Chrysostom. The influence of Origen upon these Greek theologians is apparent, but they receded from his extreme positions and modified his anthropology, (1) by the adoption of creationism instead of pre-existence; (2) by recognizing more distinctly the effects of the Adamic transgression upon the soul itself, including the will; and (3) by making a more guarded assertion of power to good in the fallen man. They agreed, however, with the earlier anthropology in affirming that original sin, or inherited corruption, is not culpable. It is only a propagated disorder of the sensuous nature seen in exorbitant physical appetites, from which temptation issues, and to which every human individual yields without exception. But until this act of the individual will there is no sin, properly so called, no sin in the sense of guilt, in any man. The mortal Adam could beget mortal descendants, but the sinful Adam could not beget strictly sinful and guilty descendants. "What, then," says Chrysostom, "is the meaning of the phrase 'were made sinners?' (Rom. v. 19). It seems to me to denote liability to suffering and death." In this exegesis Chrysostom put a secondary meaning upon the verb "to sin," which has come down to the present time, and which has unquestionably exerted an influence upon many theologians who would agree with the golden-mouthed in most of his positions, and also upon many who would be unwilling to adopt his anthropology.

The question as to the guilt of original sin, and the justice of imputing that "disobedience of one man whereby many were made sinners" (Rom. v. 19), is, in truth, the hinge upon which the whole subject of anthropology must turn. And the way in which it is answered constitutes the dividing line between the two great dogmatic divisions which from Augustine down to the present day appear in the history of the Church. Augustine, in his controversy with Pelagianism, but still more with Semi-Pelagianism, maintained that the first sin of Adam is imputable to the posterity as guilt, and is a just ground of condemnation, because the posterity existed in the progenitor, and in some real but inexplicable manner acted in him in the first transgression. "We were all," he says, "in that one man, since we all *were* that one man. The particular form in which we were to live as individuals had not been created and assigned to us, man by man, but that *seminal nature* was in existence from which we were to be propagated" (*De Civitate Dei*, xiii. 14). If the mystery of such a generic existence and such a natural union between the progenitor and the posterity could be believed, and the fact conceded, then the imputation of Adam's sin to his descendants would be made upon the same principle that it is imputed to Adam himself—upon the principle, namely, of attributing to every real and veritable agent every real and veritable act of the agent. The consequence of this primal act of apostasy was the total depravation of the entire human species, then existing in the progenitors, and consequently every individual produced out of this species is born entirely depraved. Beginning in the higher parts of the soul, the reason and will, sin penetrates and poisons the lower powers, and vitiates the bodily appetites and propensities. Sin is spiritual evil in

its very outset, and becomes sensuous corruption in its final issue. The soul itself falls from God, and carries the body with its sensuous nature along with it. Unlike the anthropology of Origen, that of Augustine explains the disordered appetites of the flesh by the rebellion in the spirit, and not the rebellion in the spirit by the disorder of the flesh.

Another point of difference between Augustine and his Semi-Pelagian opponents relates to the question as to the amount of power to holiness in man after apostasy. Pelagianism, as defined and defended by its ablest advocate, Julian of Eclanum, contended for plenary power in every man to keep the moral law. The apostasy still left the will free, and freedom means the liberty of indifference, or the power of choosing either good or evil at any instant. This view was deemed to be extreme by those who would find a middle view between Pelagius and Augustine. Cassian and Faustus of Rhegium, the best representatives of the so-called Semi-Pelagianism, maintained that by the fall of Adam his posterity were greatly weakened, but not made absolutely impotent to good. There still remained a minimum of goodness, which is capable of co-operating with God, and therefore regeneration is a joint product of grace and free will. Neither can do without the other. In opposition to this, Augustine contended that there is no power to good, not even a minimum, left in the human soul since apostasy. The heart and will are wholly determined to evil, and there is no remainder, however small, of either inclination or affection that is friendly to God and holiness. The carnal mind is enmity toward God, and nothing but enmity. Hence man can not co-operate with God in regeneration. Not until the sinner is made willing (Ps. cx. 3; Phil. ii. 12, 13) can he will the right.

The Pelagian anthropology, which was the occasion of forcing out the systematic statements of Augustine, denied that any physical or moral corruption of human nature resulted from the Adamic transgression, interpreted the statements of the fifth chapter of Romans as teaching the influence of bad example, and asserted that sin is not strictly universal, but that some have lived without transgression. Pelagianism itself never exerted much influence within the Church. It contained too few elements of truth, and was too utterly at variance with the Scripture representations of sin and grace to get the advocacy of any who possessed an evangelical experience. It was rejected as heresy. But the middle view of Semi-Pelagianism held its ground by reason of its recognition of the injurious effects of Adam's apostasy upon his posterity, and its acknowledgment of the need of grace in order to recovery therefrom. Moreover, the *degree* of power to good which many of the Semi-Pelagians asserted was much less than that asserted in the Alexandrine anthropology, and in some instances it was reduced to so low a minimum as to border closely upon the Augustinian impotence. Wiggers compares the three systems with each other as follows: Augustinianism asserts that man is morally *dead*; Semi-Pelagianism maintains that he is morally *sick*; Pelagianism holds that he is morally *well*.

The Augustinian and Semi-Pelagian anthropologies (that of Pelagius being rejected by all parties within the Church) continued to hold their ground with varying success. The Augustinian theory of sin and grace was adopted by the Western Church at the Councils of Orange and Valence, in 529, as the catholic orthodoxy, not merely in opposition to Pelagianism, but also to Semi-Pelagianism and all grades of the synergistic theory of regeneration. But it would be an error to suppose that the Western Church as a body continued to adhere to the views of the venerated North African Father. Theologians like Leo and Gregory in the fifth and sixth centuries, and like Bede, Gottschalk, and Alcuin in the eighth and ninth centuries, propagated the teachings of Augustine respecting the corruption of human nature and the agency of the Holy Spirit in regeneration, but the middle theory found increasing currency in the mediæval Church. Its less rigorous character, together with its comparative silence upon the more difficult parts of the doctrines of original sin, predestination, and the enslaved will, recommended it to a large class of minds; while the element of human efficiency which it introduced into the doctrine of regeneration was thought to render it a more intelligible and practical doctrine. It was not strange, consequently, that in course of time the Latin Church, though holding the name of Augustine in the highest veneration, and claiming not to depart from his teachings, should have lapsed very generally into Semi-Pelagianism. It came thus upon

the same doctrinal position with the Greek Church, which, during all the controversy at the West respecting sin and grace, continued to adopt the views of Chrysostom and the Greek Fathers generally. In the eleventh century the wonderful intellect and saintly piety of Anselm maintained the Augustinian view with great power and depth of reasoning, but was not able to turn the current which was sweeping with an increasing flood in the other direction. Schoolmen like Bernard and Aquinas were nearer to Augustine than to any other great authority of the past, but the main influence of Scholasticism as a whole tended to undermine his positions. The dawn of a new era at the Reformation opened the old questions. Luther, Calvin, and the Protestant theologians generally not only adopted the Augustinian anthropology, but stated the doctrines involved in it with still greater clearness, and defended them with still closer reasoning. The papal Church took the opposite view. The Council of Trent enunciated Semi-Pelagianism, and endeavored to give it currency under the great authority of Augustine, whose opinions were in some instances honestly misconceived, and in others knowingly misrepresented.

Wherever Protestantism prevailed, Augustinianism prevailed also. Augustine's theory of sin and grace pervaded and molded the symbols of the Reformation almost without an exception, and from them passed into the heart and life of the Protestant Church. But in process of time the same transition occurs in Protestantism which we have seen taking place in the Latin Church. The more rigorous type gives way to the milder in some quarters. The Arminian controversy in reality turned upon the same points that were discussed between Augustine and the monks of Adrumetum, between Prosper and Cassian. Calvinism is the revived Augustinianism, and Arminianism is the revived Semi-Pelagianism. These two types of doctrine in reality exhaust and include all the varieties of doctrinal opinion that prevail in modern evangelical Christendom. There are minor differences, but churches and individuals are either Calvinistic or Arminian, as in the Patristic period they were either Augustinian or Semi-Pelagian. There is no real mid-point between these two, although schools and theologians have frequently attempted to find one.

The difference between these anthropologies is due to logic rather than to practical experience. The follower of Arminius agrees with the adherent of Calvin in holding the fundamental doctrines of the Trinity and the incarnation, of apostasy and redemption, and the religious experience of both alike is evangelical; that is, it springs out of faith in the atonement of the Son of God. The difference between them relates not to the general facts and truths of the New Testament, but to the more specific and exact definition of them. The modern Arminian, like the ancient Semi-Pelagian, while confessing sin and trusting in the blood of Christ, urges what he believes to be a valid argument against the doctrines of predestination and irresistible grace, and that particular form of the doctrine of original sin out of which the doctrines of predestination and irresistible grace issue as necessary corollaries. And his opponent shows his respect for this belief by entering into the debate, and defending what he thinks to be the more exact and self-consistent and self-comprehending statement of that same evangelical system. The issue of a controversy that originates in logic must therefore be left to logic. The closest reasoner from the scriptural premises and the evangelical experience must be adjudged to be the victor. If the Arminian anthropology shall in the course of time prove itself to be the more scientific and self-consistent system of the two, it will be recognized and accepted as such. But if in the same calm and cool atmosphere the Augustinian statements shall evince their superiority, they must pass for Christian science.

For the sources of information see, among others, Augustine's Pelagian and Semi-Pelagian treatises; Vossius, *Historia de Controversiis quæ Pelagius ejusque reliquæ moverunt*; Calvin's *Institutes*, book ii.; Ussher's *Works*, vol. iii.; Chemnitzius, *Examen Concilii Tridentini*; Wiggers's *Darstellung*; Gangauf, *Metaphysische Psychologie des Augustines*; Neander's *Church History*, ii. 557-627; Guericke's *Church History*, §§91-93; Müller, *Christian Doctrine of Sin*; Baur's *Gegensatz*; Möhler, *Symbolik*; Redepenning's *Origenes*; Hasse, *Anselm*; Arminius's *Works*; Episcopius, *Opera*; Limborch's *Theologia Christiana*; Bellarmine, *Disputationes*; Jeremy Taylor, *On Original Sin*; Whitby, *On Original Sin*; Edwards, *On Original Sin*; Hagenbach's

History of Doctrine; Shedd's *History of Doctrine*; Cunningham's *Historical Theology*; Neander's *History of Christian Dogmas*.
W. G. T. SHEDD.

Anthropology, CRIMINAL: The subject of the criminal, his offenses and their consequences to society has been treated of, from a very early period, from the standpoint of jurisprudence. The jurist was chiefly concerned with the crime and the various degrees of punishment it deserved. Elaborate codes defined offenses and penalties, and torture was legally applicable to extort a confession. In modern times governments and benevolent associations have made strenuous efforts, largely unsuccessful, to reform the ill-doer, to lead him to repentance and to habits of honest industry. Both lawgiver and philanthropist regard criminals as varying only in degree of depravity. The care of the one was to provide adequate punishment for the offense; the other believed that religious teaching was the sole means of reform.

A new school, known as the School of Criminal Anthropology, or, as it is sometimes termed, the Neo-criminalistic School, may be said to have come into existence in 1876, when Prof. Cesare Lombroso, of Turin, published a work entitled *L'uomo delinquente*.

Three schools may be described as engaged in these investigations: (1) The classic or spiritualistic school, which denies that congenital development, race, or climate are factors in the production of crime; (2) the socialist school, which declares the physical and moral surroundings, the *milieu*, to be the sole cause—hence they are sometimes termed mesologists; and (3) the positivist criminal school, the school of Lombroso, which insists that crime is the result of three orders of factors—namely, anthropologic, physical, and social. If social causes alone produce crime, why is it, they inquire, that of 100 persons living under the same conditions of abject poverty, only five will become thieves? The social factor is the same for all, but the impulse to crime, born of the surroundings, becomes decisive only when the anthropologic and physical factors are found—the organic constitution and the abnormal brain. Crime, therefore, they emphatically assert, is the accumulated result of the individual constitution, bodily and mental, and of the physical and social surroundings.

"Criminal anthropology," then, is the study of the being who, in consequence of physical conformation, hereditary taint, or surroundings of vice, poverty, and ill example, yields to temptation and begins a career of crime. It is to study the anatomy, the physiology, the hygiene of the criminal, his productivity, his capability of amendment, to examine into his condition, and to recognize his rights.

At the outset it is necessary to define what constitutes crime. A distinction is made between "natural crime" and "statute crime," the latter varying with the codes in which it is found. Natural crime is that which is at variance with our "moral sense." Admitting the existence of the latter, it is obvious that, like other psychical sentiments, it may be subject to change, to disease, or, in extreme cases, it may be absent from birth, as in analogous cases of congenital physical monstrosity. It is asserted that certain characteristics of this "moral sense" are common to all nations and all ages, and that, therefore, violations of this universal sense constitute "natural crime."

Since crime is a violation of the common sentiments of compassion or probity, it follows that in the criminal there is either absence or temporary relapse, or weakness of one or other of these sentiments; but these sentiments form the substratum of the average morality of society, and the man who violates them is in a condition of incompatibility with that society. For the great mass of mankind the sentiment of compassion or tenderness which abhors bloodshed, and of probity which condemns theft, suffices.

It is assumed, then, that there are two varieties of our race who answer physically to the idea of these two crimes—men who are destitute of all feeling of pity, or of all sentiment of honesty. The adherents of the positivist school differ among themselves as to whether the criminal is an instance of regressive atavism or of physical and mental degeneration. They differ still more as to the existence of an anatomical type of the criminal. Lombroso emphatically asserts its reality. The supposed peculiarities are briefly these: In the brain the confluence of many of the primary fissures, the existence of four horizontal gyri, and a relative shortening of the occipital lobes which results in the cerebellum not being entirely covered. This last-named

condition is a characteristic of the inferior apes. The most common abnormalities of the criminal skull are:

1. Persistence of the metopic or median frontal suture.
2. Precocious synostosis or bony union of the other sutures.
3. A greater simplicity in the dentitions of the sutures, the edges being smoother.
4. The frequency of wormian bones in the region of the posterior fontanelle.
5. The strong development of the superciliary ridges, the effacement, or even depression, of the glabella or nasal eminence between the eyebrows, and large cavernous orbits.
6. The posterior situation of the foramen magnum.

The head and face of the criminal present an unusual number of asymmetries, so that a collection of portraits of criminals has all the effect of a series of caricatures. The lemurean jaw is of frequent occurrence. Large flat ears standing out prominently from the sides of the head—what are technically termed "winged ears"—are very common. The mean height of the criminal and his girth of chest are above the average, but the muscular force is below it. The length from finger-tip to finger-tip when the arms are extended horizontally (Fr. *le grand envergure*) is greater than in the non-criminal. While it is not true that this dimension corresponds exactly to the height in normal man, any decided excess is regarded as a reversion to the simian type. Other peculiarities of less importance have been noted. Lombroso, in a recent work, stated that he had compared 26,886 criminals with 25,447 normal persons.

It has been objected that the peculiarities named are also found in epileptics and insane persons, and, indeed, in persons neither criminal nor insane. To this it is replied that to show that the proportion of abnormalities is much greater in a given number of criminals than in an equal number of non-criminals is the vital point.

The physiological, pathological, and psychological conditions of the criminal, modified as they must be by his abnormal structure, form an important part of the researches of the criminal anthropologist. The sensibility of the criminal, tested by the electric apparatus of Du Bois-Reymond, averages 49.6, and in the honest class 64.2. In acuteness of the senses of smell, taste, and hearing, he is also inferior. The observations upon which these conclusions are based were made both upon men and women.

Diminished sensibility to pain—disvulnerability, as it is termed—enables the malefactor to recover rapidly from wounds which would be long in healing or of fatal result in normal man. Some hypnotic experiments by Delbœuf tend to confirm the belief that the rapidity of cure depends largely upon the absence of pain. This comparative insensibility to physical pain in the criminal has been pointed out by numerous observers, and it is not surprising that it should be accompanied by an equal indifference to the sufferings of others.

A French physician, Alphonse Bertillon, has devised an ingenious anthropometric system of identification of criminals. It has been formally adopted in Paris, Lyons, and other large cities with excellent results.

Ferri, who is Professor of Criminal Law at the University of Rome, and who belongs to the positivist school, proposed the following classification of criminals, which has been generally adopted:

(1) *The criminal by instinct*—the born criminal. He is distinguished by an entire absence of the moral sense and an utter heedlessness of the consequences of his acts. The prominent types of this class are the murderer and the robber. The suggestion of crime meets with ready acceptance, and the consequences to the victim—the destruction of life, the agony of the family, the loss of property—are regarded by him with imperturbable indifference. This insensibility is evinced also in endurance of pain in surgical operations and in his stolid demeanor at the place of execution.

(2) *The passionial criminal*, who commits crime under the influence of passion. He is, in most respects, the opposite of the instinctive criminal. The moral sense, which is strongly developed, is obscured for the time being by the overwhelming passion, but is speedily restored to its habitual predominance. The sense of guilt and the repentance that follows are in striking contrast to the sullen indifference of the born criminal or to his clumsy affectation of penitence.

(3) *The criminal from chance*. He is a reduced type of the instinctive criminal. In him the absence of the moral sense assumes the form of weakness, and it is more to his

surroundings than to any active disposition that his embarking in a career of crime is due.

(4) *The criminal from habit.* This is an intermediate type without marked psychologic characters. From continued relapses he acquires more and more the character of the instinctive criminal, until, from frequent prison experience, there is but little distinction observable between them.

(5) *The insane criminal.* The adherents of the new school are generally agreed in declaring that the insane criminal's condition is the result of psychological degeneration, or abnormal development, and is therefore incurable. He is, anthropologically, identical with the instinctive criminal in a great many cases of insanity, and in a large proportion of cases of epilepsy, but differs from him in the confusion of his ideas and many other psychological characters.

Jurists say that without a crime there is no criminal; anthropologists, that the criminal is here with the intent to commit crime; though his attempt may fail, he is as much the assassin or the thief as if the act had been completed, and he must be hanged or secluded accordingly. They regard any graduated scale of penalties as only a temptation to crime. The limitation of the punishment leads to a commercial view of the offense. They insist that the criminal shall merely be sent to prison. His coming out should depend, not upon a sliding scale in supposed proportion to the gravity of his crime, but upon the proof of his amendment. We do not send a sick man to the hospital for a definite period, but for treatment and for discharge *when cured*, as pronounced by competent authority. The criminal should have the right to demand from this competent authority an examination into his case, and a decision based upon regard to the safety of society. They insist, also, that the criminal should, by his labor, discharge his indebtedness to his victim as far as it would be possible to ascertain its extent. At present the State locks up the thief and appropriates to its own use the product of his labor while in prison. At the end of his imprisonment the offender is said to have "expiated" his crime—to have paid his debt to society—when, in truth, it is society who has paid his debt for him by housing, feeding, and clothing him, and not always even demanding the poor equivalent of his labor.

The spiritualistic view of punishment is that there must be expiation for crime. By suffering, the expiation of those who feel remorse is completed, and by it remorse is awakened in those who are as yet insensible. To this it is replied that long experience has shown that the ordinary criminal is incapable of remorse, although he may feign it for his own purpose. It is difficult to separate the idea of vengeance from that of expiation. What society really demands is the elimination or the segregation of the abnormal man, unassimilable with his social surroundings.

It is a biological principle that a being disappears who can not live in unison with his surroundings. The difference between the biologic and moral law is that under the first the selection takes place spontaneously by the death of the individual unsuited to his surroundings; in the second, the selection must take place artificially—that is to say, by the social power which acts in its own defense as nature operates in biologic order.

The opinion is generally entertained by those who have had to do with the inmates of penal institutions that repentance and reform are very rare among them. Mr. Bruce Thompson declares that among all the murderers he had known, amounting to nearly five hundred, only three were known to have expressed any feeling of remorse.

The positivist school is at variance with the psychiatrists as to the existence of moral insanity. Exclusively moral abnormality characterized by the perversion or absence of all moral instincts is not, they contend, a disease. If there be no disturbance of the faculty of ideation, the absence of the moral qualities can not justify the denomination of insanity. If the latter distinction were permitted, every slight peculiarity of character would be, on the same ground, pronounced to be pathological, and health would become a mere ideal standard. When there is no derangement of the psychical functions accompanying the perversity, it is not a case of disease. In the born criminal the mental process is in accord with the external impressions. If the motive was vengeance, the injury really had been inflicted. If the crime was to bring profit, the profit was real. If to obtain a certain pleasure, the pleasure was tangible. The hope of obtaining the desired end is logical, but the process is criminal, and reveals the absence of the moral sense.

Two international congresses of criminal anthropology have been held; the first at Rome in 1885, and the second at Paris in 1889. Seven journals relating exclusively to this subject are now published. ROBERT FLETCHER.

Anthropometry [from Gr. *ἄνθρωπος*, man + *μέτρον*, measure]: the measurement of the human body and of its different parts. The term is also often used to include the discussion of the results obtained by such measurements. The determination of the physical proportions and weight of different individuals, and of the force, rapidity, range and completeness of the performance of function of certain parts of their bodies, is made for very various purposes, and with corresponding differences in the scope of the methods employed. It may be used to ascertain the changes due to growth and development under various circumstances, and thus to determine the effects of exercise or special physical training, of occupation, or of habits of various kinds upon the organism or upon special parts of it, and for this purpose a series of observations of the same persons at intervals of time is especially useful. It may be used to determine the probable fitness of an individual for a particular occupation, as in the measurement of recruits, or his prospects for health and long life, as in examinations for life-insurance. It may be used for purposes of identification of an individual, such as a suspected criminal or deserter, or of a dead body in certain cases of jurisprudence. Considered as a branch of anthropology, it may be used as one means of classifying men into different race groups, or of investigating the probable affinities of one group to another. The measurements made by physicians and surgeons for purposes of diagnosis or for answering pathological problems are not usually considered under the head of anthropometry, nor are those measurements of internal organs which can only be made after death included in this subject.

The history of anthropometry begins with the use of the dimensions of certain parts of the human body as the first standards of measure. The length of the foot, of the forearm or cubit, the hand's breadth, the width of the thumb (Fr. *pouce*), or inch, are examples of such standards. Necessarily, as men differ in size, it became necessary to settle the length of the average cubit or foot, and in doing this no doubt the question as to what should be considered a properly proportioned human body may have arisen. The mathematicians and artists of Egypt and India seem to have agreed at a very early period that there must be some one part of the body whose length should be the modulus or standard of dimension for all other parts. The length of the face from the chin to the roots of the hair appears to have been the favorite modulus of sculptors, so that the height of the figure would be from nine to ten faces, the length of the arm from the shoulder to the point of the middle finger would be four faces, and so on. For an account of the various attempts to establish a canon of proportion of the human body, consult the paper of Dr. Robert Fletcher entitled *Human Proportion in Art and Anthropometry* (Cambridge, 1883).

As no two men are alike in all dimensions, and as the number of dimensions which might be taken on a given body is almost infinite, it becomes a matter of importance to decide as to precisely what measurements shall be made in a given case, and how they shall be stated. For anthropological purposes, and in the study of growth and development, it is important to have the data of as many individual measurements as possible, so stated that they can be compared with each other; and hence it is important to make the same measurements that have been made and published by others, and then to make such additional measurements as may seem desirable and expedient, bearing in mind that the more numerous and complicated the measurements the more time, labor, and skill are required to obtain them with such accuracy as to make them useful, and therefore the less probable it is that such elaborate work can be obtained from travelers, school-teachers, etc., or that such measurements can be made by experts in sufficient numbers to make them of real value.

To obtain reliable data but few measures should be asked for. It is also to be remembered that certain dimensions have little or no interest or value in themselves, but may be significant when compared with other dimensions; hence if these last are not taken, the first are of no use. This is especially the case in craniometrical work, which, however, will not be considered in detail in this article.

The most important points for registration for each indi-

vidual in a series of anthropometrical observations to determine race characteristics are sex, age, birthplace, supposed race, variety or tribe, height of body standing (taken from sole to vertex), weight, girth of chest, color of eyes and hair, breathing capacity, span of arms, strength of arm, and acuteness of vision and of color perception. To these it is desirable to add the height when sitting and when kneeling, the maximum length and breadth of the head, the length and breadth of the face, the length and breadth of the nose, and the length of the forearm and middle finger. If the measurements are to be made for the purpose of determining progress in growth and development, as in school children, or in those taking special forms of exercise, many other measurements, especially of girths and breadths, will be of interest; and in such cases there is usually a much better opportunity to obtain such data than there is in anthropological work.

Uniformity in methods and instruments is in all cases very desirable; these are discussed in the various manuals on the subject, and in the reports of the Anthropometric Committee of the British Association for the Advancement of Science (1878 to 1883). Often a slightly inaccurate method is the only one available, as, for example, in measuring the height of the body, which should be taken while the person is barefooted, but must often be taken while he is wearing shoes, and the height approximated by deducting the height of the shoe-heels.

Having obtained the individual data, the next step is to tabulate them in such a way as to show their relations to each other and to the results obtained by others; and the selection of the combinations by which this can best be effected, and the best methods of estimating and eliminating probable errors, and of presenting the results in a clear, reliable, and usable form, requires a considerable knowledge of statistical methods. In the first place, the difference between an average and a mean should be borne in mind, using these words in the sense in which they are used in the results obtained by the Anthropometric Committee of the British Association. As defined by Mr. Roberts, a member of this committee: "An *average* is obtained by dividing the sum of the values observed by the number of observations, while the *mean* is the value at which the largest number of observations occur ('the value of greatest frequency'). An average is influenced by exceptional cases, but a mean disregards exceptional cases, and is entirely dependent on the predominating numbers; hence the *mean* is employed to distinguish the racial type, and the *average* the variations to which the race is subject by the modifying influences of local and exceptional causes. To determine the radical type of a nation by means of an *average* it would be necessary to have all classes of the community represented in their due proportions; but the unequal distribution of occupations renders this impossible, unless a general census were taken. Even within narrow limits it is almost impossible to obtain observations of all the individuals of a class, as the taller and better-developed members readily submit to measurement, while the shorter and imperfectly developed evade examination, and the sick and deformed are passed over altogether. On the other hand, the determination of the racial type by the *mean* is free from these sources of error, as we disregard both the ill-developed and the over-developed individuals, and depend entirely on those which represent the medium development of the class or nation."

As the reliability of both the mean and the average depends largely upon the number and accuracy of the observations from which they are derived, we have very few of them relating to savage and barbarous tribes which are of much value. In some few cases, such as the Andamans and two or three African tribes, the stature and weight are so decidedly below the average of other peoples that they may be accepted as race characteristics without question; but for the great majority of tribes the data which we have are only sufficient to form a basis for hypotheses which must be accepted or rejected on other grounds.

Even in civilized countries the results thus far obtained, although derived from large numbers, are in many cases not comparable, owing to the age or other groupings according to which they are presented. The data derived from measurements of recruits in different countries are not comparable unless the minimum limit of stature is the same in each, nor unless they are given by uniform age groupings. As the height continues to increase to different ages in different races, this distinction is an important one.

The following table shows the average height by years of 189,216 American-born white men examined at draft stations between 1862 and 1863, and found fit for military service:

TABLE SHOWING THE MEAN HEIGHT BY YEARS, AND BY GROUPS OF FIVE YEARS, FROM THE AGE OF SEVENTEEN TO FORTY-FIVE, OF 189,216 AMERICAN-BORN WHITE MEN FOUND FIT FOR MILITARY SERVICE.

AGE.	BY YEARS.		AGE.	BY YEARS.			
	Number measured.	Mean height.		Number measured.	Mean height.		
						Inches.	Meters.	Inches.	Meters.
18.....	30,456	66·39	1·6863	31.....	5,562	68·20	1·7323
19.....	14,994	67·07	1·7036	32.....	4,635	68·20	1·7323
20.....	11,526	67·51	1·7148	33.....	3,939	68·29	1·7346
21.....	14,146	67·78	1·7216	34.....	2,782	68·35	1·7361
22.....	10,479	67·92	1·7252	35.....	4,966	68·47	1·7391
23.....	8,907	68·01	1·7275	36.....	4,138	68·28	1·7343
24.....	7,335	68·02	1·7277	37.....	4,172	68·26	1·7338
25.....	7,940	68·05	1·7285	38.....	4,014	68·24	1·7333
26.....	6,986	68·09	1·7295	39.....	3,402	68·23	1·7330
27.....	6,351	68·11	1·7300	40 to 45 ..	15,750	68·23	1·7330
28.....	6,033	68·13	1·7305	Total ..	189,216	68·00	1·7274
29.....	4,447	68·17	1·7315				
30.....	6,256	68·18	1·7318				

THE FOLLOWING IS A PART OF A TABLE GIVEN IN THE REPORT OF THE ANTHROPOMETRIC COMMITTEE OF THE BRITISH ASSOCIATION, MADE IN 1883, SHOWING COMPARATIVE STATURE OF ADULT MALES OF DIFFERENT RACES.

RACE OR NATIONALITY.	Authority.	Meters.	Ft.	In.
Polynesians	Samoa.....	1·853		
	Tahiti and Pitcairn.....	1·782		
	Marquesas.....	1·763		
	New Zealand.....	1·755		
	Polynesians.....	1·753		
	Sandwich.....	1·731		
English professional class.....	Anthropometric Com.	1·757	5	9·14
Patagonians.....	Musters.....	1·754	5	9·00
	D'Orbigny.....			
Negroes of the Congo.....	Topinard.....	1·752	5	8·95
Amakosa Kaffirs, S. Africa ..	Sir A. Smith.....	1·741	5	8·50
Iroquois Indians.....	Gold.....	1·735	5	8·28
Negroes of Calabar.....	Topinard.....	1·727	5	7·95
North American Indians.....	Baxter.....	1·726	5	7·93
Irish, all classes (recruits 5 ft. 8·04 in.).....	Anthropometric Com.	1·725	5	7·90
U. S. (white, all classes).....	Baxter.....	1·719	5	7·67
Zulus.....	Roberts.....	1·707	5	7·19
English laboring classes.....	Anthropometric Com.	1·705	5	7·08
Chippeway Indians.....	Oliver.....	1·700	5	6·90
American Negroes, of all degrees of color.....	Baxter.....	1·693	5	6·62
Hungarians, immigrants to U. S. America.....	Baxter.....	1·692	5	6·58
Swiss of Geneva.....	Dunant.....	1·688	5	6·43
Russians, immigrants to U. S. America.....	Baxter.....	1·687	5	6·38
Poles, ditto.....	Baxter.....	1·682	5	6·20
French, upper classes.....	De Quatrefages.....	1·681	5	6·14
Germans.....	Novara.....	1·680	5	6·10
Javanese.....	Novara.....	1·679	5	6·08
Italians, immigrants to U. S. America.....	Baxter.....	1·677	5	6·00
Spaniards, ditto.....	Baxter.....	1·668	5	5·66
Ainos.....	Rosky.....	1·660	5	5·33
French, working classes.....	De Quatrefages.....	1·657	5	5·24
Chinese.....	Novara.....	1·630	5	4·17
Italians (conscripts, 1·620).....	An. di Statist., 1879.....	1·626	5	4·00
Polish Jews.....	Majer and Kopernicki.....	1·623	5	3·88
Peruvians.....	D'Orbigny.....	1·600	5	3·00
Malays.....	Raffles, Crawford, etc.....	1·583	5	2·34
Andamanese.....	Man.....	1·492	4	10·7
Mincopese.....	De Quatrefages.....	1·436	4	8·53
Bosjesmans (Bushmen and South Africa).....	Various.....	1·341	4	4·78
Difference between the tallest and shortest races.....		0·421	1	4·55
Average stature of man according to the above.....		1·658	5	5·25

Tables similar to those for height are given also for weight, and for various dimensions of the body, with distinction of sex, age, and race. Among the most important anthropometric tables are those which show the relative proportions of different parts of the body to each other and to the weight, with distinctions as above. There are several different ways of calculating these ratios, which may be made more or less complex according as the individual items are grouped by twos, by threes, etc. For example, the ratio obtained by dividing the length by the breadth of the face may be compared with the height, or with the ratio of height to weight, and the results of this comparison may be in turn compared with the length of the forearm in different races at different ages. Theoretically the variety of

ratios which might thus be obtained, and which might be of value, is very great; but practically the probable error in the use of a small number of sets of individual observations, and the impossibility of obtaining more than a few details in such sets, make such calculations of doubtful utility. Anthropometrical data in anthropological studies furnish very important aid in attempts at race classification; but they are not the only things to be considered in such work, and should not be relied upon to the exclusion of consideration of language, customs, and other points belonging to ethnological studies.

The use of anthropometrical data for the identification of criminals was commenced in Paris in 1832, on a plan suggested by Alphonse Bertillon, and is employed in connection with a collection of photographs of known criminals. These photographs are divided and subdivided into groups, according to the size of the head, the height, the length of the middle finger of the left hand, the length of the foot, the length of the forearm, etc.; and these, in connection with the sex and color of the eyes, form groups so small that for any suspected individual there will be only five or six photographs to examine to determine whether he is among the number. In the U. S. army the identification of deserters is effected by cards grouped according to tattoo marks, vaccination marks, and other scars, pigmented naevi, etc., taken in connection with color of eyes and hair and height.

The following works may be consulted with reference to anthropometrical methods and data:

Statistics, Medical and Anthropological, of the Provost-Marshal-General's Bureau, compiled by J. H. Baxter (2 vols., Washington, 1875); *A Manual of Anthropometry*, by Charles Roberts (London, 1878); *Reports of the Anthropometric Committee*, in Reports Brit. Assoc. for Adv. of Science (Lond. 1878-84); A. Weisbaeh, *Körpermessungen verschiedener Menschenrassen* (8vo, Berlin, 1878); F. Jagor and G. Koerbin, *Messungen an lebenden Indiern*. *Ztschr. f. Ethn.* (Berl. 1879, xi. 1-116. 2 Tab.); P. Topinard, *De différents instruments d'anthropométrie* (Bull. Soc. d'Anthrop. de Paris, 1880, 3. s. iii. 269-277); P. Topinard, *Observations upon the Methods and Processes of Anthropometry* (J. Anthropol. Inst., Lond. 1880-81, x. 212-224); P. Peli, *Sulle misure del corpo nel Bolognesi; ricerche antropometriche; con un' appendice storica sull' antropometria del Cesare Taruffi* (Mem. Accad. d. sc. d. Ist. di Bologna, 1881, 4. s. ii.); J. Bertillon Taille, *Dict. Encycl. d. sc. méd.* (Paris, 1885, 3. s. xv. 581-649); F. Galton, *On Recent Designs for Anthropometric Instruments* (J. Anthropol. Inst., Lond. 1886-87, xvi. 2-9); D. A. Sargent, *Anthropometric Apparatus, with Directions for Measuring and Testing the Principal Physical Characteristics of the Human Body* (8vo, Cambridge, 1887); A. Lacassange, *De la mensuration des différentes parties du corps dans les cas de dépeçage criminel* (Arch. de l'anthrop. crim., Paris, 1888, iii. 158-163); W. Stephenson, *On the Relation of Weight to Height and the Rate of Growth in Man* (*Lancet*, Lond. 1888, ii. 560-564); E. Hitchcock, *An Anthropometric Manual Giving the Average and Mean Physical Measurements and Tests of Male College-Students, and Methods of Securing Them; Prepared from the Records of the Department of Physical Education and Hygiene in Amherst College During the Years 1861-62 and 1887-88, inclusive* (2d ed. 8vo, Amherst, Mass., 1889); P. Topinard, *Le canon des proportions du corps de l'homme européen* (Rev. d'anthrop., Paris, 1889, 3. s. iv. 392-403); E. Rollet, *La mensuration des os longs des membres; étude anthropologique et médico-légale* (Arch. de l'anthrop. crim., Paris, 1889, iv. 137-161); *Anthropométrie (L') judiciaire à Paris en 1889; Installations et plans des locaux; récents perfectionnements; une expérience de sociologie bureaucratique* (Lyons and Paris, 1890); H. P. Bowditch, *The Physique of Women in Massachusetts* (8vo, Boston, 1890), and *The Growth of Children, studied by Galton's Method of Percentile Grades* (Rep. Bd. Health, Mass., 1889-90, Bost. 1891, xxii. 479-522); F. Galton, *Retrospect of Work done at my Anthropometric Laboratory at South Kensington* (J. Anthropol. Inst., Lond. 1891-92, xxi. 32-35); Seggel, *Brustbau und Körpergewicht im Verhältniss zur Körperlänge* (Verhandl. d. x. internat. med. Cong. 1890, Berl. 1891, v. 18. Abth., 162-174).

J. S. BILLINGS.

Anthropomor'phism [from Gr. ἀνθρωπόμορφος, having the form (μορφή) of a man (ἄνθρωπος)]: the representation of the Deity under a human form or with human affections; the figurative application to God of terms which properly relate to human beings. Also the heresy of the ANTHROPOMORPHITES (*q. v.*).

Anthropomor'phites, or Anthropomor'phists: persons who believe or imagine that the Deity has naturally a human form, as the ancient Greeks and other pagans. This error has been also entertained by some Christians, especially the Audæans or Audians, a Syrian sect formed about 350 A. D. The tendency to anthropomorphism arises from the inability of man to form any conception of a divine person except by imagining that there is some similarity between the human and the divine nature.

Anthu'rium [from Gr. ἄνθος, flower + οὐρά, tail]: a genus of aroids including 160 species, natives of tropical America. The spathe is large and leaf-like, and the spadix is usually cylindrical and sessile. Many species are grown in greenhouses, and are remarkably beautiful. C. E. B.

Antibes, ān'teeb' (anc. *Antip'olis*): a fortified seaport-town in the S. E. of France; in the department of Alpes Maritimes; on the Mediterranean, 17 miles by rail S. W. of Nice (see map of France, ref. 8-1). Its port is small but deep, and is furnished with a lighthouse, lat. 43° 35' N., and lon. 7° 81' E. It has a college, and a considerable trade in olives, fruits, oil, salt fish, etc. Here are some remains of great antiquity. It was founded by a Greek colony about 340 B. C. Its Provençal name, *Antiboul*, readily recalls the ancient Greek appellation. Its coins, the remains of its theater and of certain Roman constructions, have excited the interest of antiquaries, but its ancient history is obscure. Pop. (1891) 7,401; (1896) 9,329.

Anti-burgher: See BURGHHER.

An'tichlore: a name given by paper-makers to substances which are employed to remove from the pulp the chlorine which, in the form of chloride of lime, had been used to bleach it, and which, if allowed to remain in the pulp, would not only damage the machinery, but injure the strength of the paper. Sulphite and bisulphite of soda were first employed, but at present hyposulphite of soda is almost invariably used. Sulphide of calcium, proto-chloride of tin, and coal-gas have been used. See BLEACHING.

An'tichrist [Gr. Ἀντίχριστος; ἀντί, against + Χριστός, Christ]: a name which has been variously applied by Christian writers to a supposed powerful individual or institution destined to arise in opposition to Christianity, and to obtain a partial or temporary triumph over it. This idea has been traced back beyond the Christian era by some writers, who cite in favor of this view the prophecy of Ezekiel concerning Gog and Magog. The word Antichrist occurs in the Scriptures only in the First and Second Epistles of John. He says "that every spirit that confesseth not that Jesus Christ is come in the flesh" is Antichrist. The "Man of Sin" and "Adversary" of Paul's Second Epistle to the Thessalonians are commonly identified with the Antichrist of John. Many writers, both before and since the Protestant Reformation, have made the pope, or the papaey, Antichrist. Many writers, both Roman Catholics and Protestants, have suggested one or another of the persecuting emperors, such as Nero or Diocletian. Others say a succession of Roman emperors.

Anticlei'a (in Gr. Ἀντίκλεια): a daughter of Autolycus; was married to Laertes, and became the mother of Odysseus. According to Homer, she died of grief at the long absence of her son, but on his visit to Hades he met her and spoke with her. According to other traditions, she put an end to her own life on account of a false report of the death of her son. Euripides calls Odysseus a son of Sisyphus (*Iphig. Aul.*, 524), referring to a tradition, communicated by Hyginus, that Anticleia lived on intimate terms with Sisyphus before she married Laertes.

Anticlei'des (in Gr. Ἀντίκλειδης): a Greek historian; lived shortly after the time of Alexander the Great, and is often referred to by later writers, but of his works only fragments have come down to us. He wrote a history of Alexander the Great, which contained an elaborate sketch of the previous history of Egypt, but his principal work was his *Περὶ Νόστων*, containing, according to Strabo, an account of the return of the Greeks from their ancient expeditions.

Anticli'max [for etymology, see CLIMAX]; in rhetoric, a sentence which descends from great to little, and is the reverse of a climax, as in this verse of Pope: "Die and endow a college or a cat"; and this line from Horace: "Parturiunt montes, nascetur ridiculus mus."

Anti-Corn-Law League: an association founded in 1839 by a number of manufacturers in Manchester, England, who aimed at the abolition of all fiscal imports on grain. Sev-

eral local associations of like purpose had preceded it; one in London, 1836, and another in Manchester in 1838. The manufacturers of the latter city had sought a hearing through Parliament in vain, and when the House of Commons, Mar. 12, 1839, rejected a motion for a commission to inquire into the operations of the corn-laws, the Manchester men in attendance at once assembled in Herbert's hotel, London, and under Richard Cobden's (*q. v.*) leadership organized the League. During the seven years that its triumph was delayed he was its presiding genius. His great coadjutor was John Bright. Its secretary was W. A. Paulton; among its celebrated adherents were Joseph Hume, Sir William Molesworth, George Thompson, C. P. Villiers, Ebenezer Elliott, who wrote political verse for it, Milner Gibson, and W. J. Fox. Its methods were those of a propaganda, and its arguments were from the standpoint of the moral iniquity and economic folly of taxing food. Its career was energetic, fiery, and expensive, and its functions ended when Sir Robert Peel (*q. v.*) carried the repeal of the corn-laws in 1846, thus, in his words, "giving the people bread, no longer leavened by a sense of injustice." See CORN-LAWS.

Anticos'ti: a large island of the province of Quebec, Dominion of Canada; in the Gulf of St. Lawrence, between lat. 49° 04' and 49° 58' N., and lon. 61° 45' and 64° 35' W. Area, more than 2,600 sq. miles; length, 135 miles; greatest width, 40. It was exploited by the "Anticosti Company," which in 1873 divided into twenty counties, and eventually attracted a considerable colony. The soil proved to be sterile and the climate cruel; the colonists suffered from starvation, and were removed to the mainland. In 1896 Menier, the chocolate manufacturer of Paris, purchased it for a private park and game preserve, and claims sovereign rights over it. Ellis Bay (the chief settlement) and Fox Bay are the only tolerable harbors.

Anticyclone, ān-ti-sī-klōn' (i. e. the opposite of a cyclone; also called a *high*, alluding to the culmination of pressure on the weather-map): an atmospheric or weather condition covering a large territory, and characterized by a high barometer, gently outflowing winds, clear skies, and dryness. Such areas of high barometer usually appear, in middle latitudes, in the W., and move eastward slowly, though with varying speed. When they follow close on a storm-area (a technical cyclone or "low"), they usually produce cooler weather, and in winter cold waves result when they follow closely behind the storm. In summer the clear skies make the weather hot by day and cold at night. Unseasonable frosts usually occur during the prevalence of an anticyclone. The humidity is low, making the weather dry and fair, or clear. The long continuance of an anticyclone is one of the accompaniments of drouths.

Meteorologically, an anticyclone is an area over which wind is gently descending at the center, and flowing out at the sides. As the upper air is relatively dry, this gives the low humidity and cloudlessness characteristic of the phenomenon, while the coolness of the upper air gives the lower temperatures, and the clearness of the sky permits uninterrupted sunshine in the daytime and uninterrupted radiation to the sky at night, thus causing the great daily range of temperature. A "high" brings calm, pleasant weather, but also danger of frost and drouth. A "low" brings cloud, wind, and storm, but also a moist atmosphere, and rain or snow.

MARK W. HARRINGTON.

Antieyra, ān-tis'i-ra: an ancient city of Thessaly, on the river Sperchius. Another Antieyra was a city of Phocis, with a harbor on the Corinthian gulf. Still another was in Loeris, on the left side of the entrance to the Corinthian gulf. All were noted for the production of hellebore.

An'tidote [Gr. ἀντίδοτον, remedy; ἀντί, against + δότης (διδόναι), given]: a medicine given to overcome or prevent the injurious effects of poisons. Antidotes are chemical or physiological. The first act by neutralizing the poison, converting it into an insoluble or harmless substance. Physiological antidotes produce action within the body which enables it to resist the effect of the poison. Thus belladonna and opium, both poisonous, are physiological antidotes or counter-poisons to each other. Alcohol or ammonia is the physiological antidote of certain snake-poisons. The more important antidotes are mentioned in this work under the name of the poison for which they are administered. See TOXICOLOGY.

Antie'tam, BATTLE OF: battle; fought on Sept. 16 and 17, 1862, between the Union troops, under Gen. McClellan, and the Confederates, under Gen. Lee; taking name from Antie-

tam creek, which enters the Potomac about 6 miles above Harper's Ferry. It was called by the Confederates the battle of Sharpsburg.

After the second battle of Bull Run the Confederates crossed the Potomac above Harper's Ferry and pushed on to Frederick, Md., with a view to invading Pennsylvania. Upon McClellan's approach from Washington, they fell back and occupied the passes of the South Mountain between Frederick and the Hagerstown road. Jackson, with his own troops and those of McLaws and Walker, meanwhile marched upon Harper's Ferry, invested it, and captured its garrison of about 12,000 men, the surrender being made Sept. 15, and then marched to join Lee at Antietam, reaching there in time to take part in the battle. McClellan, marching from Washington, forced the passes of South Mountain Sept. 14, and, marching on toward Sharpsburg, found Lee's army occupying a position behind Antietam creek. McClellan's army came up and was massed in front of this position by the evening of the 15th, except Franklin's corps, which arrived about 10 A. M. of the 16th. Burnside was placed on the left, Sumner in the center, and Hooker on the right, with Porter in reserve. On the afternoon of the 16th Hooker's corps crossed the creek with a view to turning the enemy's left. Here he commenced the action which lasted until dark, and recommenced at early dawn on the 17th. During the night Mansfield's corps crossed in support of Hooker, and joined in the battle at about 7 A. M., and Sumner reached the front an hour or two later, extending the Union line to the left. Hood's division on the Confederate left met Hooker's attack of the 16th, and was driven back, but during the night was relieved by Jackson, with Ewell's troops, who had arrived from Harper's Ferry in time to meet the attacks of Hooker and Mansfield. McLaws and Walker also came on the field just in time to strike in flank the right division (Sedgwick's) of Sumner's corps, which was somewhat in advance of the others. Sumner's two remaining divisions (French's and Richardson's), supported by part of Franklin's corps, however, pushed back the Confederate line some distance, joined with the troops on their right, and succeeded in holding their ground for the rest of the day. The battle in this part of the field was virtually ended at 1 P. M. The fighting on the Union right had been most desperate, and the losses on both sides very great, including Gen. Mansfield killed, Richardson mortally wounded, and Hooker, Sedgwick, and Crawford wounded. On the Confederate side Gens. Branch and Starke were killed, and R. H. Anderson, Lawton, Gregg, and Jones wounded. It will be observed that the battle on the right commenced at early dawn, and that the different corps came into action in succession instead of simultaneously. Meanwhile Burnside, who commanded the left wing, did not cross the creek until about 1 P. M. Consequently the Confederates were able to strengthen their left, to meet the attack made upon it, by withdrawing troops from their right and center.

At about 10 A. M. Burnside commenced to move. He sent one division (Rodman's) to cross the creek by a ford well to the right of the Confederate line, and made an effort to force a passage at the stone bridge in his front, subsequently known as "Burnside's bridge." The first two assaulting columns were repulsed, but the third was successful, and carried the bridge and the wooded bank on the other side at about 1 P. M., just before Rodman's troops came up and joined them. The remainder of the Ninth Corps crossed and formed on the other side.

At about 3 P. M. Burnside's troops, under urgent orders from McClellan, made a vigorous and gallant attack, and drove the enemy before them until the right division (Willcox) reached and entered the village of Sharpsburg. As the direction of the advance inclined to the right, Rodman's division necessarily fell to the rear of Willcox's, and was thus exposed to a vigorous attack upon its left by A. P. Hill's division of six brigades, which had just arrived from Harper's Ferry. Rodman was mortally wounded, and one of his brigades thrown into confusion. The left of the corps being thus unprotected, the whole line was retired somewhat toward the creek, and a good position taken up, which was held against the Confederate assaults of the afternoon, and during the night and the following day (the 18th). During the night of the 18th the Confederates recrossed the Potomac at Shepherdstown.

McClellan's strength by official reports was about 87,000; his losses 12,469, including 2,010 killed. The most reliable reports place Lee's strength at about 40,000 men, and his losses at about 12,000.

The discussion of the tactical features of this battle is beyond the scope of this article. For full descriptions from different standpoints, see *The Battles and Leaders of the Civil War* (The Century Co.); *The Antietam and Fredericksburgh*, Scribner's War Series, etc. See also McCLELLAN and CONFEDERATE STATES.

JAS. MERCUR.

Antifeb'rin (*Acetanilide, Phenylacetamide*): a white crystalline substance, slightly soluble in cold, much more so in hot water, which is much used in medicine for the reduction of temperature and the relief of pain. When given to persons suffering from fever, in doses of from ten to fifteen grains, it usually produces in about an hour a fall of temperature which is often but not always accompanied by a profuse sweating, but which is not dependent upon that sweating. In doses of ten to fifteen grains in health, it usually causes no distinct symptoms; in larger doses, or when the dose is repeated, it occasions headache, malaise, some somnolence, ringing in the ears, dilatation of the pupils, cyanosis of the face and extremities, and sometimes an eruption of bright red spots. In poisonous doses, it causes fall of temperature, disturbance of respiration, wide-spread paralysis with convulsions, and death in collapse. Its general action is very similar to that of antipyrin, but there is a wide-spread belief in the medical profession that it is less apt to cause collapse than is antipyrin. That it has a very great effect upon the general nutrition is shown by the fact that it decreases the production of animal heat; that is, lessens the activity of the chemical changes in the body. It is not efficient against pain which is the result of distinct local inflammations, diseases, or injuries, such as a boil or broken leg; but it often affords a great relief in nervous pains, such as nervous or sick headache, the lightning-like pains of locomotor ataxia, or other spinal disease. Dose, ten to fifteen grains.

H. C. WOOD.

Anti-Federalists: party in the U. S. opposed to centralizing tendencies in the administration of government and interpretation of the Federal constitution; its first great leader was Thomas Jefferson. It first opposed the adoption of the Constitution, but when defeated on that point favored the strictest construction. The name went out of use soon after 1793, and the party it represented has been successively called Republican, Democratic Republican, and (at present) Democratic. See ALEXANDER HAMILTON, THOMAS JEFFERSON, DEMOCRACY, REPUBLICAN PARTY, and UNITED STATES.

An'tigo: city (founded in 1880); on railroad; capital of Langlade co., Wis. (for location of county, see map of Wisconsin, ref. 3-E); 207 miles from Milwaukee; has electric lights; 6 churches; 6 public schools, 1 Roman Catholic parochial school, and 2 German Lutheran schools. Principal industries are lumbering and agriculture. Has 1 flour and 3 saw mills, 2 planing-mills, machine-shop, a foundry, and a brewery; and chair, hub, broom-handle, veneer, excelsior, and other factories. Pop. (1890) 4,424; (1900) 5,145.

EDITOR OF "REPUBLICAN."

Antig'one (Gr. Ἀντιγόνη): a daughter of Œdipus, King of Thebes, and his own mother, Jocasta. She attended her father in his exile into Colonos in Attica, remaining with him till he died, when she returned to Thebes, and afterward buried her brother Polynices in defiance of the edict of the tyrant Creon, who, for her disobedience, immured her alive. Her tragic story was a subject of the Greek poets, particularly Sophocles, whose plays of *Antigone* and *Œdipus at Colonos* are still extant, and Euripides, whose *Antigone*, though not extant, is known from extracts by later writers, and in his play of the *Phœnissæ*.

Antig'onns (Gr. Ἀντίγονος): King of Asia, surnamed CYCLOPS (i. e. one-eyed); a Macedonian general; b. about 382 B. C. He took part in Alexander's campaign against Persia, and became satrap of Phrygia in 333. In the division of the empire which followed the death of Alexander, Antigonus received the provinces of Lycia, Pamphylia, and the Greater Phrygia. Having become an enemy of Perdiccas, he formed an alliance with Antipater and Ptolemy in 321 B. C. After the death of Perdiccas (321 B. C.), Antigonus waged war in Asia Minor against Eumenes, whom he defeated and put to death in 316. He obtained by conquest several provinces in Asia, and indulged an immoderate ambition, to restrain which Ptolemy, Cassander, Seleucus, and Lysimachus formed a league against him in 315 B. C. In the long war that ensued, Demetrius Poliorcetes, the son of Antigonus, defeated Ptolemy in a naval battle in 306, soon after which Antigonus took the title of king. He encountered the united armies of the allies

at Ipsus in Phrygia, where he was defeated and killed in battle in 301 B. C.

Antigonus: King of the Jews; son of Aristobulus II.; b. about 80 B. C. After the death of his father he was expelled from Judea by Antipater and Herod. He was restored to the throne by the Parthians about 39 B. C., but the Roman senate refused to recognize him as king. Mark Antony took Jerusalem and put Antigonus to death about 36 B. C.

Antigonus Do'son (Gr. Ἀντίγονος Δάσων): King of Macedonia; was a descendant of Antigonus surnamed CYCLOPS, and a nephew of Antigonus Gonatas. He became regent or king in 229 B. C., during the minority of Philip V., who was heir to the throne. He was an ally of the Achaean League in a war against Sparta, and he defeated the Spartan Cleomenes in 221 B. C. He died in the same year, and left the throne to Philip V.

Antigonus Gona'tas (Gr. Ἀντίγονος Γονατᾶς): son of Demetrius Poliorcetes; b. about 320 B. C. at Gona, or Gonni, in Thessaly, whence his surname. Having defeated an army of Gauls who under Brennus had invaded Macedonia, he became king of that country in 277 B. C. He was expelled from his kingdom by the famous Pyrrhus, King of Epirus, in 273, but he recovered the throne after the death of Pyrrhus in 271. He died about 240 B. C., and was succeeded by his son, Demetrius II.

Antig'orite: a species of serpentine in which a portion of the silica is replaced by alumina. It has a weak luster, and feels smooth but not greasy. It is found in the Antigorio valley in Piedmont.

Antigua, ān-tee'-ga: a British West India island; the most important of the Leeward group (see map of West Indies, ref. 6-M); first settled in 1632. It is 22 miles S. of Barbuda. The capital, St. John's, is in lat. 17° 8' N., lon. 61° 52' W. The surface is diversified, the climate dry and healthy, and the soil of the interior is fertile. Sugar, molasses, and rum are the chief articles of export. English Harbor can receive very large vessels. Pop. (1891) 36,700, including the small islands of Barbuda and Redonda. Combined area, 108 sq. miles.

Antilegom'ena [Gr. pres. pass. partic. of ἀντιλέγειν, speak against]: literally, "spoken against," a theological term applied in ancient times to certain books of the New Testament, the authority of which was questioned by some biblical critics—namely, the Second Epistle of Peter, those of James and Jude, the Epistle to the Hebrews, the Second and Third of St. John, and the Apocalypse. They were, however, ultimately admitted into the canon.

Anti-Lib'anus, or **Anti-Leb'anon**: a mountain-range of Palestine and Syria, extending about 90 miles in a N. E. and S. W. direction nearly parallel with Lebanon, from which it is separated by the valley of Cœle-Syria. It is of Jura limestone formation. The highest summit of this range is Mt. Hermon, which has an altitude of about 10,000 feet. The valley of Cœle-Syria, between the two ranges, now called *Būkā'a*, is from 4 to 6 miles wide. See Robinson's *Physical Geography of the Holy Land* (1865).

Antilles [supposed by some to be corrupted from Lat. *ante*, before + *insula*, islands, because they seemed placed before the continent, which was only reached after the islands had been passed; also attributed to a mythical *Antilla* island]: all the West India islands except the Bahamas. They lie between the Atlantic Ocean and the Caribbean Sea, and extend from the Gulf of Mexico nearly to the Gulf of Paria. They are divided into three groups—the Greater Antilles, the Virgin islands, and the Lesser Antilles, or Caribbean islands, which are the most eastern. The Greater Antilles comprise the four largest islands of the archipelago—namely, Cuba, Hayti (or St. Domingo), Jamaica, and Porto Rico, with the small islands along their coasts. They are situated in the torrid zone, and are subject to frequent hurricanes and earthquakes. In the central parts of these islands rise high mountains of granitic formation. The staple products are sugar, rum, tobacco, cotton, and coffee.

The Lesser Antilles are small in size, but very numerous, and are arranged in a long curved line or row like a crescent, the convex side of which is toward the east. They are divided into two groups—viz., the Windward, or South Caribbee islands, and the Leeward, or North Caribbee islands. The Windward islands are Barbadoes, Grenada, the Grenadines, Martinique, St. Lucia, St. Vincent, Trinidad, and Tobago. All these belong to Great Britain, except Martinique, which is a French colony. The Leeward islands are Anguilla, An-

tigna, Barbuda, Descada (French), Dominica, Guadeloupe (French), Marie Galante (French), Montserrat, Nevis, Saba, St. Bartholomew (Swedish), St. Christopher, St. Eustatius, St. Martin (French and Dutch), Santa Cruz. For Virgin islands, see these words. The Leeward islands are British, except those otherwise designated, and three of the Virgin islands. Many of the Lesser Antilles are of volcanic origin, and some are of coral formation. The staple productions are similar to those of the Greater Antilles. A large portion of the population of the Antilles are Negroes and mulattoes, who are free. Slavery was abolished in the island of Cuba in 1886, and in Porto Rico in 1873. Area of Greater Antilles, 83,636 sq. miles; pop. 4,342,000: Virgin islands, area 268 sq. miles; pop. 39,000: Lesser Antilles, area 4,359 sq. miles; pop. 1,000,000.

Revised by M. W. HARRINGTON.

Antilocapra (i. e. antelope-goat): the generic name of the prong-horned antelope (*Antilocapra americana*), which inhabits the drier portions of the North American continent W. of the Mississippi. With the exception of the so-called Rocky Mountain goat (*Mazama*), this is the only antelope



Prong-horned antelope.

found in America, and it differs widely from all the Old World antelopes in this, that the sheaths of its horns are shed annually, like the deciduous horns of the deer. In this respect the prong-horned antelope stands quite alone, and forms the type of a distinct family, the *Antilocapridæ*.

Revised by D. S. JORDAN.

Antimachus (in Gr. Ἀντίμαχος): poet and scholar of Colophon; lived about 400 B. C. He was a forerunner of the Alexandrian period, and, being in advance of his times, was not popular. Audience fit he found in Plato, who admired his poems. More successful than his epic *Thebais* was his *Lyde*, a cycle of elegies, in which he undertook to console himself for the loss of his love by recounting like sorrows. Only scant fragments remain. See Couat, *La poésie Alexandrine*. p. 62 foll.

B. L. G.

Anti-Masonry: opposition to secret societies (that is, societies which conserve secrets) in general; but more particularly opposition to the order known as Masons or Freemasons, for which a high antiquity and wide influence are claimed. This order early excited the suspicions of European governments, some of which regarded it as a mask for conspiracies against throne and altar. Some of them protected themselves, so far as they might, by procuring the election of princes or other eminent personages to the chief offices of the order.

In the summer of 1826 a thriftless tailor, named William Morgan, living in the village of Batavia, in Western New York, it was whispered, was engaged in preparing a revelation of the secrets of the Masonic order, whereof he was a member. Other Masons, including the editor of the village gazette, were understood to be engaged with him in the enterprise. Morgan disappeared suddenly one evening, and it was soon proved that he had been forcibly abducted. Ex-

citement naturally arose, committees of vigilance and safety were organized, and he was traced westward to Fort Niagara, near Lewiston, N. Y., where he was temporarily imprisoned, and whence, it was ultimately testified, he was taken out into deep water in Lake Ontario and there sunk, though this was strenuously denied, and various stories from time to time affirmed that he was subsequently seen alive at Smyrna in Asia and other places. Such reports did not allay the excitement, which deepened and diffused itself, finding vent in a political party, which cast 33,000 votes in the State of New York in 1828, about 70,000 in 1829, and 128,000 in 1830; but of this last a fraction were not Anti-Masons, but only Anti-Jackson. The party spread into other States, and nominated William Wirt for President and Amos Ellmaker for Vice-President in 1832, when they were heartily supported in several States, but carried Vermont only. They probably diverted votes enough from Clay to give the States of Ohio and New Jersey to Jackson. They nearly elected Joseph Ritner Governor of Pennsylvania in 1832, and did elect him in 1835, through a split in the Democratic ranks. The excitement gradually died out, and absorbing questions of finance and political economy soon dissolved the Anti-Masonic party. See the article UNITED STATES (*History*).

Anti-Mission Baptists, called by themselves **Old-School Baptists**: a denomination of hyper-Calvinistic Baptists of the U. S. who have no Sunday-schools, missions, colleges, or theological schools, holding that these things make the salvation of men to depend on human effort and not upon divine grace.

Antimo'rial Wine: a solution of tartar emetic in sherry or other wine.

Antimony [from Mediev. Lat. *antimonia*; etymol. obscure]: a brittle metal, of a silver-white color and of a peculiar taste; atomic weight 120; chemical symbol Sb (from Lat. *stibium*). It occurs in nature native, combined with other metals, as nickel, silver, etc., with oxygen and with sulphur. The sulphide, "stibnite" or "gray antimony," is the source of all the antimony of commerce. The most abundant supplies of this ore are obtained from Borneo. It also occurs in considerable quantities in Hungary, Cornwall, New Brunswick, California, and Nevada. The sulphide, being very fusible, is often separated from the accompanying gangue-rock by heat, and cast in blocks or loaves. The metal, or "regulus of antimony" as it is called in commerce, is separated from the sulphide in various ways, such as heating with metallic iron, sodic carbonate, and charcoal, or cream of tartar and niter. The extraction of antimony from its ores is mainly carried on at Linz, in Germany, where the sulphide of antimony is found extensively, and in Great Britain, which receives its supply of ore from Singapore and Borneo, commonly as ballast. The process consists in heating the crude ore, covered with charcoal, on the bed of a furnace, when the sulphide of antimony fuses, leaving unmelted the earthy impurities; and thereafter the liquid is drawn off into iron molds, where it solidifies into cakes or loaves. The latter are reduced to coarse powder, placed on the bed of a reverberatory furnace, and heated with access of ordinary air containing oxygen, when the sulphur passes away as gaseous sulphurous acid, SO₂, leaving behind the antimony as the trioxide, Sb₂O₃. The roasted mass is now mixed with one-sixth of its weight of powdered charcoal, the whole moistened with a solution of sodium carbonate, and raised to bright redness in crucibles, when the metal antimony trickles to the bottom, and the impurities are left above in the spent flux or scoria, which is known in the arts by the name of *crocus* of antimony. The antimony thus prepared is more or less contaminated by sulphur, copper, arsenic, iron, lead, etc. It may be freed from all these metals except lead by reducing it to a coarse powder and fusing with one-sixteenth of gray sulphide and one-eighth of dry sodic carbonate. The resulting metal must then be pulverized and fused with one-tenth of dry sodium carbonate, and the process repeated.

Owing to the extensive use of antimony preparations in medicine, the removal of arsenic is of special importance. This can be effected by mixing 4 parts of powdered antimony with 5 parts niter and 2 parts dry sodium carbonate, projecting the mixture into a red-hot crucible. The semi-fused mass is boiled with water, and the insoluble potassium antimoniate is reduced to metal by fusion with cream of tartar. Several successive fusions of pulverized antimony with one-eighth of niter are said to completely remove the arsenic.

Antimony is a brilliant metal of a bluish-white color and highly crystalline or laminated structure. Its density is 6.7 to 6.86. It is extremely brittle, and may be easily pulverized in a mortar. Heated in the open air, it burns with a bluish-white flame, and forms copious fumes of antimonous oxide (Sb_2O_3), or "flowers of antimony." A peculiar *amorphous* antimony was prepared by G. Gore (*Proc. Roy. Soc.*, ix. 70 and 304) by electrolyzing certain solutions of the metal. A mass having the appearance of polished steel, with a bright, metallic, amorphous fracture, was obtained of a density of 5.78, which, on being broken or heated, suddenly passed into the crystalline form, with the evolution of sufficient heat to make it take fire. Antimony is oxidized by nitric acid, with the formation of antimonous oxide (Sb_2O_3), antimonie oxide (Sb_2O_5), or antimonoso-antimonie oxide ($\text{Sb}_2\text{O}_3 \cdot \text{Sb}_2\text{O}_5$). Antimony forms with acids or chlorous radicals two classes of compounds: (1) antimonous or tri-compounds, as the trichloride SbCl_3 ; trioxide or antimonous oxide, Sb_2O_3 ; trisulphide, Sb_2S_3 . (2) Antimonie or pentacompounds, as pentachloride, SbCl_5 ; pentoxide or antimonie oxide, Sb_2O_5 ; pentasulphide, Sb_2S_5 .

Antimonous chloride, or *trichloride* (SbCl_3), called *butter of antimony*, is obtained by dissolving antimonie sulphide in hydrochloric acid. In its concentrated form it appears as a yellow oily liquid of the consistence of melted butter. Poured into water, it produces a buttery white precipitate of oxychloride (*powder of algaroth*), $\text{SbCl}_3 \cdot \text{Sb}_2\text{O}_3$, or $\text{SbO} \cdot \text{Cl}$. Mixed with olive oil, butter of antimony is used for bronzing gun-barrels. Powdered antimony poured into a jar of chlorine takes fire, forming SbCl_3 or SbCl_5 .

Antimonie chloride, or *pentachloride* (SbCl_5), is a colorless volatile liquid, prepared by heating antimony in an excess of chlorine. By the action of water it is changed to antimonie acid and hydrochloric acid.

Antimonous hydride, or *antimonetted hydrogen* (SbH_3), a colorless gas produced by the action of zinc and sulphuric acid on a solution of antimony. It burns with a greenish flame, evolving fumes of Sb_2O_3 . Passed through a red-hot tube, it is decomposed, with the formation of a black deposit of Sb. A similar deposit is formed on cold porcelain held in the flame. When the gas is passed into a solution of argentic nitrate, a black precipitate of antimonide of silver (SbAg_3) is formed. This gas (SbH_3) is the analogue of ammonia, NH_3 , phosphine, PH_3 , and arsine, AsH_3 ; as is also the silver compound, SbAg_3 . A class of organic bases, represented by triethyl stibine, $\text{Sb}(\text{C}_2\text{H}_5)_3$, belongs to the same group.

Antimonous, or *trioxide* (Sb_2O_3), found native in beautiful crystals, as *valentinite* and *senarmontite*. Boiled with cream of tartar ($\text{K.H.C}_4\text{H}_4\text{O}_6$), antimonous oxide dissolves, with the formation of *potassio-antimonyl tartrate*, or *tartar emetic* ($\text{K.SbO.C}_4\text{H}_4\text{O}_6$). An impure oxide is manufactured for the preparation of this salt, by roasting the powdered sulphide, and fusing the product at the end of the process. It is known as *glass of antimony*.

Antimonie, or *pentoxide* (Sb_2O_5), is formed by heating powdered antimony with excess of strong nitric acid, by decomposing SbCl_5 with water, or by fusing powdered antimony with niter. Potassium antimoniate is the only reagent for the precipitation of soda. There are two modifications of this acid, known as antimonie acid, HSbO_3 , and metantimonie acid, $\text{H}_4\text{Sb}_2\text{O}_7$.

Tetroxide, or *antimonoso-antimonie acid* (Sb_2O_4 or $\text{Sb}_2\text{O}_3 \cdot \text{Sb}_2\text{O}_5$), occurs native as *cervantite*. It is the ultimate product of the action of heat and air on the metal.

Trisulphide, or *antimonous sulphide* (Sb_2S_3), the ore *stibnite*, or *gray antimony*, prepared artificially by fusing antimony with sulphur, or as an orange precipitate by passing sulphuretted hydrogen through a solution of tartar emetic. This sulphide is a sulphur-acid, which unites with basic sulphides, forming salts in every way analogous to the oxygen salts. Such are $3\text{K}_2\text{S} \cdot \text{Sb}_2\text{S}_3$; zinkenite, $\text{PbS} \cdot \text{Sb}_2\text{S}_3$; miargyrite, $\text{AgS} \cdot \text{Sb}_2\text{S}_3$; pyrargyrite, $3\text{AgS} \cdot \text{Sb}_2\text{S}_3$.

Pentasulphide, or *antimonie sulphide* (Sb_2S_5), is also a sulphur-acid, forming sulpho-antimonates, analogous to the ortho-phosphates. The sodic sulpho-antimonate is $\text{Na}_3 \cdot \text{SbS}_4$. Precipitated from a mixture of antimonie pentachloride and tartaric acid, it appears as a yellowish-red powder, the golden sulphuret.

Kermes is an oxysulphide ($\text{Sb}_2\text{O}_3 \cdot 2\text{Sb}_2\text{S}_3$) which occurs native as the beautiful cherry-red kermesite.

ALLOYS OF ANTIMONY.—*Type-metal* is composed of antimony 1, lead 4 parts, and when used for stereotype plates receives an addition of one-eightieth to one-fiftieth of tin.

This alloy is not only hard, but, owing to the fact that it expands at the moment of solidification, it takes a very sharp impression of the mold. *Britannia* is composed of antimony 1, tin 9 parts. *Peuter* is another alloy of antimony and tin. Antimony also enters into the composition of some of the *anti-friction* alloys. Tartar emetic is the most important preparation of antimony used in medicine; in large doses it is very poisonous. The old-fashioned "family pill" was a small bullet of metallic antimony, which was swallowed for certain difficulties, and carefully preserved for future occasions.

Revised by IRA REMSEN.

Antino'mians [from Gr. *ἀντί*, against + *νόμος*, law]: those who maintain that the Law is of no use or obligation under the Gospel dispensation. They took their rise from JOHN AGRICOLA (*q. v.*), who was originally a disciple and friend of Luther, and who contended that his views were the legitimate deductions from the principles taught by Luther himself. He taught, among other things, that good works do not promote our salvation, nor evil ones hinder it. Luther attacked the Antinomian heresy with great zeal, and at length, in 1540, Agricola recanted his more obnoxious tenets. The controversy, however, having been reopened by Poach, of Erfurt, in 1556, led to the full statement and decision concerning the entire subject in the *Formula of Concord*, arts. v. and vi. Similar views were afterward charged against Dr. Tobias Crisp (1600–42) and others in England.

HENRY E. JACOBS.

Antinoöpolis: See BESA.

Antinous, än-tin'ō-ūs: a beautiful youth, a native of Bithynia, became a favorite and attendant of the Emperor Hadrian. Having accompanied that emperor to Egypt, he was drowned in the Nile, near Besa, in 122 A. D. As a monument to him, Hadrian built the city of Antinoöpolis, in Upper Egypt, and established an annual festival. Statues almost innumerable were also erected to perpetuate his memory and his form, by artists whose emulation gave a new impulse to the fine arts. Some of these statues are still extant. He is the subject of the romances of George Taylor (Hausrath), *Antinous* (1880), and Georg Ebers, *The Emperor* (1881).

An'tioch [from Lat. *Antiochi'a*; Gr. *Ἀντιόχεια*; Turk. *Antakia*]: an ancient city and the former capital of Syria, situated on a fertile and beautiful plain, on the left bank of the river Orontes, 57 miles W. of Aleppo; lat. $36^\circ 11' \text{ N.}$, lon. $36^\circ 9' 30'' \text{ E.}$ (see map of Turkey, ref. 6–G). It was founded in 301 B. C., by Seleucus Nicator, and named in honor of his father, Antiochus. It was the favorite residence of the Seleucid Kings of Syria, was called "Antioch the Beautiful," and was widely celebrated for the splendor of its luxury and the magnificence of its palaces and temples. The population in the time of its greatest prosperity is supposed to have been 400,000 or more. The Romans gave it autonomy; it was the capital of the Roman governor of Syria, the center of West Asiatic trade, and until the imperial residence was removed to Constantinople it ranked after Rome and Alexandria among the cities of the empire. Antioch has been several times nearly ruined by earthquakes. The most destructive of them occurred in 526 A. D., and is said to have caused the death of 250,000 people, there being at that time an assembly of Christians there. On Apr. 3 and 10, 1872, the city was again visited by severe earthquakes, which destroyed many houses and caused the death of a considerable portion of the population. The disciples of Christ were first called Christians in Antioch (Acts xi. 26), which occupies a prominent position in the history of the primitive Church as the scene of the labors of the apostle Paul, and the starting-point of his missionary journeys. In the fifth century the bishops of Antioch received the title of patriarchs, and ranked equal to the patriarchs of Rome, Constantinople, and Alexandria. In the Greek Church the patriarchs still retain this rank. In the Roman Catholic Church four prelates (of the Greek, Syrian, Maronite, and Latin rites) have the title of patriarch of Antioch, but none of them at present resides in Antioch. The Jacobite patriarch of Antioch is the head of that Church. Many councils of the Church were also held here. The crusaders took Antioch from the Saracens in 1098, after which it was the capital of a Christian principality until 1269. Among the remains of its former grandeur are the ruined walls and aqueduct. On the south bank of the Orontes, about 5 miles S. W. of Antioch, is the site of the famous ancient grove of Daphne and temple of Apollo. The modern town, Antakia, is

meanly built, but has some manufactures of pottery and cotton stuffs. The culture of silk is the chief branch of industry. It has become a center of Protestant missionary labors. Pop. estimated at 17,500.

ANTIOCH was also the name of an ancient city of Asia Minor, in Pisidia, visited by the apostle Paul (see Acts xiii. 14. and xiv. 21), who planted a church there. Of this city extensive ruins exist. Besides the above, there were at least six other Oriental towns of this name.

Revised by S. M. JACKSON.

Antioch, Bay of: is a part of the Mediterranean, at the mouth of the Orontes river, between lat. 35° 50' and 36° 20' N., and in lon. about 36° E., and lies between high mountains on the N. and S., by which it is mostly well sheltered. The waters are deep, and free from rocks. Some ruins are situated on the north side, which are described as those of Seleucia Peiria, the ancient port of Antioch.

Antioch College (Yellow Springs, Greene co., O.): founded in 1852, and opened in the following year. This college is designed to be free from sectarian influences, and to develop good character as well as mental excellence in its pupils. The sexes are educated together with the best results. The college was established with a view of diffusing education at the lowest possible cost. It has a music school and a preparatory department. Its first president was Hon. Horace Mann, LL. D. (1852-59). Rev. D. A. Long, D. D., LL. D., is the present incumbent. Its principal patrons are members of the Christian Church. The number of instructors is twelve, and of students 100. There are 5,000 volumes in the library.

Antiochian School: a school which held doctrinal views in opposition to the Alexandrian school; flourished in Antioch during the fourth and fifth centuries. It rejected allegorizing, maintained the freedom of the will, the conjunction rather than the union of the two natures in Christ, and in general practical rather than speculative views. The great names of the school are Cyril of Jerusalem, Theodore of Mopsuestia, and Chrysostom. See Her-genröther, *Die antiochenische Schule* (Würzburg, 1866).

S. M. JACKSON.

Antiochus I., surnamed SOTER (i. e. saviour): a King of Syria, of the dynasty Seleucidæ; a son of Seleucus I. Nicator; b. about 324 B. C. He commanded the cavalry which fought against Antigonus at Ipsus, in 301. Having succeeded his father in 280 B. C., he gained a victory over the Gauls, who had invaded his dominions, from which victory he derived the surname *Soter*. He was killed in battle by the Gauls in 261 B. C.

Antiochus II., THEOS: King of Syria; son of the preceding; began to reign in 261 B. C. The people of Miletus, who had received a favor from him, gave him the title of *Theos*, "God." In his reign the Parthians revolted with success, and Arsaces became King of Parthia, which was previously subject to the King of Syria. A war which he waged against Ptolemy of Egypt was ended in 252 B. C. by a treaty, in accordance with which he married Berenice, a daughter of Ptolemy, and repudiated his first wife, Laodice. After the death of Ptolemy he reinstated Laodice, who poisoned him in 246 B. C.

Antiochus III., surnamed THE GREAT: a grandson of the preceding, and a son of Seleucus Callinicus; b. about 238 B. C. He succeeded his brother, Seleucus Ceraunus in 223 B. C. His capital was Antioch, and his kingdom comprised Syria Proper, Babylonia, Media, and a part of Asia Minor. For the possession of Palestine he waged war against Ptolemy of Egypt, by whom he was defeated at Raphia, near Gaza, in 217 B. C. While he was suppressing a revolt of Aehæns in Asia Minor in 214, the Parthians occupied Media, but, after a successful campaign against Arsaces of Parthia, Antiochus reconquered Media in 212. He afterward conducted a victorious expedition across the mountains of Hindu Koosh into India, and, having formed an alliance with several Indian princes, returned to Antioch, from which he had been absent seven years. He took Palestine from the King of Egypt in 198 B. C., and invaded Thrace in 196. By this movement he provoked the hostility of the Roman senate. He led an army into Greece, was defeated at Thermopylæ in 191 by Acilius Glabrio, and retreated into Asia Minor. The Roman army, commanded by L. Cornelius Scipio, passed over into Asia in 190 B. C., and gained a decisive victory over Antiochus at Magnesia. The war was then ended by a treaty dictated by the Romans, who re-

quired him to cede all the provinces W. of Mt. Taurus, and to pay about 15,000 talents. In order to raise this sum he plundered a temple in Elymais, for which act the populace killed him in 187 B. C. He left the throne to his son, Seleucus Philopator. This Antiochus, and the second and fourth of the name, are supposed to be referred to in Dan. xi. See Polybius, *History*. Revised by S. M. JACKSON.

Antiochus IV., surnamed EPIPHANES (the illustrious): son of the preceding. He passed about twelve years in captivity in Rome, whither he was sent as a hostage in 188 B. C. He became king on the death of his brother, Seleucus Philopator, in 175 B. C. He invaded Egypt in 170, and captured the king, Ptolemy Philometor, but was constrained by the Roman senate to retire from that country in 168 B. C. About this date he endeavored to supplant Jewish institutions and usages by Hellenic arts and culture; he plundered the temple of Jerusalem and persecuted the Jews, who rose in arms and were led by Judas Maccabæus, who defeated the Syrian armies in several battles. (See 1 Maccabees ii.) D. in 164 B. C.

Antiochus VII., surnamed SIDETES: a son of Demetrius Soter; b. about 164 B. C.; became King of Syria in 137. He defeated the Parthians in several battles, but was killed in battle by them in 129 B. C.

Antiochus VIII.: second son of Cleopatra (the wife, first of Alexander Balas, then of Demetrius II., and then of Antiochus VII.); reigned over Syria with his mother from 126 to 122 B. C., and then alone till 114 B. C., when his authority was disputed by his half-brother, Antiochus Cyzicenus (Antiochus IX.). He was assassinated by an officer of his court, 96 B. C.

Antiochus IX., surnamed CYZICENUS: son of Cleopatra by Antiochus VII., survived Antiochus VIII., and committed suicide 95 B. C.

Antiochus X., surnamed EUSEBES: son of the preceding, succeeded his father in 95 B. C., but was soon after expelled, and died in obscurity.

Antiochus XIII., surnamed ASIATICUS: the twentieth and last king of the dynasty of the Seleucidæ. He began to reign about 69 B. C., and was deposed by Pompey in 65 B. C., when Syria became a Roman province. He was executed at Rome, 29 B. C.

Antiocho: an island in the Mediterranean, near the west coast of Sardinia. The soil is fertile. Area, 42 sq. miles. Pop. about 2,200.

Antioquia, ăn-tē-ō-kē-a: a department of Colombia; centrally located, on the west side of the Magdalena river, with Bolivar on the N., Santander on the E., Tolima on the S., and Cauca on the S. W. and W. It abounds in forests and in the ores of the precious metals. Area, 22,800 sq. miles. Pop. (1884) 464,887. The chief towns are: Antioquia (pop. 8,640, elevation 1,887 feet), on the Cauca river; Medellin, the capital (pop. 40,000, elevation 6,140 feet). A railroad a few miles in length extends westward from Puerto Berrio on the Magdalena. More than half of this department is under cultivation. M. W. H.

Antiparos, Oliaros, or Olearos: a Grecian island in the Ægean Sea, about a mile W. of Paros; is one of the Cyclades (see map of Greece, ref. 17-M). It is 8 miles long and 2 or 3 miles wide, and consists of a mass of marble, covered with soil which produces some grain, wine, etc. Here is a celebrated stalactitic cavern called the Grotto of Antiparos, which is about 300 feet long and 80 feet high. The roof and sides are adorned with white incrustations of great splendor and beauty. This grotto was discovered by M. de Nointel in 1673. It was probably not known to the ancients. Pop. about 800.

Antipas: See HEROD ANTIPAS.

Antipater (in Gr. Ἀντίπατρος): a Macedonian general; a pupil of Aristotle; held a responsible position under Philip of Macedon. He was appointed regent of that kingdom by Alexander the Great in 334 B. C., when he departed to invade Persia. He defeated Agis, King of Sparta, in a battle near Megalopolis in 330. After the death of Alexander, his generals or successors agreed that Antipater should govern Macedonia and Greece. The Athenians, in alliance with other Greek states, made an effort to regain their independence in 322, and defeated Antipater near Lamia, but, having been reinforced by Craterus, he gained a decisive victory in the same year. The Lamian war was then ended by a treaty dictated by Antipater, who required the Athenians to deliver Demosthenes to him. He joined Antigonus

in a league against Perdiccas, and on the death of the latter, in 321, succeeded him as regent of the empire. He died in 319 or 318 B. C., and left a son, Cassander. See Thirlwall, *History of Greece*; Diodorus Siculus, *History*.

Antipater: a son of Herod the Great and Doris; notorious for his wickedness. Having procured the death of his half-brothers Aristobulus and Alexander, and conspired against his father, he was put to death in 1 B. C.

Antipater of Tarsus: a Stoic philosopher who lived about 140 B. C.; wrote several works on philosophy and morality. He opposed the skepticism of Carneades. Cicero represents him as a man of remarkable subtlety.

Antipater the Idumean: son of Antipas, and the father of Herod the Great; became governor of Idumea. Having assisted Julius Cæsar in his war against the Egyptians, he was rewarded with the office of procurator or governor of Judea, about 46 B. C. D. in 43 B. C.

Antiph'anes (in Gr. Ἀντιφάνης): Greek poet of the Middle Comedy, who flourished about 368 B. C., was, like Alexis (*q. v.*), a prolific playwright. Indeed, one account gives him no less than 365 comedies. Of these we have specimens of some 130. The fragments have mainly to do with the giving of dinners and the uttering of "sentiments." Meineke, iii. 590 foll.; Kock, ii. 451 foll.

Antiph'ilus (Ἀντίφιλος): Greek painter; b. in Egypt; supposed to have flourished about 330 B. C. He was distinguished for facility of execution. Among his works were *Cadmus and Europa*, and a portrait of Alexander the Great. He was perhaps the most successful and celebrated painter of the Alexandrian epoch, except Apelles.

Antiphlogis'tic [from Gr. ἀντί, against + φλογιστός, burnt up; φλογίζειν, set on fire, φλέγειν, burn]: adapted to subdue inflammation or excitement of the system in inflammatory diseases; applied to such remedies are purgatives and blood-letting.

Ant'iphon (Ἀντιφῶν): one of the ten Attic orators; b. at Rhamnus in Attica about 480 B. C.; gained great repute as a teacher of rhetoric, and as a composer of orations for politicians and for those who were accused of capital offenses. The praise bestowed on him by Thucydides is accountable for the notion that the historian was the pupil of the orator. He took an active part in the oligarchical reaction of the Four Hundred (see GREEK HISTORY), was convicted of treason, and executed in 411. Of the fifteen speeches extant, all murder cases, twelve are mere skeletons for fictitious trials, three have more life, and one of these three (*On the Murder of Herodes*) a certain historical interest. Antiphon is important as an exemplar of early rhetorical art, the stiffness and formality of which do not disguise acuteness and force. See Blass, *Attische Beredsamkeit*, i. 91 foll.; Jebb, *Attic Orators*, i. 1 foll. Ed. with elaborate commentary by Mactzner, 1838. Text ed. by Blass, 2d (1881).

B. L. GILDERSLEEVE.

Antiphon [from Gr. ἀντίφωνος, sounding in response; ἀντί, against + φωνή, voice]: a piece of music performed in cathedral service by choristers, who sing alternately; a short verse which was sung in the ancient Church before the psalms and other portions of the service.

Antiph'ony: a species of musical accompaniment in the octave by instruments or voices.

ANTIPHONY is also a sacred song sung by two parties, each responding to the other; the answer of one choir to the other when an anthem is sung alternately. This practice prevailed among the ancient Hebrews and in the early Christian Church. Ignatius, Bishop of Antioch, is said to have introduced it into the Eastern Church in the second century.

Antip'odes [from Gr. plur. of ἀντίπους, having the feet opposite; ἀντί, against + πούς, foot]: in geography, people who live on opposite sides of the globe, and whose feet point against each other. The antipodes of any place are those who live at the other end of a straight line drawn from that place through the center of the earth to its opposite surface. Thus the antipodes of London, which is in lat. 51° 30' N. and lon. 0°, must be in lat. 51° 30' S. and lon. 180° E. or W. The noon of any point corresponds with the midnight of its antipodes, and the summer of one coincides with the winter of the other.

Antipodes: a small island in the South Pacific Ocean, S. E. of New Zealand; lat. 49° 32' S., lon. 178° 42' E. It is so called because it is the nearest land to the antipodes of London. See map of World, ref. 8-D.

An'tipope: one who assumes or usurps the office of pope, but is not regularly elected or generally recognized as such. The Emperors of Germany in several instances, having quarreled with the pope, appointed another person to the office. The Emperor Henry IV. in 1080 appointed the antipope Clement III. in opposition to Pope Gregory VII. In some cases two rival popes have been elected by different parties of cardinals. The great Western schism began in 1378, when the Italian party chose Urban VI., and the French cardinals voted for Clement VII., who held his court at Avignon, and was recognized by France and Spain. This schism was continued after their death by another double election, but in 1415 the Council of Constance deposed both of the popes, and elected Martin V. The last antipope was Felix V. (originally Amadeus VIII. of Savoy), who was elected in 1439, and abdicated in 1449.

Antipy'rin [from Gr. ἀντί, against + πυρ(ετός), fever]: chemically, dimethoxyquinizine; a compound prepared by a patented process, and much used in medicine, in the dose of ten to twenty grains, for the purpose of reducing temperature in fever and for relief of pain. The fall of temperature in fever is due to lessened heat production, and not to the excessive sweating which accompanies it. Pains dependent upon inflammations are not relieved by antipyrin, but nerve-pains, such as many headaches and neuralgias, are greatly affected by it. Antipyrin is also a useful remedy in epilepsy, especially in combination with bromides. The symptoms produced by an overdose, or the too long-continued use of the remedy, are languor, malaise, a peculiar livid pallor of the face, failure of the pulse and of the general strength. An eruption upon the surface resembling measles is not uncommon. Sometimes the eruption is accompanied by much œdematous swelling, and it may resemble urticaria or be replaced by a furious inflammation of the skin. The full effect of antipyrin is usually reached in from one to two hours, and continues from three to ten hours.

Antipyrin is not, unless in very large doses, depressing to the heart, and the collapse which has occasionally followed its use in fever has probably been due to some indirect influence rather than to the direct action of the drug. The free habitual use of antipyrin is certainly deleterious to the general health, and the livid color which the drug produces (when in large dose) is due to its altering the hæmoglobin of the red blood corpuscles into methæmoglobin.

H. C. WOOD.

An'tiquaries, Society of: the title of several associations of learned men, formed to promote the study of antiquities. The London Society of Antiquaries was founded in 1572, and reorganized in 1707, but received its charter in 1751. The Scottish Society of Antiquaries was founded in 1780. The American Antiquarian Society was organized in Massachusetts in 1812.

Antiquary [from Lat. *antiquarius*, pertaining to antiquity; *antiquus*, ancient]: originally a person who copied old books in convents before the invention of printing. In modern language an antiquary is one who studies and collects ancient monuments and remains, such as medals, coins, statues, manuscripts, and inscriptions; or who makes researches into the history, manners, and customs of former generations. The antiquary renders an important service to society by collecting materials for history and rescuing many documents from the ravages of time.

Antiq'uities [Lat. *antiquitates*, deriv. of *antiquus*, ancient]: an important department of learning, comprises all memorable facts, ideas, and things which relate to or illustrate the origin, early institutions, and development of nations. Thus the study of antiquities, in the largest application of the term, includes a knowledge of the religion, laws, language, arts, traditions, manners, and customs of ancient peoples, as well as a cognizance of ancient monuments of architecture, sculpture, and other arts. In a more restricted and perhaps more popular sense the study of antiquities is limited to the discovery, collection, verification, description, and explanation of the relics of antiquity, such as medals, statues, inscriptions, manuscripts, ruined buildings, bas-reliefs, and hieroglyphics. About the time of the revival of learning after the Dark Ages the study of classical antiquities became a distinct branch of research, which was pursued by many eminent scholars. Grævius published a valuable work on Greek antiquities, entitled *Thesaurus Antiquitatum Græcarum* (12 vols. fol., 1697 et seq.); and Roman antiquities were amply illustrated by Gronovius in his

Thesaurus Antiquitatum Romanarum (13 vols. fol., 1697). Champollion, Young, Bunsen, Lepsius, and Brugsch are the highest authorities in Egyptian antiquities. Among the best antiquarian works may be mentioned Montfaucon, *Antiquité Expliquée* (15 vols., 1719-24); Heeren, *History of Ancient Commerce*; Dr. W. Smith's *Dictionary of Greek and Roman Antiquities*; Montfaucon, *Monuments de la Monarchie Française* (5 vols., 1725). For the difference between archaeology and antiquities, see ARCHÆOLOGY.

Anti-rent'ers: those inhabitants of several counties in Eastern New York who refused to pay the rents and feudal services required of them by the so-called lord-patrons, the owners of the land. This disturbance, which at one time nearly amounted to insurrection, was at length ended by the triumph of the Anti-rent party in the constitutional convention of 1846, in which a clause was inserted abolishing thenceforth all feudal tenures and incidents.

Antiscorbu'tics [from Gr. *ἀντί*, against + Late Lat. *scorbutus*, scurvy, from Low Ger. *schorbock* or *scorbut*]: remedies of *scorbutus*, or scurvy (*q. v.*). Onions, lime-juice, potatoes, lemons, horseradish, scurvy-grass, etc., are the best antiscorbutics. Diet, and not medicine, is needed to effect the cure.

Anti-Semitic Movement: a movement against Jews as Jews, based on popular prejudice and helped by the undeniable success of the Jews in those branches of trade and manufacture in which they compete with Christians. The hatred of Jews has been a glaring inconsistency in the Christian world for many centuries, but of late all over Europe there has been a more or less organized effort to put the Jews back into the political bondage from which they have lately been delivered. In this disgraceful movement Russia has played the chief part among nations, and among individuals the ex-court-preacher Stöcker in Germany. See JEWS, PERSECUTION OF. S. M. J.

Antisept'ic [from Gr. *ἀντί*, against + *σηπτικός*, putrefying; from *σῆπειν*, to rot]: opposed to or preventing putrefaction. Antiseptics are substances which prevent or check the decay and putrefaction of organic matters. As air, moisture, and heat are necessary conditions of putrefaction, the exclusion of one of these from the animal or vegetable matter is an antiseptic process. The common practice of preserving fruit in air-tight cans of tin or glass is an illustration of this principle. Generally speaking, so long as the air is excluded no decomposition or decay can take place. Cold is a powerful antiseptic; intense cold will prevent change even in those substances which putrefy most readily. To render timber more durable and less liable to decay, corrosive sublimate, chloride of zinc, and heavy oil of tar are sometimes used. For this purpose the wood is placed in a steam-box, its pores are filled with steam, and a vacuum is formed in the pores by the condensation of the steam. The pores are then filled with the antiseptic substance.

The more important chemical antiseptics are—alcohol, wood-spirit (or pyroxylic acid), creosote, carbolic acid, heavy oil of tar, sugar, glycerin, many aniline derivatives, sulphurous acid, common salt, charcoal, niter, alum, chloride of zinc, sulphate of copper (blue vitriol), cresylic acid, sulphate of iron, aluminum chloride and acetate, other aluminum compounds, corrosive sublimate, and arsenic. Sulphurous acid acts by deoxidizing the substance; sugar acts by combining with the water of the substance to be preserved; creosote, tannic acid, alun, chloride of zinc, sulphate of copper, corrosive sublimate, and arsenic form compounds with the organic matter which are not liable to become putrescent; alcohol, salt, and niter act both by combining with the water of the putrescible substance, and by combining with the substance itself. See DISINFECTION, FERMENTATION, PRESERVATION OF FOOD, and PRESERVATION OF TIMBER. Revised by R. PARK.

Antispasmod'ics: medicines which cure or alleviate spasm. The name is frequently limited to a small class of drugs which have usually a strong and often an unpleasant odor, and which in some cases act as diffusive stimulants. Such are valerian, assafœtida, myrrh, musk, camphor, ether, etc. Others are sedatives, as hydrocyanic acid. The term might well include the other nerve-sedatives or depressors of reflex action, like bromide of potassium, belladonna, Calabar bean, curari, etc. The best treatment for spasmodic symptoms aims, however, at the restoration of health by proper food, good air, and correct habits of life, and by such special treatment as may be required to remove the cause.

Antis'thenes [in Gr. *Ἀντισθένης*]: an eminent Greek Cynic philosopher, called the founder of the Cynic sect or school; b. at Athens, and flourished about 400 B. C. He was a young man when he served at the battle of Tanagra, 426 B. C. He was a pupil and friend of Socrates, whose death he witnessed. After this event he opened a school at Athens in the gymnasium of Cynosarges, where the famous and witty Diogenes became one of his pupils. He was a man of temperate habits and simple mode of life, inculcating a contempt of riches and sensual pleasure. He maintained that virtue is all-sufficient for happiness and directed his attention chiefly to practical morality. His works on various subjects are lost, but several of his sententious and pithy sayings have been preserved. Socrates reproved the poverty of his dress and his neglect of the conventional by saying: "I can see thy pride through the holes in thy robe." Antisthenes was living in 371 B. C. See Zeller's *Socrates and the Socratic Schools*. Revised by W. T. HARRIS.

Antitox'in: a substance having the power to combat the poison of micro-organisms. It has been found that infection of the animal body with bacteria gives rise to the production of certain toxins which occasion most of the symptoms of infectious diseases, and which differ widely in their action with the different micro-organisms. Subsequently the organism produces other substances having antagonistic powers, and these have been called the antitoxins. Both the toxins and the antitoxins are found in the blood, and the preparations now used in medical practice are obtained from the blood of animals which have been gradually placed under the influence of increasing doses of toxins of the various bacteria. In this way an increasing quantity of antitoxin is produced in the blood of the animals, and is finally obtained by bleeding the animal and separating the serum from the solid constituents of the blood.

Antitoxins have been successfully employed only for diphtheria and tetanus, though experimentation with other micro-organisms has been performed. The results have been partially satisfactory. See SERUM THERAPEUTICS.

WILLIAM PEPPER.

Anti-Trinitarians: See UNITARIANISM.

An'tium (in It. *An'zo*): an ancient city of Latium, on the seacoast, 34 miles S. S. E. of Rome; was a favorite resort of opulent citizens of Rome, in whose villas famous works of art have been discovered. Among these was the Apollo Belvedere, and the Borghese Gladiator, mentioned under AGASIAS (*q. v.*). The Emperors Caligula and Nero were natives of Antium, the site of which is now occupied by a village called Porto d'Anzo (i. e. the port of Antium).

Antiv'ari: the only seaport of Montenegro, on the Adriatic; 14 miles N. W. of Scutari, acquired as a result of the Russo-Turkish war of 1877-78. The harbor is shallow, and admits only small vessels. It exports oil, etc., and has, with its suburbs, about 1,000 houses. Pop. about 5,000.

Ant-lion: the larva of several species of *Myrmeleon*, and other cognate genera, insects of the order *Neuroptera*,



Ant-lion.

found in sandy tracts in different parts of the world. The perfect insect is similar in appearance to the dragon-fly.

The larva is remarkable for the curious and insidious mode in which it catches the ants and other insects on which it feeds. It excavates a funnel-shaped cavity in the sandy soil, and lies in wait at the bottom until an insect comes so near to the edge of the pit that the loose sand gives way and the insect falls down the slope. Several species of antlion are found in the U. S.

Antofagas'ta: a province in the northern part of Chile; occupying the entire width of the state from Tarapaca on the N., from which it is separated by the Rio Loa (mouth in lat 21° 30' S.), to Atacama on the S., boundary the parallel of 26°. The area is 60,968 sq. miles, making it the largest province in the state, except the comparatively uninhabitable Magellan territory in the extreme S. Pop. (1891) 35,317. This province comprises the territory ceded by Bolivia as a result of the war of 1879-82. Bolivia has the right to free transport of goods over the state to her own custom-houses. Much of the province lies in the desert of Atacama, which is a rocky, not a sandy, waste. It is not generally suitable for agriculture, but it is one of the richest regions in the world in the ores of the precious metals. Antofagasta, the capital and principal port, has a population of 8,000 or 10,000. It is the littoral terminus of a railroad which reaches the rich mining districts to the N. E. (see map of South America, ref. 6-C). It has silver-smelting works, and ships much bullion, ore, and nitrate of soda. Toltal is the littoral terminus of a railroad extending to Cachinal, while the Antofagasta road sends a branch to the thriving port of Morro Mejillones. M. W. H.

Antommar'chi, FRANCESCO: Italian anatomist; b. in 1780; a native of Corsica; became in 1812 anatomical dissector to a hospital of Florence, attached to the University of Pisa. In 1819 he was sent for to attend Napoleon at St. Helena. The ex-emperor was so well pleased with him that he left him a legacy of 100,000 francs. He published *The Last Moments of Napoleon* (2 vols., 1823). In 1836 he settled in New Orleans as a homœopathist. He died at St. Antonio in Cuba, Apr. 3, 1838.

Antonel'li, GIACOMO: Italian cardinal and politician; b. at Sonnino, Apr. 2, 1806. He became grand treasurer of the two apostolic chambers in 1845, and was appointed minister of finance by Pius IX. soon after his election (1846). In 1847 he was made cardinal-deacon. He acquired much influence with the pope, and opposed the liberal movement of 1848. In 1849 he was appointed papal secretary of foreign affairs (i. e. prime minister), which place he occupied when Rome, in 1870, was incorporated with the kingdom of Italy. He strenuously opposed the cause of Italian unity. He left property to the amount of 100 million lire. D. in Rome, Nov. 6, 1876.

Antonel'lo, or **Antonelli**, ANTONIO (surnamed *Da Messina*, from the place of his birth): painter; b. at Messina in 1414. He is reputed to be the first Italian who painted in oil, having visited Bruges and obtained from J. van Eyck the secret of oil-painting. He returned to Italy about 1445, after which he worked at Milan, and removed to Venice about 1470. He gained distinction by the brilliance of his coloring. D. in Venice, 1493.

Anto'nia, MAJOR, or the ELDER: a Roman lady; daughter of Mark Antony the Triumvir; b. in 39 B. C. Her mother was Octavia, a sister of Augustus Cæsar. She was married to L. Domitius Ahenobarbus, and was the grandmother of Nero.—Her sister, ANTONIA MINOR (the younger), was born 36 B. C. She was the wife of Claudius Drusus Nero, and mother of the famous Germanicus and of the Emperor Claudius. She is said to have been virtuous and fair. D. in 37 or 38 A. D.

Anto'nides van der Goes: See GOES, ANTONIDES VAN DER.

Antoni'us, MARCUS AURELIUS (usually called *Marcus Aurelius*, and sometimes surnamed *The Philosopher*): a Roman emperor highly distinguished for his wisdom and virtue; b. in Rome, Apr. 26, 121 A. D. He was a son of Annius Verus and Domitia Calvilla, and his original name was Marcus Annius Verus. He became a disciple of the Stoic philosophy, with the principles of which his habitual conduct was consistent. Having been adopted as a son by the Emperor Antoninus Pius in 138 A. D., he assumed the name of M. Ælius Aurelius Verus Cæsar. He then admitted Lucius Commodus (or Lucius Verus) to a share of the imperial power, but the latter died in the year 169. Before this date the Roman army gained several victories over

the Parthians. Although the temper of Marcus Aurelius was pacific, he was involved in frequent wars by the aggressions of northern barbarians and the revolts of his subjects. He conducted in person an expedition against the Marcomanni, which was successful, in 168 A. D., and afterward drove them out of Pannonia. In 174 A. D. he gained over the Quadi a famous victory, which was reputed miraculous. According to Dion Cassius and other writers, the Romans, who were suffering with thirst, were refreshed by a shower of rain, while their enemies were demoralized by a violent storm of hail. In 176 the emperor visited Syria and Egypt, and displayed great clemency toward those who had been implicated in the rebellion of the previous year, headed by Avidius Cassius, one of his generals, who had obtained possession of Egypt and part of Syria, but who had been killed by his own officers. On his homeward journey he passed through Athens, where he founded a chair of philosophy for each of the four sects, Platonic, Stoic, Peripatetic, and Epicurean. His ardent love of learning continued unabated in advanced age, and he cherished constantly, amid the turmoil of war and the distractions of public life, his philosophic and philanthropic aspirations. No monarch was ever more warmly and generally beloved by his subjects. It is a strange anomaly in his character and conduct that he persecuted the Christians, but explicable on the ground that he considered them atheists and fomenters of political dissension. During a campaign against his inveterate enemies, the Marcomanni, he died at Sirmium or at Vindebona (Vienna), Mar. 17, 180 A. D., and was succeeded by his son Commodus. He was author of an excellent ethical work in Greek, called *Meditations*, a good English version of which, by George Long, appeared in 1862, under the title of *Thoughts of M. Aurelius Antoninus*. Besides, we have some Latin letters of his, edited by Naber (Leipzig, 1867), among the works of Fronto. See Farrar's *Seekers after God* (London and New York, 1869); Renan's *Marc Aurele* (Paris, 1881).

Revised by C. K. ADAMS.

Antoninus, Column of: a pillar in the Piazza Colonna in Rome. It is a combination of the Corinthian and Doric orders, and is adorned with bas-reliefs of the victories which Marcus Aurelius gained over the Marcomanni, in memory of which it was erected by the Roman Senate.

Antoninus, Itinerary of: valuable geographical work, the date and author of which are unknown. It contained the names of all places and stations on the roads of the Roman empire, with their distances in Roman miles.

Antoninus Pius (or, more fully, **Titus Aurelius Fulvius Boio'nus Ar'rius Antoninus**): a Roman emperor; b. at Lanuvium, Sept. 19, 86 A. D., was a son of Aurelius Fulvus. He was chosen consul in 120 A. D., and married Anna Galeria Faustina. Having, as proconsul in Asia, distinguished himself by his wisdom and equity, he was adopted by Hadrian in 138 A. D., and he ascended the throne on the death of Hadrian in July of that year. He adopted as his successor Marcus Aurelius. His reign was so peaceful and prosperous that it furnishes but scanty materials for history. Antoninus promoted literature, and treated the Christians with mildness. As a man he was temperate, humane, learned, and eloquent. The name of "Pater Patriæ" (father of his country) was given to him by the vote of the Roman Senate. He had two sons, whom he survived. He died in Rome, Mar. 7, 161 A. D., and was succeeded by Marcus Aurelius. His memory was greatly venerated by the Romans of his own and later ages. See Bossert und Müller, *Zur Geschichte des Kaisers Antoninus* (Leipzig, 1868); Lacour-Gayet, *Antonin le Pieux et son temps* (Paris, 1888).

Revised by S. M. JACKSON.

Antoninus, Wall of (in Lat. *Antoni'ni Vallum*): a rampart or intrenchment raised in Scotland by the Romans under Lollius Urbicus, in the reign of Antoninus Pius, in 139 A. D. It extended from the Clyde to the Frith of Forth, was 36 miles long and 20 feet high, and was built of earth and stone. Its remains are called "Græm's dyke."

Anto'nio, NICOLAS: Spanish critic and bibliographer; b. at Seville in 1617. He published *Bibliotheca Hispana Nova* (2 vols., 1672), and *Bibliotheca Hispana Vetus* (2 vols., 1696), which contain catalogues of all the Spanish books, with biographical notices, and are highly esteemed. He was Spanish agent at Rome 1659-81. D. Apr. 13, 1684.

Anto'ninus, CAIUS HYBRIDA: Roman consul; son of M. Antonius the Orator, and an uncle of Mark Antony the Triumvir. He was chosen consul as the colleague of Cicero

in 63 B. C. He was a profligate politician, and did not earnestly co-operate with Cicero in opposing the conspiracy of Catiline. D. in 44 B. C.

Antonius, MARCUS (called *The Orator*): an eminent Roman orator and lawyer; b. in 143 B. C.; was grandfather of the famous Mark Antony. He became prætor in 104, and consul in 99 B. C., and was attached to the aristocratic party. Having become an adherent of Sulla in the civil war, he was assassinated by the order of Marius in 87 B. C. He was perhaps the most eloquent Roman orator of his time. His eloquence is highly eulogized by Cicero in his treatise *De Oratore*, and in his *Brutus*. The orations of Antonius are not extant. See II. Meyer, *Oratorum Romanorum Fragmenta* (ed. ii., 1842, p. 280).

Antonius, MARCUS (surnamed **THE TRIUMVIR**, and commonly called in English **Mark Antony**): a celebrated Roman general and politician, b. in 83 B. C.; was a son of M. Antonius Creticus. His mother, Julia, was a daughter of L. Julius Cæsar, who was consul about 90 B. C. He obtained about 57 B. C. command of the cavalry of Gabinius, in Syria and Egypt. Having been elected quæstor in 53 or 52, he served in Gaul as legate of Cæsar, and displayed superior talents in several campaigns. Through the influence of Cæsar he was elected augur and tribune of the people in 50 B. C. As tribune he promoted the interest of Cæsar, and vetoed a decree of the Senate which ordered Cæsar to disband his army. Early in 49 B. C. he fled from Rome to Cæsar's camp. After the civil war began, and Cæsar passed into Spain, he appointed Antony commander-in-chief of his forces in Italy. The latter commanded the left wing at the battle of Pharsalia, 48 B. C. In the year 47 he became master of the horse to Cæsar, who was now invested with the office of dictator. He negotiated with Brutus and Cassius, and temporized with the Senate, whom he induced to ratify the acts of the late dictator. His eloquent funeral oration over the body of Cæsar excited such popular indignation against the conspirators that they were compelled to retreat from Rome. In 43 B. C. Antony was defeated in battle by the consuls Hirtius and Pansa at Mutina (now Módena). About this time he was denounced by Cicero in a series of famous orations, called "Philippics." Before the end of the year 43, Antony, Octavius, and Lepidus united to form a league (triumvirate) against the Senate and the republicans, many of whom were put to death by the myrmidons of the triumvirs. At the instigation of Antony, Cicero was proscribed and killed. It was the military skill of Antony which defeated Brutus and Cassius at the decisive battle of Philippi (42 B. C.), which rendered the triumvirs masters of the Roman world. This victory was followed by another bloody proscription. Antony, who received for his share of the empire the Asiatic provinces and Egypt, now gave himself up to pleasure and luxury. He was so captivated by Cleopatra, Queen of Egypt, that he neglected public affairs, while Octavius was marching with stealthy steps toward supreme and undivided power. Antony and Octavius were involved in a quarrel in the year 41, but they were formally reconciled in 40 B. C., and Antony then married Octavia, the sister of his rival or colleague. He soon divorced Octavia and returned to his dalliance with Cleopatra. The conflict which had been postponed now became inevitable, and Antony was defeated at the naval battle of Actium, in Sept., 31 B. C. He then retreated to Alexandria in Egypt, and was deserted by his fleet. Reduced to a desperate extremity, he killed himself in 30 B. C. He left two sons, Iulus and Antyllus. See Plutarch, *Life of Antony*; Drumann, *Geschichte Roms*; Appian, *Bellum Civile*.
Revised by C. K. ADAMS.

An'tony, or Anthony, SAINT (surnamed *Abbas*): an eminent anchorite, called the founder of monachism; b. at Coma, in Upper Egypt, in 250 A. D. He reduced himself to voluntary poverty, and retired to a desert, where he passed many years in ascetic devotion and solitude. About 305 he founded a monastery near Fayoum (or Phaiûm). He was an opponent of Arianism, and was venerated as a saint and oracle by his contemporaries. During the persecution of the Christians in 311 he went to Alexandria in the hope of obtaining the crown of martyrdom, but he was disappointed, and returned to the desert. He had an interview many years later with Athanasius, to whom is attributed the well-known account of his life, but there is grave doubt whether he really did write it. Some of the letters of St. Antony are extant. D. near the Red Sea, Jan. 17, 356 A. D.

Antony, or Anthony (SAINT), of Padua: b. at Lisbon, Aug. 15, 1195. He became a Franciscan monk, and preached

at Toulouse, Bologna, and Padua, where he died June 13, 1231. According to a legend, he once preached to the fish in the sea an eloquent sermon, because men would not listen to him, which attracted the devoted attention of his finny auditors. This sermon is extant. An abstract of it may be seen in Addison's *Remarks on Italy*. He was canonized in 1232. He is the patron saint of the animals.

Antony of Bourbon (in Fr. *Antoine de Bourbon*): Duke of Vendôme and King of Navarre; b. in Picardy, Apr. 22, 1518. He was a brother of the Prince of Condé. He married, in 1548, Jeanne d'Albret, the only child of the King of Navarre. In 1560 he was appointed lieutenant-general of France. Soon after that date he formed a coalition with the Duke of Guise and Constable Montmorency, and became a Roman Catholic. He commanded the royal army in the civil war, and was mortally wounded at Rouen, and died Nov. 17, 1562. He was the father of Henry IV. of France.

An'trim: the extreme N. E. county of Ireland; province of Ulster; bounded N. by the Atlantic, E. by the Irish Channel, S. by the Lagan river, and W. by the river Bann. Area, 1,237 sq. miles (see map of Ireland, ref. 4-I). The surface near the seacoast is hilly, and the soil is mostly light. The rock which underlies it is basaltic trap, with some new red sandstone. Lignite of good quality is mined. On the north coast is the famous Giant's Causeway, one of the most perfect examples of columnar basalt in the world. Oats and flax are the staple products of the soil. The county has extensive manufactures of linen and cotton. The earliest known inhabitants of this county were of Celtic origin. It was exposed to the inroads of the Danes and the Northern Scots, who finally made permanent settlements here. It has numerous ancient cairns, mounts or forts, cromlechs, round-towers, castles, etc. The noble castle of Carrickfergus is the only one perfectly preserved. Antrim is one of the most decidedly Protestant counties in Ireland. Chief town, Belfast. Pop. (1881) 423,171; (1891) 427,968. A battle was fought near the town of Antrim in this county between the English and Irish, in the reign of Edward III., and on June 7, 1798, a severe conflict took place there between the British army and a large body of rebels (United Irishmen), in which the latter were defeated.

Revised by M. W. HARRINGTON.

Ant-thrush: See the Appendix.

Ant'werp (Fr. *Anvers*): a province of Belgium; bounded N. by Holland, E. by Limbourg, S. by South Brabant, W. by the river Scheldt. Area, 1,093 sq. miles (see map of Holland and Belgium, ref. 9-E). The river Dyle forms part of its southern boundary. The soil is generally fertile, and produces grain, hemp, madder, hops, and pine timber. Capital, Antwerp. Pop. (1880) 577,232; (1896) 784,975.

Antwerp (Dutch *Antwerpen*, i. e. *aent werp*, on the wharf; Lat. *Antuer'pia*; Fr. *Anvers*, an'-vâr'; Sp. *Ambéres*): the chief commercial city of Belgium and capital of the province of same name; on the right bank of the Scheldt; 26½ miles by rail N. of Brussels; lat. 51° 13' N., lon. 4° 24' E. (see map of Holland and Belgium, ref. 9-E). It is strongly fortified, and has among its defenses a citadel built by the Duke of Alva in 1567. The magnificent public buildings, the numerous churches, the stately and antique houses, and the profusion of ornamental trees, render the general appearance of the city very picturesque. The streets are tortuous and irregular, but one of them, called the Place de Meir, is scarcely surpassed in beauty by any street in Europe. Foremost among the public buildings is the cathedral, one of the largest and most beautiful specimens of late and florid Gothic architecture in Europe, and has a tower and spire of extraordinary beauty. It is 500 feet long and 240 feet wide (having five aisles), and contains the principal masterpieces of Rubens. Among the other public edifices are the exchange and the marble hôtel de ville. The principal institutions are the Academy of Sciences, the Academy of Painting and Sculpture, a rich gallery of pictures, a public library, a zoölogical garden, and a botanic garden. Antwerp has a good harbor, which will admit the largest vessels, and has excellent railway connections with all parts of Europe. It has an extensive trade, and is an important market for hides. Here are manufactures of black silk stuffs, cotton, linen, lace, carpets, sewing-silk, and printer's ink. Antwerp was a city as early as the eighth century, and in the fifteenth and sixteenth was the great center of European commerce. It is stated that 509 vessels daily entered its port. It was besieged and taken by the Prince of Parma in 1585, soon after which much of its commerce was transferred to Amsterdam.

By the treaty of Paris, Antwerp, with the rest of Belgium, was annexed to the kingdom of Holland in 1814. In the popular rising of 1830 against that Government the citadel was held by Dutch troops under command of General Chassé. The resulting siege of Antwerp by the French was a fine practical example of the science of sieges, which excited the interest of military amateurs of all nations. The defense exhibited a conspicuous example of fortitude and endurance. The capitulation took place Dec. 24, 1832, the trenches having been opened Nov. 30. During recent years Antwerp, the true military capital of Belgium, has been fortified under a very distinguished engineer, Colonel Brialmont, as the central point of a great intrenched camp on the Scheldt, by a system of works "unrivaled in Europe in the intelligent application of the true principles of art to a great practical example." The most remarkable feature, however, in the recent history of the city is the marvelous development of its commerce during the last few years. About 4,500 vessels, of some 4,000,000 tons burden, enter the harbor annually, which places it at the head of all continental ports of Europe, far exceeding Bilbao, Genoa, Havre, Hamburg, etc., and ranking immediately after London, Liverpool, and New York. The causes of this unexpected development were the abolition in 1863 of the entrance-toll on the Scheldt and the construction in 1877 of magnificent quays and docks, at a cost of some \$20,000,000. Pop. (1896) 267,902.

Revised by C. K. ADAMS.

Antwerp: village; on Rome, Watertown and Ogdensburg R. R., Jefferson co., N. Y. (for location of county, see map of New York, ref. 2-G); the seat of the Northern New York Conference Seminary. Two hundred thousand tons of iron ore are raised from beds in this vicinity per year. Pop. (1880) 731; (1890) 912; (1900) 929.

Antwerp: village; Paulding co., O. (for location of county, see map of Ohio, ref. 2-C); on Wabash R. R. and on Maumee river, 72 miles S. W. of Toledo; has iron and clay industries. Pop. (1880) 1,275; (1890) 1,331; (1900) 1,206.

Anu'bis, or **Anepu**: a god of the Egyptians; represented as a son of Osiris, and as having the form of a jackal, a dog, or a man with a jackal's head (the Greeks took this for a dog's head). His worship commenced in the earliest times of Egyptian history, and was continued in some form till superseded by Christianity. The Greeks confounded him with Hermes, and called him Hermanubis. His worship spread to Rome. Among the Egyptians he was the god of embalming and of funeral rites, and was the escort of the soul to the under-world. He was also called *Ap-heru*, signifying "the opener of the paths supposed to lead to heaven."

Anu'ra [from Gr. *ἀ-*, not + *οὐρά*, tail]: the order of tailless batrachians, typified by the frog and toad. Striking characters are the loss of the tail and gills in the process of development, and the acquisition of strong hinder limbs. The young are called tadpoles. See SALIENTIA.

An'varī, or **An'wari**, **AUHAD UD-DĪN**: Persian poet; b. at Khorassan in the twelfth century. He is classed with Firdausi, Hafiz, and Saadi as one of the masters of the Persian Parnassus. He enjoyed the favor of the Seljukide Sultan Sanjar, at whose court he passed many years. He wrote numerous lyrical poems; also some longer panegyrics. His elegy on the capture of Sanjar by the Ghaurians has been translated into English. Having turned his attention to astrology, and having predicted that a great hurricane would occur in 1185 or 1186, he fell into disgrace when his prediction was not fulfilled. D. about 1200.

Revised by A. V. WILLIAMS JACKSON.

Anville, **JEAN BAPTISTE BOURGUIGNON, d'**: a French geographer; b. in Paris, July 11, 1697. He devoted his whole life to the study and improvement of geography, and is recognized as the first who raised geography to the rank of an exact science. He was appointed geographer to the king, and became a member of the Academy of Sciences. Among his works are *Orbis Romanus* (Roman World); *Orbis Veteribus Notus* (The World known to the Ancients); and a *Compendium of Ancient Geography* (in French, 3 vols., 1768). He published 211 maps and plans, which embrace nearly every country in the world. Although he never traveled, he delineated various foreign countries with remarkable accuracy. The correctness of his map of Egypt was confirmed by the French survey of 1798-99. D. in Paris, Jan. 28, 1782. See Condorcet, *Éloge de M. d'Anville* (1762).

An'yte (*Ἀνύτη*) of **Tegea**: a famous poetess of her day (290 B. C.); "a female Homer." We have twenty-two epi-

grams under her name that give some warrant for her reputation.

Anziu, *ān'zāi'*: a town of France; department of Nord; a mile N. W. of Valenciennes (see map of France, ref. 2-G). It has iron-foundries and glass-works, and is the center of the greatest collieries of France. Pop. 10,043.

Ao'nia: a district of ancient Greece; in Bœotia; contained Mt. Helicon (the Aonian mount) and the fountain Aganippe. These were celebrated as the favorite resorts of the Muses, who were called *Aon'ides*.

A'orist [Gr. *ἀόριστος*, unlimited; *ἀ-*, not + *ὀρίζειν*, define, limit; *ὄρος*, boundary]: a form of the Greek verb which simply names an action as an occurrence, and was so called by the Greek grammarians because it did not further define the action of the verb, e. g. with reference to its continuation, or its present or past completion. The Greek grammarians also used the term of the pronouns which we call "indefinite," as *ὅστις*, *ὅποιος*, *ὅπόσος*, "whoever," etc.

BENJ. IDE WHEELER.

Aor'ta [from Gr. *ἀορτή*, something suspended; *ἀείρειν*, raise, suspend; because it is supported or suspended from the heart]: the large arterial trunk arising from the left ventricle of the heart, and giving origin directly or indirectly to all arteries except the pulmonary and its ramifications. The curve that it makes in the upper part of its course, during which it sends off the innominate and the left carotid and subclavian arteries, is called the arch of the aorta. The *thoracic* aorta extends from the third dorsal vertebra to the diaphragm, where it takes the name of *abdominal* aorta, which in the lower part of the abdomen, about opposite the fourth lumbar vertebra, divides into the two iliac arteries, going to supply the lower extremities. The thoracic aorta gives off two or three bronchial arteries to supply the tissue of the lungs and intercostal arteries to the chest-walls. The abdominal aorta gives off two phrenic arteries to the diaphragm and a number of branches to the abdominal organs. See CIRCULATION OF THE BLOOD.

Aosasaguntacooks, or **St. Francis Indians**: See ALGONQUIAN INDIANS.

Aos'ta (anc. in Lat. *Augusta Prætoria*): a town of Italy, in the province of Turin; on the river Dora, in a valley 50 miles N. N. W. of Turin (see map of Italy, ref. 2-B). It has a Gothic cathedral, the remains of a Roman amphitheater, and a fine triumphal arch. The valley of Aosta produces large forests of pine, and has mines of copper, silver, iron, and lead. Cheese, leather, wine, and hemp are exported. Pop. (1881) 7,437.

Apaches, a-pach'ēes: See ATHAPASCAN INDIANS and YUMAN INDIANS.

Ap'afi, **MICHAEL** or **MIHALY**: Prince of Transylvania; b. in 1632. He began to reign in 1661, and was for many years an ally of the Turkish sultan. In 1687 he became tributary to the Emperor of Germany. D. April 15, 1690. He was succeeded by his son Mihaly, under whom Transylvania was invaded by the Turks, who took several towns. He sold his principality to Austria for a pension. D. Feb. 11, 1713.

Apalachicola, Fla.: See APPALACHICOLA.

Apame'a: an ancient city of Syria, on the river Orontes, which here expands into a lake named Apamea, about 75 miles S. of Antioch. It was probably named in honor of Apame, the wife of Seleucus Nicator. The place was called *Famieh* in the time of the crusades. Its extensive ruins still exist. There were several other ancient cities of this name in Asia.

Ap'anage, or **Ap'panage** [Fr. from *apaner*, furnish with food; from Lat. *ad*, to + *panis*, bread]: in feudal law, an allowance to the younger sons of a sovereign or prince out of the revenues of the country, generally joined with a grant of the public domain. In England the Duchy of Cornwall is an apanage of the Prince of Wales, but the younger sons of the sovereign are dependent upon the liberality of Parliament.

Apartment-house: a building containing more than three families under one roof. Tenement-houses are classed in the same way, but usually have more than one family on a floor. Such buildings have been common in Scotland, and in the large cities of the Continent of Europe for a century or more, but are of recent introduction in the U. S. They are mainly the result of the increased cost of living, the enhanced value of building-lots, the greater profit to be ob-

tained from high rather than from low buildings, and the relative economy of living in flats.

By the introduction of many labor-saving devices in apartment-houses, such as automatic door-openers, speaking-tubes, passenger and freight elevators, ash-shoots, trunk-rooms, combined laundries, and restaurants on the catering system, it is now possible to erect buildings ten, and even thirteen, stories high, which will comfortably provide for several hundred persons under one roof, and at less rental than in a proportionate number of single dwellings, yet with a higher profit to the owner.

Great ingenuity has been shown in planning apartment-houses so as to economize space to the greatest advantage, and to obtain light and ventilation for every room. Under the amended law recently passed by the New York State Legislature apartment-houses and tenements are prevented from occupying more than 65 per cent. of the building-site, and ample space is required to be left between them and adjacent houses in the rear. In European cities modern apartment-houses are usually built around a central court, with a driveway entrance for carriages, but in U. S. cities many are built upon a single or double city lot, 25 by 100, so that the suites of rooms of necessity extend from end to end, and, unless the building is on a corner, they must be lighted by narrow courts on either side or by light-shafts from above, and often wholly inadequate for the purpose. Few of these flats are fireproof, and several conflagrations have occurred in them.

There has been much agitation in regard to the necessity of limiting the height of buildings of this kind, which are found to be destructive to the value of adjoining property, and also objectionable from a sanitary point of view. One building of this class in New York is fourteen stories high, and the roof is 170 feet above the sidewalk. The Chicago Real Estate Exchange has recommended restricting apartment-houses to 100 feet in height, and a similar regulation is favored in New York. In Berlin such buildings are limited to five stories.

Some of the most notable apartment-houses in New York are remarkable for their size. The Dakota is estimated to have cost nearly \$2,000,000, and is said to be fireproof. It is 200 feet square and 9 stories in height. There are 65 suites, containing 8 to 20 rooms each, or 623 rooms in all. The suites rent from \$1,000 to \$5,600 per annum. There are 4,000 electric lights, 300 electric bells, and 12 water-tanks with a supply of 2,000,000 gal. per month. The annual expenses, including taxes, exceed \$50,000 per year. The Central Park flats constitute eight buildings, each 130 feet high and with 9 stories, having each 16 apartments. The whole cover half a city block on Fifty-ninth Street; the land cost \$1,000,000, and the buildings \$4,000,000 additional. The latter are considered fireproof. The Chelsea, Berkshire, Florence, and Van Corlear are other notable buildings of this class. Recently bachelor flats, to accommodate single gentlemen, have been erected, and have proved very popular.

Some apartment-houses have been erected on the co-operative plan, the occupants of each floor being independent owners of the same, while the title to the land is held in common by the associated owners, who manage the building the same as the affairs of any other corporation. Special laws have been passed by the Legislature of New York regulating the control of such associations and to facilitate their management, but the experiment has not proved a financial success.

Flats have never been popular in England; a few have been erected in London, but they have not become fashionable. They are common in Scotland, and Edinburgh and Glasgow have long been famous for their lofty tenements, some of them 13 and 14 stories high, with tortuous and interminable flights of stairs, which are the wonderment of visitors.

In Parisian apartment-houses persons of quite different social position may reside under the same roof, the *premier étage* or principal story being the home of wealthy people, while the stories above diminish in elegance and expensiveness as they are placed higher; but in the U. S. the use of elevators does away with such distinctions, so that there is a tendency toward a gradual and marked separation of classes, and the greater exclusiveness of the apartment-houses is one reason of their popularity with fashionable people.

CHAS. F. WINGATE.

Apatin': a town of Hungary; county of Bacs-Bodrog; on the left bank of the Danube; 60 miles S. of Baja (see

map of Austria-Hungary, ref. 8-H). It has a trade in silk, madder, and hemp. Pop. 12,821.

Ap'atite [from Gr. *ἀπάτη*, deceit + suffix *-ite* (Gr. *-ίτης*; as in Eng. *siderite*, Gr. *σιδηρίτης*); so called because it deceives the observer by its resemblance to other minerals]: the native phosphate of lime, which is extensively used as a manure in both Great Britain and the U. S. It usually occurs in crystalline rocks, such as granite and greenstone, but is also found in granular limestone and serpentine. The most abundant supplies, however, are derived from beds of animal remains, bones, etc. When crystallized it appears in six-sided prisms, sometimes of a greenish color, and containing calcic phosphate, with a certain proportion of calcic chloride and fluoride, $\text{Ca}_3(\text{PO}_4)_2 + \text{Ca}(\text{ClF})_2$. The amorphous apatite which is used in the preparation of artificial manure is imported from Spain and Norway, and from Sombrero, Navassa, Swan, and some other small islands in the West Indies. Before it is applied to the soil it is ground to powder and subjected to the action of sulphuric acid, which renders the phosphoric acid of the apatite soluble in water. The efficacy of apatite as a fertilizer of the soil depends on the presence of phosphoric acid, which is essential to the growth of such plants as wheat, barley, and oats. It is often mixed with guano, bones, and other manures to make a complex fertilizer, which is better than the simple mineral phosphate. A rich deposit of apatite in the form of nodules has been found in the Postpliocene marls of South Carolina, near the Ashley, Stono, and Edisto rivers. Large quantities of these nodules, which contain 25 or 30 per cent. of phosphoric acid, are converted into "superphosphate of lime" at Charleston, S. C., and at Camden, N. J. It is stated that about 13,000 tons of apatite (otherwise called phosphatic guano) were imported into the U. S. in 1868. Apatite occurs in large crystals, associated with white limestone, in St. Lawrence co., N. Y. Massive apatite is found in England, Ireland, Spain, and other countries. See AGRICULTURAL CHEMISTRY, BONE, FERTILIZERS, and GUANO.

Revised by IRA REMSEN.

Apcheron: See APSHERON.

Ape (synonymous with *monkey*): any of the Primates, excepting the lemurs and man; in a more restricted sense, any of the Old World tailless members of the family *Simiidae*, which includes the chimpanzee, orang-utan, gorilla, and gibbons. These apes are the most highly organized of the Quadrumana, and approach in structure nearest to man, from whom they differ principally in the smaller size of brain and brain-case, the larger canine teeth, the relatively greater length of the arms, and the shorter great toe, which is opposable to the other toes. Their structure is better adapted for climbing trees than for walking on the ground, and accordingly in the forest they swing from tree to tree with great agility and ease, but on the ground they are slow, often walking on the knuckles of the closed hand and on the outer side or the knuckles of the foot. Their food consists mainly of fruit and vegetables, varied in some species with insects. Apes are natives of Africa, India, Borneo, etc. See CHIMPANZEE, GORILLA, and ORANG-UTAN.

DAVID S. JORDAN.

Ap'eldorn, or **Apeldoorn**: a beautiful village of Holland; in Gelderland; on the river Grift; 16 miles N. N. E. of Arnhem (see map of Holland and Belgium, ref. 6-H). Here are an agricultural school and manufactures of paper, blankets, and coarse woolen fabrics. Pop. with adjacent hamlets (1879) 15,053; (1890) 19,190.

Apell'es: a Greek painter of the second half of the fourth century B. C.; probably a native of Colophon; studied his art at Ephesus, but at Pella, in Macedonia, formed that acquaintance with Alexander the Great which was so profitable to him in fame and wealth. He is noted especially as the painter of an *Aphrodite Anadyomene* and an *Artemis in the Chase*. His portrait of Alexander was put in the temple at Ephesus. Of it Alexander made the oft-quoted remark: "There are only two Alexanders, the invincible and the inimitable." See A. Houssaye, *Histoire d'Apellès* (Paris, 1867).

S. M. J.

Ap'ennines (It. *Apenni'no*; anc. in Lat. *Mons Apenni'nus*): a long chain of mountains extending through the whole length of the Italian peninsula, and forming the watershed between the Adriatic Sea and the Mediterranean. This chain belongs to the system of the Alps, from which it branches off near the Col de Tenda. The northern portion, called the Ligurian Alps, is nearly parallel to the Gulf of

Genoa, and is in close proximity to the coast. The entire length of the chain is about 800 miles, and its general direction nearly southeastward. None of its summits rises to the limit of perpetual snow. The highest summit in the peninsula is Monte Corno, which has an altitude of 9,546 feet, but Mt. Etna, regarded by some as a part of the Apennine system, is 10,935 feet high. The average height of the chain is about 4,000 feet. The geological formations of the Apennines are either metamorphic or secondary, and limestone is the predominant rock. They are remarkable for their rich quarries of marble of various colors, but are poor in metals. Rocks of volcanic origin abound in the former kingdom of Naples. The mineral riches of these mountains consist chiefly in the celebrated marbles of Carrara, Seravezza, and Sienna. The Apennines are somewhat deficient in sublime and magnificent scenery, and their general aspect is that of a wall, with few projecting peaks to break the monotony of the scene. The higher parts of these mountains are mostly dry, rocky, and destitute of trees, but below the altitude of 3,000 feet they are covered with forests of the evergreen oak, chestnut, beech, and other trees. The olive, orange, and palm also flourish near their base, especially where they are in close proximity to the sea, as near the Gulf of Naples and at the Riviera of Genoa. Some geographers divide this chain into four parts: 1. The Northern Apennines, extending from the Col de Tenda to the Pass of Borgo San Sepolero, near Arezzo; 2. The Central Apennines, from Arezzo to the valley of the Pescara, which separates the provinces of Teramo and Chieti; 3. The Southern Apennines, from the Pescara to Cape Spartivento; 4. The Insular Apennines, in the island of Sicily. In Central Italy the western or southwestern side presents a very gradual descent, but in the northern part of the range, which approaches the coast, there is a very steep declivity next to the sea.

Apenra'de: a seaport-town in Schleswig, on a fiord of the same name in the Little Belt, 35 miles N. of Schleswig (see map of German Empire, ref. 1-E). It has a good harbor and beautiful environs. Ship-building is carried on here. Near this town is the castle of Brundlund, built by Queen Margaret about 1410. Pop. 6,069.

Ape'rients: remedies employed to act upon the bowels in habitual or chronic constipation. They may be divided into two sets: salines; vegetable aperients. The most used of the saline aperients are the various mineral waters, such as Bedford water, Saratoga water, Hunyadi Arpad and Hunyadi Janos water, and Fredrickshalle water. These all depend for their activity upon the sulphates of sodium, magnesium, or lime, either alone or mixed together. The difference in the action of waters depends chiefly upon their strength. Sulphate of sodium, or Glauber's salts, sulphate of magnesium, or Epsom salts, tartrate of sodium and potassium, or Rochelle salts, may be substituted for the more costly natural waters. A very close imitation of these natural waters may be made by mixing an ounce each of the sulphate of sodium and magnesium, and half a drachm of the bicarbonate of sodium, and dissolving in water as needed. In order to act kindly, salines should be taken when the stomach is empty, and are therefore usually preferred on rising, at least half an hour before breakfast. The dose of the salines varies almost indefinitely; the amount taken should be increased until the desired effect is produced. Of the mixture given above, from a heaped teaspoonful to a heaped tablespoonful may be taken in half a glass of water.

The vegetable aperient compounds in use are legion. Probably the best of the single vegetable aperients is the cascara sagrada, given in the form of the fluid or solid extract, of which the dose is respectively 5 to 30 minims and 2 to 5 grains. A most excellent combination, and one which on account of the smallness of the dose can be taken in granules, is one-sixth of a grain of aloin, one-eighth of a grain of extract of belladonna, with one-sixtieth of a grain of strychnine. Of these granules, one to three may be taken at a dose. A vegetable laxative acts slowly, and should always be taken at bed-time; or in severe cases of constipation may be taken in minute doses after the mid-day and evening meals.

When habitually used, aperients lose their power over the individual, and it is essential that they should be changed from time to time. It is also an invariable rule that the use of aperients in chronic constipation is to be avoided as long as possible, the constipation being overcome by the use of proper food and the formation of proper

habits of life. All foods which contain a large proportion of non-nutritious material act as laxatives, by their bulk distending and stimulating the intestines. Thus bran bread, oatmeal porridge, whole-wheat flour, and cracked wheat are all distinctly laxative, while milk and meat are distinctly constipating. Water, by its softening influence, has some laxative power, and in many individuals a pint of hot water, taken on going to bed at night or getting up in the morning, acts most happily. General exercise is of great service in maintaining the normal condition of the alimentary canal, and all persons of costive habit should make an absolute rule of setting aside a fixed time in each day to respond to the calls of nature. Enemata of simple water may often be used with advantage from time to time to replace medicines. The habitual use of glycerine suppositories or of enemata of glycerine is not proper. H. C. WOOD.

Apet'alous Plants (*Apetalæ*): one of the divisions of dicotyledons, according to the usual system of classification. It includes many families, often with little if any relationship, agreeing only in wanting petals. While this division is recognized by most British, French, and American botanists, it is unquestionably artificial. In all or nearly all cases the petals have disappeared by a reduction from the petal-bearing type. Many apetalous plants belong to families containing choripetalous or gamopetalous flowers, and it is probable that all apetalæ should be considered as the reduced or degraded relatives of the plants of these higher groups. CHARLES E. BESSEY.

Aphanop'tera, or **Aphanop'tera** [from Gr. ἀφανής, invisible + πτερόν, wing; i. e. with wings not apparent]: a sub-order of wingless insects containing a single family, the *Pulicidae*, or fleas. There are many species, of which the common flea (*Pulex irritans*) may be regarded as the type. The female deposits her eggs, generally about a dozen in number, in any favorable situation; and in about six days the larvæ are hatched, attaining their full size in ten or twelve days more. At the end of this time the larva spins itself a little silken cocoon, in which it passes into the pupa state, and in about twelve days afterward emerges a perfect flea. The chigoe (*Sarcopsylla penetrans*) is a native of South America and the West Indies, and is an exceedingly annoying and sometimes even a dangerous insect. It penetrates the skin of the foot in man and various other mammals, and there lays its eggs. The larvæ often form troublesome ulcers which, if neglected at first, are very difficult to heal. Revised by D. S. JORDAN.

Apha'sia [from Gr. ἀφασία, speechlessness; from ἀφασος, speechless; ἀ-, not + φάσαι, speak]: disorder or loss of the power of speech due to brain disease, as distinguished from aphonia (*q. v.*), the loss of phonation of external disease, as of the vocal cords or larynx. There is a portion of the left side of the brain especially devoted to the function of speech, and whenever this becomes in any way diseased, as most frequently by apoplectic hæmorrhage in the brain, aphasia results. There are many grades of the condition, from entire speechlessness to the slightest, almost imperceptible, hesitation. Moreover, there are different types of aphasia, widely different in nature. In one there may be plain speechlessness; in another inability to speak correctly, the words of a sentence being confusedly misplaced; in a third, words are improperly applied (a table being called a knife or the like), not from want of intelligent appreciation, for the patient is at times painfully aware of his inability to express himself; and finally there may be a curious form in which any attempt to speak thoughts is futile, though the patient is able to repeat poems or declamations, or sing songs without the least hesitation. The last-mentioned phenomenon is due to the existence of an "automatic speech-center," which is operative when words once committed to memory are re-spoken, and this center lies on the opposite side of the brain from the "volitional speech-center." Disease of the latter may therefore be present while the automatic center remains intact. There are many other varieties of aphasia which can only be understood when the physiology of the brain is carefully considered. Aphasia must not be regarded as a disease, but as a symptom of many diseases. Therefore the question of its cure is involved in the consideration of the diseases which brought it about. In cases in which the speech-center has become irreparably damaged, it has happened that by a process of re-education, other parts of the brain assuming the function, the power of speech has been partially regained. See SPEECH. WILLIAM PEPPER.

Aphe'lion [from Gr. ἀπό, off + ἥλιος, sun]: that part of a planet's orbit which is the most distant from the sun, and is opposite to the perihelion, or the point nearest the sun.

Aph'ides (sing. *a'phis*, a plant-louse) [etymology uncertain]: the name applied to numerous hemipterous insects of the family *Aphididae*,



Aphides.

men, through which the saccharine fluid is exuded. In some of the aphides wings are present, but in others they are not. Many of them secrete a sweet fluid known as "honeydew," produced by a pair of small tubes near the hinder end of the body. Ants have a special fondness for this substance, and often frequent plants on which it is deposited. They may sometimes be seen milking the aphides, as it is termed—that is, stroking the sugar-tubes with their antennæ to induce them to furnish them the saccharine fluid more abundantly. Hence the aphides have been termed the milk cows of the ants. Some species of this genus are very destructive to vegetation, as the hop-fly (*A'phis hu'muli*), and the aphid of the turnip-cabbage (*A'phis bras'sicæ*), which have sometimes destroyed whole crops. Here also belong the *Phylloxera* or vine-louse. The aphides are often infested by certain minute parasites, which, by laying their eggs in the bodies of those insects, cause the death of great numbers. It is remarkable that one of these parasites (*Aphid'ius*) has itself still more minute ichneumon parasites, whose eggs are deposited in its body.

Revised by D. S. JORDAN.

Aphis: See APHIDES.

Apho'nia [from Gr. ἀφωνία, voicelessness; ἀ-, not + φωνή, voice]: loss of speech, in which the patient more or less completely loses power to utter sounds. This may arise from disease of the larynx, from direct paralysis of that organ, or from some functional disease, as hysteria or chorea. The treatment varies with the disease of which the aphonia is a symptom. As a general rule, these cases are temporary, unless there is a destruction or serious organic change in the tissues of the larynx.

Aphrodite, ἄφ'ρō-dī'tēē: See VENUS.

Aph'thæ (sing. *aphtha*) [from Gr. ἄφθα, ulcer, thrush]: ulcers of the mouth, beginning with numerous minute vesicles and terminating in white sloughs. Aphthæ are usually the seat of microscopic vegetation, but whether the growth is an essential or only an accidental element is a disputed point. Aphthæ resemble "thrush" in appearance, but in the latter disease no vesicles are formed.

Aphthar'to-Doce'tæ [from Gr. ἀφθαρτος, incorruptible + δοκεῖν, think]: literally, "believers in [that which is] incorruptible," the name of the followers of Julian of Halicarnassus, who lived about 520 A. D., and taught that the body of Christ was divine and incorruptible.

A'pia: the chief town of the Samoan islands; on the island of Upolu; lat. 14° 2' S., lon. 171° 21' W. There is a small but safe harbor. Since 1879 it has been a municipality governed by an elected council of six members, responsible to the consuls of Germany, Great Britain, and the U. S. Considerable foreign trade is carried on here, but it is for the most part in German hands. Copra (i. e. dried cocoanuts) is the most important article of trade, but cotton, cocoanuts, and breadfruit are also exported. Pop. 3,750. M. W. H.

A'pian, or Appian, PETER: German astronomer and mathematician; b. at Leisnig, Saxony, 1495. His proper name was BIENEWITZ. He became Professor of Mathematics at Ingolstadt about 1527, and gained distinction by his writings, among which is a work on cosmography (1524). He first proposed the method of ascertaining the longitude by lunar observations. He was ennobled by the Emperor Charles V. (1540). D. at Ingolstadt, Apr. 21, 1552. See Günther, *Peter und Philipp Apian* (Prag, 1882).

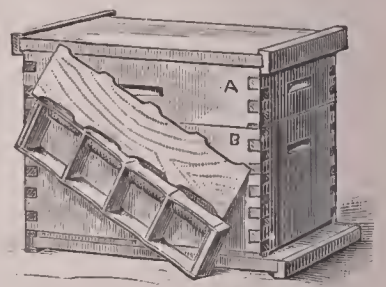
Apiary: See BEE.

Apicius, a-pis'i-ūs, MARCUS GABIUS: a celebrated epicure who lived at Rome in the reigns of Augustus and Tiberius. His name became proverbial for gluttony and luxury in eating. According to Seneca, he expended more than \$3,600,000 in the indulgence of his taste for rare dishes, and then discovering that his fortune was reduced to 10,000,000 sesterces (about \$360,000), he poisoned himself, because he could not continue his expensive style of living. Apicius composed a work on cookery, but the extant work *De re coquinaria*, in ten books, containing a large number of recipes, can not in its present form be attributed to Apicius, being compiled in part as late as the third century. See edition by C. T. Schuch (Heidelberg, 1874).

M. WARREN.

A'piculture: the rearing of bees. This industry is now represented by something over 300,000 beekeepers in the U. S. alone, some of the most extensive apiarists owning from 300 to 3,000 colonies; and, as a consequence, honey is produced by the ton and car-load in nearly all sections of the country. While the majority carry on apiculture in connection with some other rural pursuit, there is a considerable number who make beekeeping their sole means of livelihood.

Prior to 1850 beekeeping was carried on in the old-fashioned way, and but little practical results were obtained. In 1852 the Rev. L. L. Langstroth made the great invention which revolutionized apiculture throughout the world. This consisted in making the first practical movable-frame hive, an invention that made it possible to take out and put back with facility the combs, so that the exact condition of the colony could be easily ascertained. Although great improvements have been made since the date of Mr. Langstroth's invention, nearly all hives and frames are still made essentially on the Langstroth principle, the only difference being that the frames are self-spacing; and the hives, instead of having porticos, are simpler, stronger, and lighter. The illustration shows an eight-frame Langstroth hive, with the "super," as it is called, for the storage of the surplus or box honey.



Improved Langstroth eight-frame hive.

Honey is put upon the market both in the comb and liquid form. The former is put up in little square boxes which hold about a pound. These boxes are put in the hive, containing a little piece of embossed wax, which the bees draw out into comb, fill with honey, and cap over.

Extracted honey is the liquid product without the comb. It is sometimes incorrectly called "strained" honey. To obtain the former the combs are first cleared of bees, and then uncapped with a thin knife—that is, the film of wax that covers the cells is sliced off; the combs are next put into the revolving basket of an extractor, and the honey thrown out by centrifugal force. In this way there is no mutilation of the combs, and the same are put back into the hive to be filled again by the bees. While extracted honey is clear and wholesome, strained honey is the product from mashed-up combs; and the result is it is often befouled by

the juices from mashed-up bees, larvæ (or grubs), and bits of wax, propolis, etc.

Bees usually swarm during the honey harvest; and this swarming is simply nature's method of increase. It is not even yet decided how swarming may be controlled or prevented, but it is generally admitted that the first swarm should be allowed, and that all subsequent swarming should be stopped. The first one should be hived in a new location, and given empty combs or section honey-boxes, so that the bees may commence storing honey at once, because the first swarm is usually very active, and will do better work than the parent colony—at least for a time. In the meantime, all second or third swarms should be controlled in the parent colony as far as possible by cutting out the queen-cells in eight days after casting the first swarm, leaving, of course, one cell for one virgin queen to hatch.

Where the climate is cold enough bees are wintered either in the cellar or in double-walled, chaff-packed hives outdoors, the upper story filled with chaff or leaves. In the very coldest climate the cellar plan is preferred; but in localities where the winters are somewhat open, occasionally interspersed with warm days, so the bees can fly, the outdoor method is preferable. Each colony should have from 15 to 20 lb. of sealed stores in the fall. If, upon examination, the bees are found to be lacking, they should be fed up with sugar-sirup made in the proportion of one-third water and two-thirds sugar by weight, the same to be made into a sirup over a slow fire, being very careful not to burn it. If the bees are to winter in the cellar, the hives should have large entrances, or, better, the bottom-board should be removed. In that case the hives should be set in a row upon a pair of scantling in such a way that the bottoms of the hives are left entirely open, with a space of 4 inches between each hive. The next lot of hives should be piled on top of the lower row, each hive right over the space between the two hives below. The purpose of this is to give the bees plenty of bottom ventilation, and allow old bees, as they become superannuated, and die, to drop out of the way, and not to befoul the hive. If double-walled hives are not available for outdoor wintering, the single-walled hives may be placed in covered boxes large enough so as to give a space of 3 or 4 inches all around the hive. This space should then be filled with leaves, chaff, or any other packing, leaving, of course, a passageway from the hive entrance to the outside.

There are two kinds of bees in the U. S. The first are the black (or German) bees, and these seem to be more widely disseminated than any other race. But the bees that are preferred by the large practical beekeepers are the yellow-banded, or Italians, or, at least, a cross between them and the black bees. The Italians are proof against mothworms, and, in general, are better honey-gatherers.

Fortunately, the diseases of bees are hardly worth mentioning. There is only one disease that beekeepers are at all afraid of, and that is what is called foul brood. Colonies so affected become more or less demoralized, the brood dies in all stages of growth in the comb, and the cappings of the sealed brood are usually perforated and sunken. The affected larvæ are shriveled, and of a light coffee color, and the odor is very much like that of an ordinary glue-pot. To treat, shake the bees into a clean hive, put them on frames of foundation, and cause them to build them out into combs; and then the old combs should be burned, and the old hive boiled in water for some minutes, to be sure that all germs have been killed.

For further particulars in regard to bees, the reader is referred to Langstroth on *The Honey-bee*, revised by Dadant; the *Beekeepers' Guide*, by Prof. A. J. Cook; *Quinby's New Beekeeping*, by L. C. Root; or the *A B C of Bee Culture*, by A. I. Root.

A'pion (Ἀπίων): Greek grammarian and rhetorician of the first century A. D.; foster-son of Didymus, and head of the philological school at Alexandria. He is chiefly known by Josephus's tract *Against Apion*, a reply to the charges which he brought against the Jews in an address to Caligula.

A'pios Tubero'sa: a papilionaceous plant of the family *Leguminosæ*. It is a native of the U. S. east of the Rocky Mountains, has a twining stem, pinnate leaves, and tuberous roots, which are used as food, and resemble the potato. The roots are commonly called ground-nuts.

A'pis (in Gr. ἄπῖς): the name of the bull of Memphis, the favorite object of worship of the ancient Egyptians, as early as the second dynasty. According to some authorities, he

was sacred to Osiris, or was a symbol of Osiris, and was not permitted to live more than twenty-five years, at the end of which time he was secretly put to death by the priests. During his life he was kept in the temple of Ptah in Memphis, and served by a retinue of priests. His death was followed by a general mourning until a calf with the requisite color and marks was found to supply his place. The principal of these required marks were—black color with a white square on the brow, the figure of an eagle on the back, and a peculiar knot under the tongue.

Aplanat'ic Lens: in optics, a lens which causes all the rays of light that fall on it to converge to a single point or true focus. In order to be aplanatic, the lens must not only have the true geometrical figure necessary to destroy aberration, but must be formed of different media, so as to be achromatic. These conditions can not be accurately fulfilled in practice.

Apoc'alyptse [from Gr. ἀποκάλυψις, revelation; ἀπό, off + καλύπτειν, cover]: literally revelation, usually the last book of the New Testament, which contains discoveries or predictions respecting the future of Christianity. See REVELATION, BOOK OF.

Apocalyptic Number: the mystical number 666 spoken of in the book of Revelation: "Let him that hath understanding count the number of the beast: for it is the number of a man" (xiii. 18). Some critics interpret this to be an enigmatical expression of the word *Latinus*, the Greek characters of which, taken as numerals, amount to 666. The connection between *Latinus* and the Roman power has given Protestants a reason, or pretext, to apply this passage to the Roman Church, and the Roman Catholics retort by making the same number stand for Luther, Calvin, and other Protestants. It is frequently interpreted, according to its value in Hebrew characters, as meaning Nero.

Apocren'ic Acid [from Gr. ἀπό, from + κρήνη, fountain, so called because derived from some fountains or springs]: an extractive or brown matter found in some spring water, and in ordinary vegetable mould. It is a product of the natural decay of wood and other vegetable tissue.

Apoc'rypha [from neut. pl. of Gr. adjec. ἀπόκρυφος, hidden, spurious; ἀπό, away + κρύπτειν, hide]: a collection of writings which have been regarded as an appendage to the Old Testament, and sometimes as a part of it. They are valuable chiefly as historical records, and for the light they throw on the religious condition of the Jews from the close of the Old Testament to the Christian era. They are divided into three classes: (1) those which originated in Palestine, such as the book of Jesus, son of Sirach, first book of Maccabees, and book of Judith; (2) those of Egypto-Alexandrian origin—the book of Wisdom, second of Maccabees, and the addition to Esther; (3) those which show traces of Chaldaic or Persian influence, as Esdras, Tobias, Baruch, and the additions to Daniel. The Council of Laodicea in Phrygia, between 343 and 381 (commonly referred to cir. 360), condemned the use of "uncanonical books"; but the list of canonical books which follows is now generally thought to be an interpolation. The third Council of Carthage (Aug., 397), in the forty-seventh of its fifty canons, gives a list which includes Ecclesiastical, Wisdom, Tobit, Judith, First and Second Maccabees. There are in all fourteen apocryphal books, or portions of books, all but three of which were pronounced canonical by the Council of Trent in 1546. The Roman Catholic Church calls these books deuterocanonical or antilegomena, and applies the name "apocryphal" to those books which have been refused a place in the canon of the books of the Old Testament. By Protestants these books are generally called PSEUDEPIGRAPHA (*q. v.*). The Church of England in her Articles mentions the Apocrypha as books which "the Church doth read for example of life and instruction of manners, but yet doth it not apply them to establish any doctrine." In the Protestant Episcopal Church, lessons from the Apocrypha are included in the latest revision of the Lectionary. They are entirely rejected from public worship by other Protestants in the U. S., and by the dissenting churches in Great Britain. Besides the Old Testament there are many New Testament Apocrypha. See PSEUDEPIGRAPHA.

Revised by WILLIAM S. PERRY.

Apocynaceæ, or **Apocynææ**, a-pos-i-nā'scē-ee, or äp-ō-sin'ē-ee [from *Apoc'ynum*, the name of one of its genera]: an order of exogenous herbs, trees, and shrubs. The calyx is usually five-partite, persistent; the corolla monopetalous

and hypogynous; the stamens are five, inserted on the corolla. Many of the species have a poisonous milky juice, and others are used in medicine. The whole number of the species is said to be more than 1,000. This order comprises the oleander; the *hya-hya*, or cow-tree, the milk of which is wholesome; the *Cerbera*, which produces the Tanghin poison of Madagascar; the *Carissa edulis* of Arabia; and the *Apocynum cannabinum*, or Indian hemp, which grows in North America.

Ap'odal Fishes, or **Ap'odes** [apodes is from Gr. *ἄπους*, pl. *ἄποδες*, footless; *ἀ-*, not + *πούς*, foot]: fishes destitute of ventral fins or homologues of the posterior extremities. In the Linnaean system, *Apodes* was the name of an order of such fishes. Modern writers have restricted the group, till it now contains only the eels, which are further characterized by the elongate body and narrow gill openings, and the fact that the shoulder-girdle is not in contact with the skull.

D. S. J.

Ap'ogee [Fr. *apogée*, from Lat. *apogæum*, from Gr. *ἀπόγειον*, away from the earth; *ἀπό*, off + *γῆα*, earth]: the point of the moon's orbit most remote from the earth; the point which is opposite to the perigee. The apogee of the lunar orbit advances eastward among the stars, and completes a revolution in nine years.

Apol'da: a town of Central Germany; near the river Ilm, in the grand duchy of Saxe-Weimar; on the railway from Berlin to Weimar, 11 miles by rail N. E. of Weimar (see map of German Empire, ref. 5-F). It has manufactures of hosiery, cloths, etc. Here are mineral springs. Pop. (1880) 15,630; (1890) 20,880.

Apollina'ris, or **Apollina'rius**, THE YOUNGER: a learned bishop and philosopher; was a son of a grammarian of the same name. He became Bishop of Laodicea in 362 A. D., and gained distinction as an orator and writer. Among his works were *Thirty Books against Porphyry*, and commentaries on the Bible. He was an opponent of Arianism, and in 375 founded the sect of Apollinarians, who were regarded as heretics. The heresy of which he was accused was the denial of the human soul in Christ, the place of which, he taught, was supplied by the *Logos*. His heresy was condemned at Alexandria in 362, and at Rome in 374. At the Council of Constantinople, in 381, he was condemned by name. He died in 390, and by the middle of the subsequent century the sect he founded was extinct. Some of his writings have been recently discovered among those of other Fathers. See Wernsdorff, *Dissertatio de Apollinare Laodicensi* (1694).

Apollina'ris Sido'nus, GAIUS SOLLIUS. Saint: Latin poet and ecclesiastic: b. at Lugdunum (Lyons), in Gaul, about 430 A. D. He was a son-in-law of Avitus, who was Emperor of Rome for a few months in 455-456 A. D. Anthemius, who became emperor in 467, appointed him prefect of Rome in 468. About 470 he was elected Bishop of Clermont (Augustonemetum). He wrote *Carmina* and *Epistole*, which are extant, and have some historical value. D. about 480 A. D. Best ed. by C. Luetjohann (Berlin, 1887).

Apollinaris Spring: the source of true Apollinaris water; in the valley of the Ahr, near Remagen, Rhenish Prussia. The water is drawn from a deep rocky source at a depth of 50 feet, and the carbonic acid it contains is that contained by water at that depth. A London company undertook the export of the water in 1874. The bottles filled at the spring in 1888 numbered 12,720,000; in 1889, 15,822,000. In 1891 it was probably between 18,000,000 and 20,000,000. See MINERAL WATERS.

M. W. H.

Apollina'ris Sulpi'cius, GAIUS: Latin grammarian of the second century of our era; b. at Carthage, and famous as the teacher of Aulus Gellius and the Emperor Pertinax. He wrote metrical arguments (which are still extant) to the plays of Terence, and to the twelve books of the *Æneid*. The non-acrostic arguments preserved for five plays of Plautus (*Amphitruo*, *Aulularia*, *Miles*, *Mercator*, and *Pseudolus*) are commonly ascribed to him.

M. WARREN.

Apoll'o (in Gr. *Ἀπόλλων* and *Ἀπέλλων*): among the Lycians, Greeks, the Italic peoples, and the Etruscans, a god, primarily of light, secondarily the deity who presided over the annual stages of the sun. Hence he was regarded as an increaser and preserver of vegetable, animal, and human life. He is the protector of crops and flocks, the friend of the wild creatures of field and flood, and the maintainer of physical health, vigor, manly spirit, and masculine beauty, which he illustrates in his own person. The association of

Apollo with athletics and war, and with the healing of disease, comes under this head; the god's anger naturally has power to cause the disease and death which his mercy can ward off and check. The ritual prescribed for the worship of Apollo laid great stress on physical and moral purity. He removed the stain and the disabilities ensuing on moral guilt, such as bloodshed, by special expiatory rites. Another of his attributes is a knowledge of hidden things. Prophecy was dispensed in the name of the god at many of his sanctuaries. In this regard the ancient Pythian oracle at Delphi, on Mt. Parnassus, acquired a commanding pre-eminence. Finally Apollo, as the god of whatever is bright and fair, was considered to be the author of musical inspiration. As such he is the inventor of the lyre and the leader of the nine Muses. His largest Greek temple was at Miletus in Ionia. The Ionians made him the progenitor of Ion, the founder of their race. The island of Delos was represented to be the place of his birth, with his twin sister Artemis (Diana). Their parents were Zeus (Jupiter) and Leto (Latona). Delos remained sacred to Apollo, and was spared by the Persians, who must have identified the Delian Apollo with their own Ahuramazda (Ormuzd). The official recognition of the worship of Apollo in Rome dates from 429 B. C.

Apollo in Art.—Augustus, who ascribed his victory at Actium to Apollo's favor, erected a magnificent temple on the Palatine Hill. It contained one of his most spirited and widely famed statues, the work of the celebrated Skopas. A copy of it in the Vatican Museum shows the god in long robes, striking the strings of his lyre with both hands. The delicacy of the features causes many visitors to take the statue for a female figure. It is possible that the beautiful Pourtalès head, in the British Museum, with its rich topknot of luxuriant hair, and its perfect oval face suffused with a tender melancholy, better reproduces the exquisite original of Skopas. That a kindred conception of Apollo obtained from the earliest times is shown by the Homeric hymn to Pythian Apollo, and by a relief many times reproduced with studied quaintness, on which Apollo appears in the garb of the Pythian lute-player, welcomed by the goddess of victory. An early relief from Thasos, now in the Louvre, exhibits Apollo with the lyre, and clad in long garments, crowned victor by one of the Graces. The date is about 475 B. C. Even earlier are paintings on Greek black-figured ware, on which Apollo appears in the same ornate dress, bearded, and with long curls, striking a huge lyre. Totally different is the conception of the early statues, in which the god is represented as the patron of athletic exercises. A considerable number of these, dating from the sixth century B. C., has been unearthed on the islands and mainland of Greece, as at Thera and Naxos (Cyclades), Tenca (near Corinth), and Orchomenos (Bœotia); also elsewhere in Bœotia, and at Actium. These nude figures, of rigid pose, awkward execution, and little facial expression, mark the struggle of the Greek chisel with the great difficulties of the nude male form. In the absence of any attributes they have been held to portray human athletes; the dedication is, however, commonly to Apollo. Akin to these was the bronze Apollo of the artist Kanachos, at Miletus. The nude god stood with a bow in one hand and a stag or doe on the other. The Payne Knight statuette in the British Museum is a reproduction of this, as indicated by types on the coinage of Miletus. The Strangford marble in London and another discovered in the theater at Athens show the skillful transformation of this type by Attic artists at the beginning of the fifth century. Pythagoras of Rhegium in Italy modeled an Apollo as the divine archer in combat with the Pythian serpent. A notable extant figure of Apollo, which tradition ascribes to Alkamenes, occupied the center of the western gable of the temple of Olympia. Here Apollo is quelling the wild and ruthless Centaurs in behalf of his *protégés* Peirithoös and Theseus. A Neapolitan bronze of affected primitive quaintness shows Apollo as the "far shooter" of prayers and hymn, advancing with bow in hand and arrow strung. His only garment is a light hunter's cloak. The taste and skill of the fourth century found its expression in the above-mentioned statue by Skopas and in a number of graceful creations by Praxiteles. Such were his Apollo at rest and Apollo in action, of which good copies exist; the latter shows the god in the act of piercing a lizard which is crawling up the tree trunk against which he leans; the former, known as the Apollino, represents his exceedingly youthful figure in a pose full of languid grace, also leaning against a laurel tree. Several

temple statues by Praxiteles grouped Apollo with Leto and Artemis, his mother and sister. The third century, while no doubt elaborating and reproducing the types already crystallized, was stimulated to a more heroic conception of Apollo by the stirring event of an invasion of Greece by the Gauls under Brennus, in 278 B. C. The original of the much admired Apollo of the Belvedere in Rome was fashioned and dedicated at this time. It is proved by two bronze statuettes that Montorsoli's restoration of the god as an archer is wrong. He really held an ægis with which he terrifies the enemy exactly as described in the *Iliad*. Of similar character is the splendid figure of Apollo among the Pergamene bas-reliefs recently set up in the Berlin Museum. Attention should also be called to the figures and heads of Apollo on Greek coins, many of which are of great beauty. The ordinary attributes of Apollo are lyre, bow and quiver, laurel branch or wreath, and among animals the swan. In modern art Apollo figures as the leader of the Muses (so in Raphael's Vatican fresco), and as driver of the solar chariot (so in Guido Reni's equally celebrated ceiling fresco of the Rospigliosi Palace). His pursuit of Daphne, and her transformation into a bay-tree, is also a favorite subject of Italian art. The figure of Apollo is nowadays frequently used as a personification of art or music, and sometimes appears coupled with one of Minerva as the patroness of science.

ALFRED EMERSON.

Apollo: borough; Armstrong co., Pa. (for location of county, see map of Pennsylvania, ref. 4-B); on Pa. R. R. and Kiskiminetas river; in coal-mining district; has rolling-mills, foundry, steel-works, etc. Pop. (1880) 1,156; (1890) 2,156.

Apollodo'rus (Gr. Ἀπολλόδωρος): a celebrated Greek painter, surnamed THE SHADOWER; was b. at Athens about 440 B. C. He was a rival of Zeuxis, the founder of a new school, and the reputed inventor of chiaroscuro. His works are highly praised by Pliny, who says he was the first who painted objects as they really appear.

Apollodorus of Athens: grammarian and historian of the second century B. C.; was a pupil of Aristarchus. Only fragments of his numerous works remain. See Müller, *Fragmenta Historicorum Græcorum*, i. 428-469. To Apollodorus is attributed a manual of mythology entitled *Bibliotheca*, a large part of which is extant, and which has its value. Others assign it to a compiler of the second century A. D. Edited by Heyne (2 ed. 1803), and by Westermann in his *Mythographi Græci*.

B. L. G.

Apollodorus of Damascus: architect; b. at Damascus; lived about 100 A. D. He was patronized by Trajan, and erected in Rome numerous works, among which were the Basilica Ulpia, the Forum of Trajan, and the Column of Trajan, which is still extant. His capital work was a noble bridge over the Danube, near the mouth of the Aluta, built in 105 A. D. He was put to death about 128 A. D. by Hadrian, whom he had offended by criticising a temple which that emperor had designed.

Apollo'nia (Gr. Ἀπολλωνία): an ancient city of Illyricum, on the Adriatic Sea, about 40 miles S. of Dyrrhachium. It was founded by colonists from Corinth and Coreyra, and became an important city. The site is now occupied by a village called Polina or Pollina, and some ruins of temples.

Apollo'nus: Athenian sculptor; son of Nestor. His date is unknown, and nothing is known about him but that he executed the marble statue of Hercules, of which a large fragment, called the Torso of the Belvedere, is now in Rome. From the style of the work, and the form of the letters inscribed upon it, this statue may be ascribed to the first century A. D. It is one of the most important pieces of ancient sculpture existing.

Apollonius (surnamed DYSCOLUS the Crabbed): an eminent Greek grammarian of Alexandria (120-160 A. D.), was the father of Ælius Herodian. Of his many works a *Treatise on the Syntax of the Parts of Speech* and three others are extant. He had rare insight for his times, and Priscian calls him *maximus auctor artis grammaticæ*. Recent edition by Schneider and Uhlig. See Egger, *Apollonius Dyscole* (1854).

Apollonius (surnamed PERGÆUS): Greek geometer; b. at Perga, in Pamphylia, about 250 B. C. Little is known of his life, except that he resided in Alexandria in the reign of Ptolemy Philopator (222-205 B. C.). His most important work is a Greek *Treatise on Conic Sections*, in eight books,

which is extant except one book. He wrote other works, which are lost. He was also distinguished as an astronomer.

Apollonius Mo'lon: Greek rhetorician; b. at Alabanda, in Caria. He taught rhetoric at Rhodes and Rome, which he visited in 81 B. C. Cicero and Julius Cæsar were his pupils soon after that date.

Apollonius of Rhodes (280-203 B. C.): the most eminent of the Alexandrian epic poets. B. at Alexandria or Nau-cratis, he became the pupil and afterward the enemy of Callimachus. In consequence of this feud he betook himself to Rhodes, whence his surname. After the death of his rival he returned to Alexandria, where he finally became chief librarian. His *Argonautica*, or Story of the Argonauts, in four books shows great learning, great ingenuity, and a remarkable command of epic diction. Apollonius is rich in new expressions, new figures, new comparisons; he describes vividly, and his portrayal of emotions has elicited great applause, so that he was not unworthy of the admiration and imitation of the Romans, in spite of his lack of unity and his lack of reality. Ed. by Merkel (1854). See Couat, *La Poésie Alexandrine* (p. 293 foll.).

B. L. GILDERSLEEVE.

Apollonius the Sophist: a grammarian of Alexandria; about 100 A. D. His lexicon of Homeric glosses, based on Aristarchus and Apion, is extant. Ed. by Bekker (1833).

Apollonius of Tralles: Greek sculptor; lived probably about 200 B. C. Aided by his brother Tauriscus, he executed a group of Zethus and Amphiion tying Dirce to the horns of a bull. Some persons identify this with the group called *Toro Farnese* which is now at Naples.

Apollonius of Tyana (Gr. Ἀπολλώνιος Τυανεύς): a Pythagorean philosopher; b. at Tyana, in Cappadocia, lived about 30-70 A. D. He performed a journey to India in order to learn the doctrines of the Brahmans, and after his return gained a high reputation as a sage, an oracle, and a worker of miracles. He is considered by some authors as an impostor, and by others as a prophet or magician of extraordinary powers. He traveled extensively in Europe and Africa, and is said to have passed his latter years at Ephesus. But to disengage the real Apollonius from the romance of Philostratus (*q. v.*) is quite impossible. In addition to Baur (1832) and J. H. Newman (1853), see the authors cited in Gildersleeve's *Essays and Studies*, p. 251. Also L. Dyer, *The Gods in Greece* (1891), p. 257. The 100 letters under his name in Hercher's *Epistolographi Græci*, pp. 110-130, are doubtless spurious.

Apollonius of Tyre: See ROMANCES.

Apol'los: an eloquent preacher among the early Christians; was originally a Jew and a native of Alexandria. He is said to have been ordained Bishop of Corinth. See Acts xviii. 24; 1 Corinthians i. 12; iii. 4.

Apol'lyon [Gr. Ἀπολλύων, from ἀπολλύω, destroy]: the destroyer. The name answers to the Hebrew *Abaddon* (*q. v.*), and to the *Asmodeus* of Tobit.

Apologetics [from Gr. ἀπολογητικός, fit for defense; ἀπό, off + λέγειν, speak]: that branch of learning which treats of *Apology*. In this use the term apology does not, as in its popular use, imply an acknowledgment of error, but simply denotes the formal defense of a person or a doctrine that has been attacked. It is principally employed as the name of a branch of Christian theological learning, namely, the literary defense of Christianity and its doctrines. Some distinguish between apologetics as concerned with the methods of this defense and apology the defense itself, but it is more in accord with usage to speak of the two as theoretical and practical apologetics.

Its Place among the Departments of Theological Study.—There is a sense in which it is true that apologetics precedes dogmatics and practical religion. That is, there is a sense in which Christianity should be proved to be true, in order to justify its being systematically studied and practiced. But as a matter of ordinary fact, Christian people accept their religion as an element in life and society, on the testimony of others who have previously accepted it, combined with evidence from their own observation and experience, and are not interested either to define the doctrines of Christianity, or to study the literary defense of it, until after they have been thus convinced of its truth. In other words, they treat this problem as men of good sense treat other great problems of life, accepting evident truth as true, even

when they have to postpone the logical definition and demonstration of it.

Classifications.—Treatises in general apologetics take up the defense of Christianity as a whole; work in special apologetics is the discussion of the objections to each particular doctrine, as a part of the discussion of that doctrine. With all advance in thorough study, special apology gains in relative importance.

With reference to the materials used, apologetics may be classified as philosophical and historical or critical, though, in a large part of the field, the two kinds of material are used in combination. Purely philosophical are the arguments drawn from psychological and metaphysical considerations in proof that man is capable of knowing God and the supernatural. Partly philosophical and partly historical are the various arguments in proof that, as a matter of fact, God actually is known to exist and to reveal himself. In this class are included, notably, arguments from manifestations of design in nature, arguments from natural analogies, arguments from the comparative study of religions. More strictly historical are the arguments drawn from the history of the Israelitish and Christian religions (or, better, religion), as compared and contrasted with other religions, and the whole body of argument by which the character of the Bible, as a divine revelation, is vindicated.

With reference to its practical methods, apologetics may be classified as polemic or scientific, without implying, however, that one of these classes necessarily excludes the other. The principal aim of the polemic apologist is to defeat adversaries whom he has directly in mind. He attacks that which attacks Christianity. He lays out his strength in disproving accusations, or in showing some adverse position to be untenable. The scientific apologist, on the other hand, undertakes to vindicate positively the truth of Christianity, without so much regard to particular attacks upon that truth. He aims to establish the position of the Christian religion in the great cycle of possibly knowable truth, aware that, just in proportion as this is recognized, all particular attacks will fail of themselves. In proportion as an apologist is merely polemic, he avoids definitions, lest an adversary should take advantage of some imperfect definition. In proportion as he is scientific, he defines carefully, knowing that tenable positions are made stronger by abandoning untenable positions.

The History of Apologetics.—The defense of Christianity, particularly its polemic defense, changes character with the changing attacks made. Three periods, however, may be distinguished in the history of Christian apologetics, apology beginning in each period in polemic form, and advancing by stages to a more scientific form. The first period is that of the APOLOGETIC FATHERS, extending through the first five centuries. First come such men as Aristides and Justin Martyr, refuting the charges brought against Christians by Jews and pagans, then such men as Tertullian, Origen, and Clement of Alexandria, adding a constructive element to the mere negative apology, and then men like Eusebius and Augustine, giving the apology the form of a full theory of Christianity, according to the scientific standard of those times. The second period extends from the sixth century to the fifteenth. As the church is established by law, and its authority is undisputed, it has no great need of literary defense. But during these centuries such men as Agobard of Lyons and Rainund Martins wrote elaborate polemics against Jews and Mohammedans, and such men as Thomas Aquinas developed a new statement of the philosophy of Christianity. In these two periods apologetics had chiefly to do with attacks on Christianity from without. But during the third period, beginning with the Reformation of the sixteenth century, the defense has been mainly against skepticism, agnosticism, or other forms of adverse criticism from within. Apologetic writings have abounded, and group themselves according to the various controversies that have raged, such as the deistic controversy in Great Britain and others. In the latter part of the nineteenth century apology, though still abundantly polemic, is yet strongly tending toward forms more strictly scientific than have hitherto prevailed.

Literature.—A library of Christian apologetics would include many thousands of volumes and smaller works. The great works on theology all include treatments of apologetics. In these, and in the articles in special encyclopædias (for example, the Schaff-Herzog *Encyclopædia of Religious Knowledge*, or the *Cyclopædia* of McClintock and

Strong), lists of works are given, the lists in some instances covering several pages. For the earliest period see any set of the Patristic writings. Perhaps the greatest works of the middle period are Agobard, *De Insolentia Judæorum* (822); Martius, *Pugio Fidei* (1278, accessible in Ugolino); Abelard, *Dialogue between a Philosopher, a Jew, and a Christian* (early in the twelfth century); and works of Alexander de Hales, Albertus Magnus, Duns Scotus, and Thomas Aquinas. Among the multitude of apologetic works of the eighteenth century few have been more widely read than Bishop Butler's *Analogy* and Paley's *Natural Religion; Evidences of Christianity*; and *Hore Paulinae*. It is hardly possible to mention a few more recent works without seeming invidious. Dr. Herrick Johnson's little book, *Christianity's Challenge* (1881 and later eds.), is a particularly good popular treatise. In philosophical apologetics, Bushnell's *Nature and the Supernatural* (1858); G. P. Fisher's *Supernatural Origin of Christianity* (revised ed. N. Y., 1870); Flint's *Theism*; and *Antitheistic Theories* (Edinburgh, 1877-78), deserve mention, along with works, perhaps equally important, by McCosh, Schaff, Christlieb, and others. Albert Barnes, Stanley Leathes, and many others have newly presented the historical evidences. Kurtz, Hugh Miller, Sir William Dawson, Tayler Lewis, and many others have treated of the proofs from astronomy and natural science. And more voluminous than all the others are the recent works of critical authors of different schools touching the character of the Bible, and thus touching the domain of historical apologetics. A compendious and comprehensive treatise is A. B. Bruce's *Apologetics* (Edinburgh and New York, 1892). WILLIS J. BEECHER.

Apology of the Augsburg Confession: one of the symbolical books of the Lutheran Church, written by Melancthon in answer to the *Confutation of the Augsburg Confession* by the Roman Catholic theologians Eck, Faber, Wimpina, and Cochlaeus. It was written in Latin and first published in April, 1531. A German translation by Justus Jonas appeared six months later. It is a more elaborate treatment of the topics contained in the *Confession*, and combines clearness of definition and vigor of argument with a mild and conciliatory spirit, and a chaste and classical style. A translation from the Latin is found in Jacobs's *Book of Concord* (Philadelphia, 1882); one from the German translation in the Henkel edition of *Book of Concord* (New Market, 1854). The best commentary is *Die Apologie der Augustana geschichtlich erklärt von Gustav Plitt* (Erlangen, 1873). HENRY E. JACOBS.

Apophyllite [from Gr. *ἀπό*, off + *φύλλον*, leaf]: a zeolitic mineral with a lamellar structure; is so called because it exfoliates before the blowpipe. It is a hydrated silicate of lime and potash occurring in square prisms, the solid angles of which are sometimes replaced by triangular or rhombic planes. It is brittle, and has a white or grayish color, often tinged with green, yellow, blue, or red. It is found in beautiful crystals in the Hartz Mountains, in Poonah, and in the Bergen tunnel at Jersey City.

Ap'oplexy [from Gr. *ἀποπληξία*: *ἀπό*, off (to completion) + *πλήσσειν*, strike; cf. Eng. *stroke* (of apoplexy or of paralysis)]: a disease marked by the sudden failure of volition, sensation, motion, and mental action, the symptoms being caused by a pressure upon the brain, or disturbances of the circulation, originating within the cranium. Apoplexy is produced in various ways, though the symptoms are similar. The typical form is characterized by hæmorrhage into the substance of the brain. The rupture itself may be caused (1) by a non-inflammatory, fatty degeneration of the blood-vessel, caused by bad nutrition, etc.; (2) by a brittle condition or aneurismal dilatation of the vessel, resulting from an inflammatory process. These causes may be supplemented by a full habit of body or by a hypertrophied heart, or both; and it is easy to see how such secondary causes might assist in the rupture of a weakened blood-vessel. Apoplexy may, however, be produced by an extravasation of blood between the meninges, by a sudden serous effusion into the ventricles of the brain, by stoppage of circulation, by emboli or thrombi in the blood-vessels, or even by a congestion (hyperæmia) of the brain. The apoplectic stroke may end in partial recovery or in speedy death. Cases not fatal generally result in permanent or temporary paralysis of one side of the body (hemiplegia), often on the side opposite that in which the mischief has occurred.

The symptoms of apoplexy are often unexpected. The patient falls suddenly (with or without an outcry), his respi-

rations are long, slow, and stertorous, the pulse is slow, one or both the pupils usually small. If the patient does not die during the attack, a secondary inflammation follows which may destroy life. Bleeding may be resorted to if the pulse be strong, and the heart and lungs in good condition, but it is often injurious. Mustard to the extremities and frictions of the skin should be resorted to, and the bowels should be moved by enema. Persons having reason to fear apoplexy should avoid excesses of all kinds, yet live upon nutritious food, paying special attention to hygienic conditions.

Revised by WILLIAM PEPPER.

A Posteriori and **A Priori**: Before the time of Kant the former of these terms denoted a reasoning from effect to cause, and the latter a reasoning from cause to effect. Since Kant's time, and owing to his influence and that of his school, these terms are generally used more in relation to the doctrine of knowledge; a *posteriori* knowledge being empirical knowledge, or knowledge through experience, and a *priori* knowledge being rational knowledge, or a knowledge through the reason of that which is prior to experience. See ONTOLOGY and PHILOSOPHY.

Apos'tle [from Gr. ἀπόστολος, one sent forth; ἀπό, away + στέλλειν, send]: literally, "one sent," especially a "delegate"—e. g. in care of a collection; so Philo calls the persons sent to carry the tithes of the Dispersion to Jerusalem "apostles." In the New Testament the term is applied (1) to men divinely sent before Christ (Luke xi. 49); (2) to Christ himself (Heb. iii. 1); and (3) to church delegates—very much in the Philonian sense (Rom. xvi. 7; 2 Cor. viii. 23; Phil. ii. 25). The commonest application, however, is (4) to the twelve whom Jesus chose and sent to preach his religion (Luke vi. 13), viz.: Simon Peter, Andrew, James, John, Philip, Bartholomew (Nathanael), Thomas, Matthew, James the son of Alphæus, Thaddeus, Simon the Canaanite, and Judas Iscariot. There was no express command to keep up their number, yet it was doubtless approved of all to elect one to fill the vacancy caused by the suicide of Judas Iscariot. No successors of the twelve were in the nature of the case possible. When Paul had demonstrated his capacity as a preacher he was allowed to call himself the apostle to the Gentiles. Paul claimed that his commission was as much from Jesus as that of any of the other apostles. But this is really to use the term in a sense divergent from the primitive one. In this latter sense (5) Paul and Barnabas (Acts xiii. 1-3) were both apostles, sent by the Holy Spirit, and are so called afterward. The term was still further extended (6) to include the seventy disciples, and even Clement of Alexandria and others. Among the first disciples the chief requisites for an apostle were (1) that he should be the personal choice of Christ and (2) be a witness to the resurrection of Jesus. So Matthias was an apostle, as the use of the divinely directed lot rendered him the choice of the Lord, and he could testify to the empty tomb and to the appearance of the risen Lord.

Apostles, Acts of the (Gr. Πράξεις τῶν Ἀποστόλων): fifth book of the New Testament, written by Luke, containing the history of the period from the ascension of our Lord to the first captivity of Paul in Rome; that is, in all probability, from 30 to 63 A. D. It is proper to observe that though this portion of the Scriptures is styled the Acts of the Apostles it treats only of the acts of Peter, Paul, and James; and of these, only Paul's career is narrated fully and connectedly. The book is avowedly a continuation of the third Gospel, and, though restricted within such narrow limits, may be said to give those great events in the history of the apostles in which the Christian Church would naturally feel the greatest interest. It is a history of the founding of the Christian Church among the Jews (the work chiefly of Peter) and among the Gentiles (the work chiefly of Paul). Among these events the pouring out of the Holy Spirit at Pentecost, the martyrdom of Stephen, and the conversion of St. Paul, as well as most of his subsequent journeys and labors, are fully related. The best commentaries on Acts are by Lechler (in Lange's *Biblework*), Meyer, Hackett, and Gloag.

Apostles' Creed (Lat. *Symbolum Apostolicum*): called also the Creed or Confession of Faith; the most universal creed of the Christian Church. It is as follows: "I believe in God the Father Almighty, Maker of heaven and earth: And in Jesus Christ his only Son our Lord: Who was conceived by the Holy Ghost, Born of the Virgin Mary: Suffered under Pontius Pilate, Was crucified, dead, and buried: He descended into hell [or hades], The third day he rose again from the dead: He ascended into heaven,

And sitteth on the right hand of God the Father Almighty: From thence he shall come to judge the quick and the dead. I believe in the Holy Ghost: The Holy Catholic Church; The Communion of Saints; The Forgiveness of sins; the Resurrection of the body; And the Life everlasting. Amen." According to a tradition prevailing in the fourth century, but now generally discredited, this creed was composed by the apostles themselves, each contributing one of the articles. Some churches omit the clause, "He descended into hell," asserting that it was not a part of the original creed. In the American Prayer-Book (Standard of 1892) the rubric is as follows: "*And any churches may instead of the words, He descended into hell, use the words, He went into the place of departed spirits, which are considered as words of the same meaning in the Creed.*" See CREED.

Revised by W. S. PERRY.

Apostles' Islands, or the Twelve Apostles: a group of twenty-seven islands in Lake Superior, 70 miles W. of Ononagon (see map of Wisconsin, ref. 1-C). The principal islands are Ile au Chêne, Madeline, Bear, Stockton, and Outer island. The islands belong to Wisconsin. They are covered with fine timber, and their cliffs have been worn into strange forms by the action of the waves. The land area is estimated at 200 sq. miles. Brown sandstone is quarried and exported from the islands. La Pointe, on Madeline island, was formerly the capital of Ashland co., Wis. This place was settled by the French in 1680. The Jesuits established very early several missions on these beautiful islands.

Apostolic, or Apostolical: a general epithet applied to everything directly derived from, or bearing the character of, the apostles. The Roman Catholic Church styles itself the Apostolic Church, and the papal chair is called the Apostolic chair, because the pope is supposed to be the legitimate and lineal successor of Peter, the chief apostle. The Church of England claims to be apostolic in virtue of regular episcopal ordination from the Church before the Reformation; so also do the Protestant Episcopal churches in Scotland and the U. S. Several churches of Jerusalem, Antioch, Ephesus, Corinth, and Rome, which were the special scenes of the labors of the apostles, were called apostolic churches. With the increasing power of the Roman Catholic Church the word apostolic was more exclusively applied to whatever belonged to that Church, as Apostolic See, Apostolic Canons, etc.

Apostolic Canons and Constitutions: notes of ecclesiastical customs regarded as apostolic. The Apostolic Constitutions (*Constitutiones Apostolicæ*) consist of eight books, the first six of which contain a comprehensive rule for a Christian life. These are supposed to have been written about the end of the third and beginning of the fourth century. The Apostolic Canons (*Canones Apostolici*) were composed at a later period. The first fifty, translated from Greek into Latin by Dionysius Exiguus, were acknowledged by the Latin Church alone. The Greek Church accepted the thirty-five canons put forth early in the sixth century; and this became a point of dissension between the Eastern and Western churches. The Apostolic Constitutions have been ascribed by some writers to Clement of Rome. In them, as Bishop Lightfoot (*Apostolic Fathers*, pt. i. S. Clement of Rome, i. 100, 101) states, "the apostles are represented as communicating to Clement their ordinances and directions for the future administration of the Church." The Apostolic Canons "may be regarded as a corollary to the Constitutions."

Revised by W. S. PERRY.

Apostolic Fathers: the disciples and fellow-laborers of the apostles, especially those who have left writings. They are Barnabas; Clement of Rome; Ignatius, Bishop of Antioch; Polycarp, Bishop of Smyrna; Hermas; and Papias of Hierapolis. Some also include the author of the epistle to Diognetus among these Fathers. Cotelerius (Paris, 1672) issued an edition of the works of the Apostolic Fathers, which was improved by Clericus in 1698, and again in 1724. Of recent editors, the best are Jacobson (1838; 4th ed. 1866), Hefele (1839; 5th ed. 1878), and Dressel (1857; reissued 1863). Another edition, by Gebhardt, Harnack, and Zahn (1876, 1877, 1878). The late Bishop of Durham, Dr. Lightfoot, published (1890) *The Apostolic Fathers*, a revised text, with introductions, notes, dissertations, and translations, in five octavo volumes. The translations were reprinted in one volume (1892). Another translation is found in the Ante-Nicene Christian Library, vol. i.

Revised by W. S. PERRY.

Apostol'ici, or **Apostolic Breth'ren**: a sect of religious reformers who originated in Italy in the latter part of the thirteenth century, and had for their leader Gherardo Segarelli, of Parma. They traveled over Italy, France, and Switzerland, preaching the duty of renouncing worldly ties, property, etc. Having denounced popery, they were condemned by Pope Honorius IV., and Segarelli was burnt at the stake (1300). His place was filled by Dolcino, formerly a priest of Milan, who, after a brave resistance, was, with his adherents, taken by the forces of the pope, and perished at the stake in 1307.

Apostolic Majesty: a title of the Kings of Hungary; first conferred on the Duke of Hungary by Pope Sylvester II. in 1000 A. D. The title was renewed in 1758 by Pope Clement XIII. in favor of Maria Theresa.

Apostolic Par'ty: a party of fanatical Spanish Catholics, formed about 1820 for the promotion of an absolutist political policy. Their leaders were priests. In 1830 they merged themselves into the Carlist party.

Apostolic Succession: the uninterrupted succession of bishops, priests, and deacons (the apostolic orders) from the first apostles down to the present day. The Roman Catholic, Greek, Oriental, and Anglican churches consider this historical and essential. See ROMAN CATHOLIC CHURCH, ENGLAND, CHURCH OF, and GREEK CHURCH.

Apostool', SAMUEL: Dutch Mennonite theologian; b. in 1638. He became in 1662 a minister of a Waterlandian congregation in Amsterdam. He and Galenus engaged in a doctrinal dispute which divided the Church into two sects, Apostoolians and Galenists. D. about 1700.

Apos'trophe [Gr. ἀποστροφή, a turning away; ἀπό, away + στρέφειν, turn]: in rhetoric, a digressive address; a figure of speech by which the orator suddenly changes the course of his oration, and addresses with emotional emphasis a person present or absent, or some inanimate object. Frequent examples of it occur in the speeches and writings of great orators and poets.

Apoth'ecary [from Lat. *apotheca'rius*, storekeeper, from *apotheca*, loan, from Gr. ἀποθήκη, storehouse]: a person who compounds and sells medicines, and makes up medical prescriptions. The profession of an apothecary in England may be not incorrectly described as an inferior branch of the medical profession. He is legally entitled to attend sick persons and prescribe for them, as well as to make up and dispense medicines. It is not, however, usual for him to prescribe medicines to be prepared and supplied by others. But, although he may attend sick persons and prescribe for them, he can not charge both for his attendance and his medicines, but must make his election between the two. Although, therefore, the apothecary is inferior in professional rank and authority to the physician and surgeon, he is considered to be of a higher grade than the chemist and druggist, who merely vends drugs and medicinal compounds, but whose qualification, beyond the payment of a small annual tax by way of license, does not necessarily offer any test or guarantee of skill. The rules of the Pharmaceutical Society of Great Britain, incorporated in 1843 by royal charter, and the powers of which were considerably enlarged by a statute passed on June 30, 1852, operate as some restraint on ignorance and want of skill. Apothecaries and grocers (like surgeons and barbers) were in England and other countries formerly members of the same guild, and hardly distinguishable from each other. They were chartered as one company in London in 1606, but in 1617 James I. granted the apothecaries a charter as a separate corporation.

In the U. S. the vocation of the apothecary is mostly quite distinct from that of the medical practitioner. Among physicians it is generally regarded as contrary to professional ethics for a practitioner, in large cities at least, to be directly interested in the retailing of medicines. The education of pharmacists in the U. S. has greatly advanced of late years. Many of them are now graduates of colleges of pharmacy (the most important of which are in New York and Philadelphia), wherein excellent scientific and practical training is obtained. There is also a well-organized national pharmaceutical association. To limit the danger connected with the unskillful dispensing of drugs, a law has been put in force in New York and other States requiring all apothecaries to pass a rigid examination.

Apothe'osis [Gr. ἀποθέωσις, deification; ἀπό, off (to completion) + θεῖν, make into a god (θεός)]: a Greek word meaning deification, or the practice of raising a human be-

ing to a place among the gods. This practice was common among the ancient Greeks, who deified and worshiped heroes and benefactors after their death. Among the Romans, Romulus was the first who received such an honor, and Julius Cæsar appears to have been the second. Alexander the Great sent to all the states of Greece an order that they must recognize his divinity, and received from Sparta this laconic answer: "Since Alexander desires to be a god, let him be (or become) a god!" Several Roman emperors apotheosized themselves and their favorites.

Appalach'ee Bay: a large open bay near the northern part of Florida; is a part of the Gulf of Mexico, and is about 30 miles S. of Tallahassee. It extends inland about 50 miles.

Appalachees: See MUSKHOGEAN INDIANS.

Appalachian Mountains: the chain of mountains traversing the eastern part of the U. S. from Maine to Alabama. It is composed for the most part of a large number of ridges or small ranges, parallel with one another, with the Atlantic coast, and with the axis of the chain. The general trend is S. W. Prominent members of the chain are the White Mountains of New Hampshire, the Green Mountains of Vermont, the Adirondack and Catskill Mountains and the Highlands of New York, and the Alleghany Mountains of Pennsylvania and West Virginia. In part of Pennsylvania and in Virginia the most easterly range is called the Blue Ridge, and in North Carolina this region adjoins a broad mountain mass, the Great Smoky range, including the highest peaks of the chain. The culminating points are Mt. Mitchell, N. C., 6,688 feet, and Mt. Washington, N. H., 6,293 feet. S. of New York the subordinate ridges are remarkably uniform in outline and height, and in general long and closely parallel; and they are separated by valleys equally long, parallel, and simple in configuration. One valley, broader than the others, is of great length, extending from Alabama to Pennsylvania. It is locally known as the Coosa valley, the Great valley of Tennessee, the Great valley of Virginia, and the Cumberland valley, and is sometimes called collectively the Great Appalachian valley.

The constituent geological formations range in age from the Archean to the Coal-Measures, including representatives of each of the Paleozoic periods. In a general way, the older rocks lie nearer the coast and the younger toward the N. W., but to this there are exceptions. In New England all the Paleozoic rocks are metamorphic, and have not yet been fully discriminated from the older crystallines. From Pennsylvania southward the great valley divides the chain into two belts, of which the northwestern contains Paleozoic strata with little metamorphism, but greatly folded and faulted, and the southeastern contains crystalline rocks, of which a portion are metamorphic Paleozoic, and other portions are of greater age. The principal folding of the strata took place during and at the close of the Paleozoic era, when they were crowded together by forces acting in a N. W. and S. E. direction. The amount of compression in that direction is believed to have been from 5 to 15 miles, and the rocks were not only forced into a parallel system of huge wrinkles, but were in many places fractured and made to slide over one another. The resulting mountains may have had great magnitude, but in the geologic ages that followed they were almost completely worn away by the untiring action of rains and rivers, the country being reduced to an approximate plain, above which projected a few low ridges, marking the outcrops of the most enduring rocks. Subsequently the whole region was upraised bodily, apparently without renewal of the folding process, and from the plateau thus formed the rains and rivers of the last geologic periods have carved the existing chain. Wherever a soft or a soluble rock was exposed at the surface a valley was made, and the outcrops of hard rocks were left as the existing ridges. The great Appalachian valley marks the position of a broad belt of Cambrian and Silurian limestones. If we date the Appalachians from the folding of their strata, they are among the older of the mountain systems of the earth; if we date them from the time of their relifting and final sculpture, they are comparable in age with the Sierra Nevada, the Alps, and the Rocky Mountains.

The leading minerals derived from the chain are coal, iron, manganese, copper, zinc, marble, and slate. See *Physical Structure of the Appalachian Chain*, by H. D. and W. B. Rogers (*Amer. Jour. Science*, 1st ser., vol. xlv.); and *The Appalachian Mountain System*, by Arnold Guyot (*Amer. Jour. Science*, 2d ser., vol. xxxi.). G. K. GILBERT.

Ap'palachico'la: a river, formed by the union of the Chattahoochee and Flint, at the S. W. extremity of Georgia. It flows southward through Florida, and after a course of 100 miles enters Appalachicola Bay, a part of the Gulf of Mexico. It is navigable for steamboats.

Appalachicola: city and port of entry; 85 miles S. W. of Tallahassee; capital of Franklin co., Fla. (for location of county, see map of Florida, ref. 3-E); on river of same name, at its point of entrance into St. George's Sound, a part of the Gulf of Mexico. It has a large trade in timber and fish. Pop. (1880) 1,336; (1895) 3,061.

EDITOR OF "TIMES."

Appalachicola Bay: in the State of Florida; is situated in the N. E. part of the Gulf of Mexico, between St. George's island and the mainland, at the mouth of Appalachicola river.

Appanage: See APANAGE.

Appara'tus Sculpt'oris (the *Sculptor's Workshop*): a constellation situated immediately east of the large star Fomalhaut. It hardly rises above the horizon in the northern hemisphere.

Appa'rent [from Lat. *appa'rens*; part. pr. from *appa'reo*, appear]: that appears to the eye, in distinction from true or real. This word is used in astronomy to express several important distinctions, as "apparent time," which is indicated by the sun, and differs from true time. The apparent magnitude of a heavenly body is the dimension of the angle formed by two lines drawn from the ends of its diameter to the spectator's eye. The apparent diurnal motion of the sun and moon is an optical illusion caused by the rotary motion of the earth, and the real motion of the moon is contrary to its apparent motion. An heir-apparent to a throne is a person whose title is better than any other except the actual occupant of the throne, and whose succession does not depend on any contingency if he survive the reigning monarch.

Appari'tion [Lat. *appari'tio*, an appearance; see APARENT]: literally an appearance or appearing; in common language a specter, a ghost, a visible spirit. In astronomy it means the first appearance of a heavenly body after it has been eclipsed or obscured. Stars which appear to revolve around the pole, and which never set below the horizon, are said to be within the circle of perpetual apparition, which circle grows larger and larger in proportion as the spectator approaches the pole.

Appar'itor [Lat., attendant, from *appare're*, wait upon]: among the ancient Romans one of the officers or public servants who attended the magistrates and judges, including heralds, lictors, scribes, etc. In England the term is applied to the officer of an archiepiscopal, episcopal, archdiocesan, or other ecclesiastical court whose duty it is to summon persons to appear before the judge. It is also applied to the beadle of a university, who carries the mace, as well as to a messenger of a spiritual court, who serves its process.

Appeal [from Lat. *appello*, call]: in law, an accusation of a private citizen against another of some heinous crime, demanding punishment for the peculiar injury suffered, rather than for the offense against the public. This proceeding has been entirely abolished in England, and does not exist in this country. The word also means the removal of a cause from an inferior to a superior court for the purpose of obtaining a review and retrial of the case. It differs from a *writ of error* and a *certiorari*, inasmuch as they merely bring up for review the questions of law involved in the proceedings in the lower court, while by an appeal the questions both of law and fact may be re-examined. In a popular sense, the word signifies the removal of a cause, or of a proceeding in a cause, from an inferior to a superior court for the purposes of review, by whatever means effected. Codes of procedure in a number of States abolish writs of error in civil cases, and establish a review by appeal in all actions, whether of a common-law or equity nature. The word "appeal" is used in parliamentary law to indicate the mode of questioning the decision of the presiding officer as to a parliamentary rule.

Appear'ance [ultimately from Lat. *appareo*, be seen]: in law, the act by which a party to an action brings himself, or is brought, into court, usually applied to the defendant. Appearance is either voluntary or compulsory. It is said to be voluntary when no process has been served. It is also special or general. It is said to be special when made for

special purposes, not extending to the entire subject of litigation. It is general when absolute and unconditional. A notice of appearance will suffice, or the performance of some act from which an appearance can be inferred, such as serving a pleading. In civil cases it may be made by an attorney as well as by a party. In criminal cases personal appearance of the accused is frequently requisite, particularly in cases of felony.

Appel, THOMAS GILMORE, Ph. D., D. D., LL. D.: minister of the (German) Reformed Church in America; b. in Easton, Pa., Nov. 14, 1829. After graduating from Marshall College he served for some years as teacher, and afterward as pastor. He was president of Mercersburg College, 1865-71, and from 1871 has been Professor of Church History and New Testament Exegesis in the Theological Seminary at Lancaster, Pa. In addition to this work he was president of Franklin and Marshall College, 1877-90, and has edited the *Reformed Quarterly Review* from 1867. He has written much for the press, and has been active in the public work of his Church, in the movements for bringing the two Reformed churches into closer relations, and in the alliance of the Presbyterian churches of the world. W. J. BEECHER.

Appendici'tis: inflammation of the vermiform appendix resulting from obstructions at the mouth of the appendix or from extension of inflammation from the colon. Foreign bodies, such as grape-seeds, are much less important in its causation than was formerly believed. The appendix becomes swollen and filled with pus, and tends to rupture, when general peritonitis may result. Very often, however, inflammatory exudations around the appendix limit the inflammation, even though rupture has occurred.

The onset of appendicitis is usually abrupt, and the patient complains of pain in the right flank, of constipation, and of fever. Vomiting is usually present and may be a distressing symptom. The occurrence of chills and marked fever may indicate the beginning of suppuration, and sudden collapse may denote the occurrence of rupture of the appendix into the peritoneal cavity. A majority of the cases if left to themselves recover, but there is a constant tendency to relapses of the disease. Removal of the appendix by surgical operation is justified in cases of oft-repeated appendicitis, and during acute attacks is often proper or necessary. Medicinal treatment if begun early enough aborts many cases. W. P.

Ap'penzell [i. e. *des Abts Zelle*, the abbot's (of St. Gall) cell]: a canton in the N. part of Switzerland; bounded on every side by the canton of St. Gall (see map of Switzerland, ref. 3-I). In consequence of religious differences it was divided in 1597 into two half cantons—Appenzell Inner Rhodes (Catholic) and Appenzell Outer Rhodes (Protestant). Inner Rhodes has an area of 61 sq. miles, and had in 1894 a population of 12,899. Outer Rhodes has an area of 101 sq. miles; pop. in 1894, 55,616. It consists entirely of a wild mountain country, intersected by narrow valleys. Capital of Inner Rhodes, Appenzell; and of Outer Rhodes, Trogen. The canton was formerly subject to the abbey of St. Gall, gained its independence early in the fifteenth century, and joined the confederation in 1513.

Apperception: as used by Leibnitz, a knowledge that brings with it a reflection of the mind upon itself by which we know such objects as the ego, the soul, self-existence, true substances, spiritual being—in a word, immaterial things and truths. HERBERT (*q. v.*) used apperception to mean the act of recognition, identification or interpretation with which we assimilate what we perceive. In the works of Herbart and his followers this idea becomes of great importance for the philosophy of education. Apperception stands for what we understand and perception for what we only see. It is not what we perceive but what we apperceive that educates us. Kant found in the mind a transcendental act of apperception, while Herbart investigated the apperception which arises through the recognition of what has been formerly perceived in the object before us. W. T. H.

Appian of Alexandria (in Gr. Ἀππιανός): Greek writer of Roman history; came to Rome under Hadrian and was made a procurator by the influence of FRONTO (*q. v.*). In his *Roman History* (Ῥωμαϊκά), written about 160 A. D. in twenty-four books, he forsook the annalistic plan for the method of groups, of which we have those that pertain to the Spanish, Hannibalic, Punic, Syrian, Mithridatic, Illyrian, and Civil wars, about half of the whole. Appian is not critical; his style has no elevation and swarms with Latin-

isms. Ed. by Schweighäuser (1785); critical ed. by Mendelsolm (1881).

Appia'ni, ANDREA: Italian painter; b. at Bosizio, May 23, 1754; imitated the style of Correggio. He is thought to have excelled all the artists of his time in fresco-painting. About 1805 he was appointed court-painter to Napoleon, whose portrait he painted. Among his masterpieces are the frescoes on the ceiling of the royal palace of Milan, and those in the Church of Santa Maria Vergine, in the same city. D. in Milan, Nov. 8, 1817. See G. Longhi, *Elogio Storico di A. Appiani* (1826).

Ap'pian Way (in Lat. *Via Appia*): one of the great highways leading from ancient Rome, and the most famous of all because probably the first that was well and thoroughly constructed, and because it was lined with tombs and monuments for several miles outside of the walls. It extended originally from Rome to Capua, 125 miles, but was eventually continued to Brundisium. It was built in a very thorough manner, and was paved with large polygonal blocks of the hardest stone, accurately fitted to each other, so as to appear like a solid mass. The substructure was solidified by cement. The road has been partially restored by excavation, and is found to be in a remarkable state of preservation.

Revised by RUSSELL STURGIS.

Applause [from Lat. *applau'dere*, *applau'sum*, strike upon, clap]: a shout of approbation; an approving acclamation; a public expression of approbation and praise by striking upon the floor or the clapping of hands. This custom prevailed among the ancient Greeks and Romans. The Roman comedians usually terminated their performances with a request that the audience would applaud, *valet et plaudite!* Three species of applause were used by the Romans—namely, *Bombus*, a confused hum, like the buzzing of bees, produced by the mouth or the hands; and *Imbrices* and *Testæ*, which were sounds made by striking vessels placed in the theater for this purpose. The last was like the sudden crash produced by the fall and fracture of a set of chinaware.

In modern times, French politicians and dramatists often

small, hard apples, useful only for culinary purposes, and which are offspring of *Pyrus baccata* or are supposed hybrids between that species and *Pyrus malus*.

The apple is the most important fruit of temperate climates, and is peculiarly adapted to a large area of North America, where it occupies a larger acreage probably than any other fruit. In 1890 the number of acres devoted to the growing of apple-trees in nurseries was 20,232.75; and the total number of trees then growing in these nurseries was 240,570,666. The leading apple districts of North America are those comprising the Middle and Southern New England States, New York and Michigan, the Annapolis valley of Nova Scotia, a large area of the Province of Ontario, the middle altitudes of the Alleghanies in Virginia and southward in the Carolinas, the central area comprising Missouri, Kansas, and Northwestern Arkansas, and a large area in the Pacific Northwest, including the States of Oregon and Washington. The apple is profoundly influenced by latitude and climate. In the Northeastern States and Canada the fruit is very firm, highly colored, of high flavor and long-keeping quality. As the apple regions extend southward the fruit takes on a duller or less intense color, and loses much of its sprightliness or flavor, has a tendency to become larger, and the keeping qualities are very greatly diminished. Thus the Tompkins King, which is one of the standard winter apples of the northernmost States, becomes a fall apple in Kentucky. A knowledge of these influences of the climate upon the apple has come to be of great importance to apple-growers, in consequence of the growing export trade which demands apples of great firmness and of long-keeping qualities. Apple cultivation is rapidly assuming a new importance in the New England States, New York, and Canada, because of the trade which is opening up in the European countries. So long ago as 1845 apples were shipped to Scotland in small quantities, but it was not until 1880-81 that the export trade assumed great importance. It is now one of the established lines of international trade. The table on this page, showing the apple exportations during the last decade in barrels, will give some idea of the importance of this industry.

YEAR.	SHIPPING PORTS.							RECEIVING PORTS.				Total.
	New York.	Boston.	Montreal.	Halifax.	Portland.	Philadelphia.	Annapolis.	Liverpool.	London.	Glasgow.	Various.	
1880-81.....	599,200	510,300	145,276	24,250	39,908	9,872	.....	839,444	177,935	216,391	95,036	1,328,806 bbls.
1881-82.....	75,889	65,093	56,433	13,805	6,497	.....	21,535	133,784	46,147	59,266	55	239,252 "
1882-83.....	169,570	102,409	64,390	18,542	16,890	3,900	19,893	253,432	46,975	81,269	13,318	395,594 "
1883-84.....	53,048	7,145	7,445	3,758	9,811	325	.....	46,661	4,843	29,685	343	81,532 "
1884-85.....	256,314	307,130	84,487	41,207	71,460	.....	8,612	491,898	123,081	137,641	16,590	769,210 "
1885-86.....	466,303	221,724	68,716	37,982	87,301	186	3,161	537,695	147,102	176,445	24,031	885,273 "
1886-87.....	175,595	303,479	106,713	94,606	100,596	.....	26,935	468,553	187,840	138,756	12,775	807,924 "
1887-88.....	275,696	163,916	93,058	32,652	25,215	.....	17,884	346,557	104,072	139,517	18,275	608,421 "
1888-89.....	474,337	382,199	291,307	94,691	145,825	860	18,190	790,502	279,374	272,068	65,465	1,407,409 "
1889-90.....	169,557	132,589	162,526	53,627	122,433	.....	37,030	418,850	128,248	116,449	14,115	677,762 "
1890-91.....	76,503	23,123	182,095	89,199	80,365	.....	.....	252,548	116,705	80,772	1,260	451,285 "

avail themselves of the services of hired applauders, called *claqueurs*, who cry *Bis, bis!* (twice, again, encore), or *Bien, très bien!* The audiences of English actors signify their approbation by the cry of *Encore!* but in the British House of Commons applause is expressed by cries of *Hear! hear!*

Apple: the fruit of a tree belonging to the rose family, and known botanically as *Pyrus malus*. It is supposed to be a native of Southwestern Asia and of a large part of Europe. De Candolle thinks "it probable that the tree was indigenous in Europe as in Anatolia, the south of the Caucasus and Northern Russia, and that its cultivation began early everywhere." It has been cultivated from time immemorial. The Siberian crab-apple is *Pyrus baccata*, which is characterized by very hard, dense wood, long-stalked and nearly smooth leaves and flowers, and a hard and austere small fruit from which the calyx drops before the fruit is fully ripe. Several varieties of this species are in cultivation in this country, but they are of minor importance. There are a number of species of wild apple in America, two of which (*Pyrus coronaria* and *P. Ioensis*) appear to possess some value as possible fruit-plants. Another type of native apple, which has already gained some prominence, is that represented by the Souldard crab, which has been recently described under the name of *Pyrus Souldard'i*, but which may be a hybrid between the common apple and *Pyrus Ioensis*. The term *crab-apple* is applied somewhat loosely to any small and inferior apple, whether belonging to *Pyrus malus* or to other species. Among pomologists, however, the term is often technically used to designate a class of

This export trade is confined almost entirely to shipments to England and Scotland, but there is reason to believe that other European markets may be opened with profit. There is probably no country in the world which can compete successfully with the U. S. and some parts of Canada in the production of apples.

In Europe apples are grown extensively in the central countries, in Denmark and throughout Great Britain, but there are few places in which apple cultivation is carried on so extensively and with such uniform commercial results as it is in the U. S. Very lately Tasmania and New Zealand have gained prominence as apple-growing countries, and they now ship considerable quantities of fruit to Great Britain and some to the Western U. S. Tasmanian apples were shipped to England as early as 1870, but only recently has this exportation become important. In 1890 there were shipped from Tasmania to Great Britain some 80,000 cases of apples, each holding about 40 lb. of fruit. These sold at prices ranging from 10s. to 20s. Tasmanian apples began to attract attention in San Francisco in 1890, and in 1891 shipments were received there from Australia and New Zealand. The Tasmanian and New Zealand apples, however, do not compete with the U. S. product, as they are received at a season of the year when domestic fruit is growing. They begin to arrive in the San Francisco and London markets in April and early in May.

The soils which are thought to be best adapted to apple cultivation are the higher and more rolling lands which contain more or less gravel, and are possessed of both atmospheric and water drainage. Those lands which are well

adapted to wheat and corn ordinarily make good apple lands. Soils which are warm and comparatively dry, and which admit of frequent and timely cultivation, are most desirable, both for the good of the tree and for the quality of the fruit.

The varieties of apples are very numerous, reaching undoubtedly four or five thousand; but the number of varieties actually grown for profit in the U. S. is probably not over 200, and in any one locality the number of profitable varieties will not ordinarily exceed a dozen or twenty. The varieties differ widely in different parts of the country, especially between the North and South, and there are few of the apples which are adapted to New England and New York which are grown so far S. as Maryland and Virginia. During recent years a great effort has been made to extend the apple regions northward in the northern parts of New England and into the colder parts of the Mississippi valley, as Wisconsin, Iowa, and Minnesota. This has been done by the origination of varieties of great hardiness, and by the importation of varieties from Russia. The apples grown in these cold regions nearly always possess great delicacy and beauty of surface and texture, but so far there are comparatively few of them which possess very high quality. There is every reason, however, to hope for the best results in the future.

New varieties of apples are produced by sowing seeds. As a rule, all the seedlings are different from each other, but it is only rarely that a meritorious variety is obtained. When such a variety is procured, however, it is readily propagated by grafting or budding it upon other seedling stocks, or in some cases it is grafted into the tops of old trees. The seedling trees or stocks, upon which the varieties are budded or grafted, are obtained by sowing the apple seeds in drills in early fall or spring; and the resulting trees are taken up at the end of the first season's growth, when they are ready to be set in nursery rows. In practice these seedling stocks are stored in cellars during the first winter, and the next spring they are set in the nursery into rows about 3 or 4 feet apart, and about a foot apart in the row. If the stocks are to be budded (see GRAFTING), the operation is performed during the following July and August. If they are to be grafted, they are taken up in the following fall and stored in cellars, and the grafting is performed during the winter season. During the following season, which is two years from the sowing of the seed, the trees, whether budded or grafted, grow rapidly, and make at the end of that year what the nurseryman calls the yearling trees. Apple-trees are rarely set in the orchard, however, until they are two or three years old—that is, two or three years from the bud or the graft. In the orchard, the larger growing varieties should be set as far as 40 feet apart each way; some of the smaller growing varieties may be put as close as 30 feet. Good cultivation during the first ten years of the orchard is advisable, during which time the soil should be well fertilized; but annual cultivated crops, such as corn and potatoes, may be grown in the same land in the meantime with good results. Trees should be pruned regularly and judiciously every year from the time of setting. Pruning produces the best quality of fruit, promotes the healthfulness of the tree, and renders it amenable to the best cultivation and treatment.

Numerous insects prey upon the apple-tree and its fruit. The most important is the codlin-moth, a small lepidopterous insect which lays an egg in the apex or blossom end of the apple soon after the petals fall. The larva soon hatches from this egg and bores directly downward into the fruit. In recent years this insect is being kept within almost entire control by spraying, as soon as the last blossoms fall, with some arsenical poison, as Paris green or London purple. One lb. of the poison to 200 or 250 gal. of water is used. (See INSECTICIDES.) This is sprayed thoroughly upon the tree as soon as the last petals fall, and again at an interval of a week or ten days. The arsenic lodges in the small cup-like cavity of the apex of the apple and destroys the young larva. No danger to health may be feared from this operation of spraying, for all traces of the poison are washed away by the rain long before the apple reaches maturity. The apple-scab is a well-known fungous disease of the apple, which causes the fruit to become distorted and scabby (see cut), but one which can be controlled by a spray of copper solutions, especially by the ammoniacal carbonate of copper. This disease is also common upon the leaves, producing discolored or blighted patches. (See FUNGICIDES.) For further information, see Downing's *Fruits and Fruit Trees of Amer-*

ica; Warder's *Pomology*; Barry's *Fruit Garden*; Thomas's *Fruit Culturist*; Fitz's *The Apple*; Strong's *Fruit Cul-*



Apple scab.

ture; Todd's *Apple Culturist*; Bailey's *Field Notes on Apple Culture*; Wickson's *California Fruits*. L. H. B.

Apple Blight: a disease of apple-trees, caused by a species of aphid (*Aphis lanigera*). This little insect penetrates the chinks in the bark, extracting the sap, causing diseased excrescences, and ultimately the death of the tree.

Apple Diseases: See BLIGHT, ROT, RUSTS, and SCAB.

Appledore: a small seaport and watering-place in the parish of Northampton, Devonshire, England; at the mouth of the river Torridge and on Barnstaple Bay, about 2 miles N. of Bideford (see map of England, ref. 13-D).

Apple Oil (artificial): a solution of valerianate of amyl in six parts of alcohol.

Apples of Sod'om: a fruit mentioned by Josephus and other ancient writers as growing near the Dead Sea. It was fair in appearance, but when grasped in the hand collapsed into dust and ashes. Some modern writers have supposed that it was the fruit of *Solanum Melongena* (nightshade), but Robinson identifies it with the *Asclepias gigantea*, the fruit of which looks like an orange, but disappoints those who touch it by its nauseousness in an immature state, and its emptiness when fully ripe.

Appleton: city; capital of Outagamie co., Wis. (for location, see map of Wisconsin, ref. 5-E); on the lower Fox river, 30 miles S. of Green Bay. The river is navigable for steamboats, and has here a constant fall of 49 feet, furnishing inexhaustible water-power. The city is the seat of Appleton Collegiate Institute and of Lawrence University. Pop. (1880) 8,005; (1890) 11,869; (1900) 15,085.

THE "POST" PUBLISHING CO.

Appleton, DANIEL: founder of the publishing house of D. Appleton & Co.; b. in Haverhill, Mass., Dec. 10, 1785; became a dry-goods merchant there and later in Boston, removing in 1825 to New York, where he combined the business of importing English books with the sale of dry goods, but soon abandoned the latter and gave his attention solely to books and publishing. *Daily Crumbs from the Master's Table* (1831) was the first of the many thousands of valuable works in literature, science, and art which have been issued from the press of D. Appleton & Co. He retired in 1848, and died Mar. 27, 1849. His eldest son, William II. (b. Jan. 27, 1814; d. Oct. 19, 1899), a partner from 1838, carried on the business in partnership with his brothers (now all deceased) and later with his son William W. and the sons of his brothers John A. and Daniel Sidney. It has now attained enormous proportions; its growth necessitating many removals—from Exchange Place about 1830 to Fifth Avenue in 1894.

Appleton, JESSE, D. D.: theologian; b. at New Ipswich, N. H., Nov. 17, 1772, and settled over the Congregational Church in Hampton, N. H., in Feb., 1797. In 1803 he was one of the most prominent candidates for the chair of theology in Harvard University. In 1807 he was chosen president of Bowdoin College, Brunswick, Me., and there died Nov. 12, 1819. A man of rare abilities and high classical culture, he was distinguished also for saintliness of character and singular dignity and grace of manners. His works, with a memoir prefixed, were published by his son-in-law, Prof. Alpheus S. Packard, in 1837.

Appleton, JOHN, LL. D.: jurist; b. in New Ipswich, N. H., July 12, 1804; graduated at Bowdoin College in 1822. In 1852 he became a justice of the Supreme Court of Maine, and in 1862 chief justice, being reappointed in 1869 and 1876. He published two volumes of *Maine Reports*. D. at Bangor, Me., Feb. 7, 1891. HENRY WADE ROGERS.

Appleton, JOHN: b. at Beverly, Mass., Feb. 11, 1815; graduated at Bowdoin College in 1834; became a lawyer and prominent Democratic editor in Portland, Me., where he settled in 1837, became chief clerk of the U. S. Treasury Department in 1845, and afterward held a similar position in the State Department; was *chargé d'affaires* to Bolivia (1848-49), member of Congress (1850-59), secretary of legation in London (1855-56), U. S. minister to Russia (1860-61). D. at Portland, Me., Aug. 22, 1864.

Appleton, NATHAN, LL. D.: merchant; b. at New Ipswich, N. H., Oct. 6, 1779; became a partner of his brother Samuel in Boston. He was one of the founders of Lowell, Mass., was several times in the Massachusetts Legislature, and was chosen a member of Congress in 1830 and again in 1842. Wrote speeches and essays on banking, currency, and the tariff. He was a member of the Academy of Sciences and Arts, and of the Massachusetts Historical Society. D. in Boston, July 14, 1861.

Appleton City: village; on Mo., Kan. and Tex. R. R.; St. Clair co., Mo. (for location of county, see map of Missouri, ref. 5-E); has various manufactures. Pop. (1880) 1,034; (1890) 1,081; (1900) 1,133.

Appoggiatura, ap-pod-ja-too'ra, literally, a support [Ital. from *appoggiare* (Fr. *appuyer*) < Lat. *appodia're*, lean upon; *ad*, to + *podium*, support, from Gr. *πόδιον*, base]; an Italian musical term indicating a form of embellishment by insertion of one or two "passing notes" in a melody. These notes are printed in a smaller character than the notes of the melody itself.

Appointment [remotely from Lat. *ad*, to + *punctum*, point]; in law, a disposition of property made by one authorized by a power contained in a deed, will, or other instrument to direct its use; an instrument executed pursuant to a power of appointment directing the disposition of property agreeably to such power (see POWERS). The word is also used to indicate the designation by lawful authority of some person to hold an office or to perform a public duty. Under the U. S. Constitution the President has the power to nominate, and, with the consent of the Senate, to "appoint," persons to hold certain specified offices.

Ap'pold, JOHN GEORGE, F. R. S.: English mechanician; b. in London in 1800; the inventor of a celebrated centrifugal pump, of machinery for paying out marine telegraph cables, and of a process for dressing furs, which last gave him the control of that business. His house was a museum of wonderful mechanical devices, which opened and closed doors, shutters, and gates, and performed many other surprising acts by automatic machinery. D. in London, Aug. 31, 1865.

Apold Centrifugal Pump: See PUMP.

Appomat'tox: a river of S. E. Virginia; rises in Appomattox County, flows in a general easterly direction, and enters the James river at City Point. Length, estimated at 150 miles. It is navigable for large vessels to Petersburg, 20 miles from its mouth.

Appomattox Court-house: former capital of Appomattox co., Va. (for location, see map of Virginia, ref. 6-F); here Gen. R. E. Lee, with the Confederate army of Northern Virginia, surrendered to Gen. Grant, Apr. 9, 1865.

Appor'tionment [ultimately from Lat. *ad*, to + *portio*, a share]; in law, the division of a thing into parts; the distribution of a claim or charge among different persons in proportion to their interests in the subject-matter to which it attaches. The leading cases concern—1, Incorporeal rights in land, such as commons and rents; 2, Encumbrances upon land; 3, Contracts. 1. The principal case under this division is that of rents. The question of apportionment may arise as to the rights of different owners either of the rent or of the land to which the burden of the payment of the rent attaches, or it may occur in case of a partial failure of the title as to the territorial extent of the land rented, or because the right of the tenant to hold the land ceases before the time agreed upon, on account of the expiration of the landlord's estate. Thus a landlord, after a lease of two houses by one contract for a specified rent, may sell one of them. The purchaser would be entitled to collect a propor-

tionate part of the rent. So, if the lessee should assign to a stranger all his rights in one of the houses, the latter would during his ownership be bound to pay a proportionate part of the rent. In case the title to a portion of the premises failed, as if in the case supposed the landlord did not own one of the houses that he assumed to lease, and the tenant was accordingly evicted, he would pay a proportional part of the rent for the remaining house. By the common law there was no apportionment where there was a failure as to time. This case is illustrated by a lease made by a life-tenant for a specified period—e. g. a year. Should he die before the time expired, the lease would of course instantly terminate, and the tenant would pay no rent for the time intervening since the last payment of rent fell due. This defect in the law has been remedied by statute. It should be added that there is by common law no apportionment where the property leased is simply diminished in value. Should a house and lot be hired and the house be destroyed by fire, no deduction can be claimed, as the rent is deemed to be paid for the land, which still remains. This rule may be obviated by agreement of the parties. 2. *Encumbrances.*—It is a general rule that several owners of land must bear the burden of an encumbrance upon it in proportion to their respective interests. Thus if land were mortgaged, and then conveyed to A for life, and, subject to A's estate, to B, the respective owners should share between themselves the burden of payment; while the mortgage remained, A should pay the interest. If it became necessary to pay the mortgage, A would need to raise a sum equivalent to his entire duty to pay the interest during his life. His probabilities of life are estimated by well-known tables indicating longevity, such as the Northampton, Carlisle, and others. On a similar principle, if mortgaged lands be sold in parcels, the duty to pay the mortgage is apportioned among the owners of the respective parcels. This is clearly the rule where the sales are contemporaneous; but if successive in point of time, the better opinion is that there is no apportionment, but that the lots must be taken to satisfy the mortgage in "the inverse order of alienation." By this is meant that the lands last sold by the proprietor must be first resorted to as a means of paying the mortgage. As soon as enough money is thus realized the remaining lots are discharged. 3. *Contracts.*—As a general rule, there is no apportionment of contracts. In other words, a party to a contract must completely fulfill his own obligation before he can enforce the agreement against the other party. Thus if a servant agreed to labor for a year at a specified salary, and should work for a portion of the time, and leave without cause, he could collect no portion of his wages. There are special cases where a contract is apportioned. One is where, after it has been partly performed, it is dissolved by mutual consent. So also in a contract for personal service there is an implied understanding that the contract is not to be completely fulfilled unless life should continue. Accordingly, if the servant should die before the expiration of the time specified in the contract, his wages would be apportioned according to the time of actual service. Some jurists have objected to the severity of the general rule, and would allow an apportionment, even where a contract is deliberately broken by a party, corresponding to the benefit received by the other party; but the prevailing opinion of courts is, and the better philosophy would seem to be, to adhere to the rule as modified by the special cases referred to. T. W. DWIGHT.

Apportionment Bill: an act of Congress which determines the total number of members sent by all the States of the Union, and also the number that each State shall send, to the House of Representatives. A new apportionment is made after each decennial census. The same term is applied to the act by which a State Legislature distributes among the counties their respective portions of representation. A populous county often forms a district by itself, and elects several members, while another district is formed by the union of two or three thinly populated counties. Those of the dominant party of the State sometimes so contrive the apportionment that they gain an advantage in the election, by forming districts in each of which a county that gives a majority against them is joined to one that gives a larger majority for their side. This is called *gerrymandering*.

Appraise'ment, or Apprize'ment [from vb. *praise*, fix a price for < O. Fr. *preiser* < Lat. *pretia're*, from *pretium*, price]; the act of estimating the value of property; the

valuation of property made by an authorized person who is called an appraiser. The mode of appointing appraisers varies in the different States of the Union. The law of the U. S. requires that there shall be an appraisal of the inventoried property of decedents and insolvent debtors, of property appropriated to public use, and of real estate seized upon execution. In Great Britain, appraisal, as a legal term, signifies a valuation of goods taken under a distress for rent by two appraisers, who are sworn by the sheriff or constable. The appraisers must be licensed for the office.

Appren'tice [O. Fr. *aprentis*, from *aprendre*, learn < Lat. *apprendere*, grasp]: a person, ordinarily a minor, bound in due form of law, usually by indenture, to another for a certain time to learn some art, trade, or business. In most of the States of this country statutes borrowed from English legislation allow minors, with their own consent, and with that of their father, mother, or guardian, to be bound out to service—if males, till the age of twenty-one; if females, till the age of eighteen, or for a shorter time. When the child is a pauper, he may be bound without his consent by public officers or by orphan asylums, houses of refuge, or of industry. The same rule is followed in the case of children charged with petty crimes. Apprenticeship is thus to some extent a mode of penal discipline, and is reformatory in its nature, particularly where some central authority oversees from time to time the conduct both of the apprentice and the master. The master in many respects stands in the relation of a parent. It is his duty to instruct the apprentice in the art which he has undertaken to teach him, to give him a reasonable support, and to provide for him in case of sickness. The apprentice, on his part, is bound to render faithful service and obedience to his master, who may administer for misconduct reasonable corporal punishment. This relation is not regulated by the ordinary rules governing master and servant, but depends upon special grounds of public policy. It may usually be dissolved by magistrates where the object of the apprenticeship has failed, and in special cases the apprentice may be punished by them for willful neglect to perform his duties. The contract of apprenticeship is of a personal nature, and is not assignable. T. W. DWIGHT.

Apprentice System (U. S. navy): See NAUTICAL SCHOOLS.

Approach'es: in military usage, the entire system of works employed in the methodic *approach* by siege of a fortification. The works consist of enveloping trenches called *parallels*, and trenches of communication called *boyaux* or *zigzags* (terms indicating the tortuous or *zigzag* form given them, in order to screen from the fire of the place), *places of arms*, etc. The earth removed is thrown upon the side toward the besieged place, by the height of which and the depth of the trench itself adequate cover is gained for the passage of troops, and even of artillery. Approaches sometimes acquire great development, as at Sebastopol, where, as is stated, the allies dug 70 miles of trenches. Recent changes in artillery and small-arms have rendered almost obsolete the methodic rules for the location and construction of approaches laid down in text-books on sieges.

Appropri'ation of Payments: in law, the application of money paid by a debtor to his creditor to one of several debts. The general rule is that when the payment is voluntary, and not under process of law, the debtor has a right to direct the application of the money. If he does not exercise this right, the creditor may elect to which debt to apply it; and in case of the failure of both parties to make such election the law will apply the money in accordance with certain rules, so as best to promote the rights of the parties. When the payment is not voluntary, but is made under compulsion, the rules as to election give way, and the money should be applied ratably to all the claims. Where a debt bears interest, that is extinguished before application to the principal.

Appui, ap'pwee' [for etymology see APPOGGIATURA]: a French word signifying "support." In military language the phrase *point d'appui* is applied to a base or position fitted to give support to troops; a fixed point at which troops form, and on which operations rest. Lakes, marshes, hills, or steep declivities sometimes serve as *points d'appui*.

Appur'tenances [viâ Fr. from Late Lat. *appertinentia*; *ad*, to + *pertine're*, belong]: in law, something belonging or appertaining to another thing as principal, as a right of way appurtenant to land. In a conveyance of land with

the "appurtenances," all easements and privileges in use and necessary to the enjoyment of the estate granted will be included. Land itself will not be considered as appurtenant to land. It is often a difficult question of construction to determine whether land can be regarded as a *part* or *parcel* of the thing granted; in which case it will pass, while it would not be embraced in the word "appurtenances." Thus in the conveyance of a "mill" or a "mansion-house," land which in the narrow acceptance of the terms "mill" or "mansion-house" would not be included might be in a comprehensive sense, since there could be no complete enjoyment of the mill or mansion-house without them.

Aprax'in, FEODOR MATVEIEVITCH: Russian admiral; called the creator of the Russian navy; b. in 1671. He was one of the principal coadjutors of Peter the Great in his efforts to civilize Russia, and enjoyed his confidence in a high degree. He built several ships of war, became an admiral and president of the admiralty in 1707, and took Viborg from the Swedes in 1710. In 1713 he ravaged the coasts of Finland, and commanded a fleet in the war against Sweden. D. Nov. 10, 1728.

Apraxin, STEPAN FEODOROVITCH: Russian general; grandson of the preceding; b. in 1702. He served in a war against the Turks, rose rapidly, and became a field-marshal. Having the command of a large army in the Seven Years War, he defeated the army of Frederick the Great at Gross-Jägerndorf in Aug., 1757. He neglected to improve the victory by marching to Berlin, and was recalled and tried by a court-martial, but before the trial was finished he died, Aug. 26, 1760.

A'pricot [Fr. *abricot*, Span. *albaricoque*, from Arab. *al-birquq*; *al*, the + *birquq*, from Gr. *πραϊκόκιον*, perhaps a loan from Lat. *præcoquum*, early-ripe]: a fruit (*Prunus armeniaca*) intermediate between the peach and the plum in character, having a small, thin, slightly furrowed stone, a firm, sweet flesh, and a pubescent exterior. The apricot has been cultivated from the earliest times, and is probably a native of China. The apricot is considered to be one of the most delicious fruits of temperate climates. It is grown throughout temperate Europe, where, especially in England, it is commonly trained on walls. In America, apricot culture has assumed great importance in California, and many portions of the country are adapted to it. Little attention has been given to the apricot in the Eastern States, because of the early blooming of the tree and the consequent danger from frosts, the injury by the plum-curculio, and the erroneous impression that the tree is very tender. The apricot is as hardy as the peach, while the Russian varieties—which are only extra hardy strains of the same species, *Prunus armeniaca* — are often still hardier. Even in New York orchard apricot culture is now receiving some attention. Grown upon the north or west side of walls—where the blossoms are retarded—apricots form one of the choicest fruits for the home garden. The general cultivation of the apricot is much like that of the peach. Plum stocks are commonly used for the apricot in the Northern States, especially if trees are to be placed upon heavy soil. Peach stocks are generally used elsewhere in this country, except in California, where apricot stocks can now be obtained. The apricot will also grow upon the almond, although this stock is not liked by orchardists. There are something like 100 varieties of apricots described. Among the best known are Breda, Moorpark, Royal, Early Golden, and Hemskirke. The Russian apricots are not esteemed except in regions where the better varieties are not hardy. L. H. BAILEY.



Apricot.

A'pries (in Gr. Ἀπρίης): a King of Egypt of the twenty-sixth dynasty, called in the Bible PHARAOH-HOPHRA; a son of Psammetichus II., whom he succeeded about 588 B. C. He attempted the relief of Jerusalem (587), but was defeated by Nebuchadnezzar. See the biblical account, Jer. xxxvii. 5-8; Ezek. xvii. 11-13; 2 Kings xxv. 1-4. His subjects revolted and killed him about 568 B. C., and Amasis then obtained the throne.

A'pril (Lat. *Aprilis*): the fourth month of the year; derived from the Romans, but in the early age of the Roman republic it was the second month.

April Fool's Day: the name given to the 1st of April, from the custom of playing tricks upon people or sending them upon bootless errands on that day. Some have derived it from some ancient pagan custom, such as the Holi festival (Mar. 31) among the Hindus, or the Roman Feast of Fools. Probably it was observed as the octave of Mar. 25, which used to be New Year's day. In France the person tricked is called *poisson d'Avril* (April fish), and in Scotland he is called a *gowk* (cuckoo).

A Priori: See A POSTERIORI.

A'pron: in former times, a piece of sheet-lead which covered the vent of a cannon. In ship-building the apron is a piece of curved timber fixed behind the lower part of the stem, and just above the foremost end of the keel, to fortify the stem. Apron is also a platform or flooring of plank at the entrance of a dock. In the Authorized Version of Gen. iii. 7 *apron* is used to render the Heb. *chagorah* (which is rendered "girdle" in 2 Sam. xviii. 11): "And they sewed fig-leaves together, and made themselves aprons"—in the margin, "or, things to gird about." In the Geneva (Barker) Bible (1599) it is rendered, "And they sewed figge tree leaves together, and made themselves breeches"—in the margin, "Ebr. things to gird about them to hide their privities." Because of the translation "breeches," this is called "the Breeches Bible." In Acts xix. 12 *apron* is the rendering of *σικκινδιον*, from the Latin *semicinctium*, a half-girdle, or belt covering half the person—an apron worn by workmen, servants, etc.

Apsheron', Apcheron, or Abcheron: a peninsula which extends into the Caspian Sea at the S. extremity of Daghestan. It forms the eastern termination of the Caucasian chain of mountains. It is famous as the place of the sacred flame which is venerated by the fire-worshippers (Ghebers), and is produced by inflammable gas rising from the soil. Large quantities of naphtha are procured here.

Ap'sides, plural of **Apsis** [from Gr. ἀψίς, -ίδος, loop, bow, arch]: the two points in the orbit of a primary planet which are at the greatest and the least distance from the sun, corresponding to the aphelion and perihelion. The term is also applied to the extreme points in the orbit of a satellite, which in the case of our moon are the same as the apogee and perigee. The straight line connecting them is called the line of the apsides.

Apteryges, āp-ter'i-jěz [for etymol. see **APTERYX**]: an order of birds comprising only the species of *Apteryx* of New Zealand. So named because the very short wings are hidden in the long loose feathers, and the birds appear wingless. See **APTERYX**.

F. A. LUCAS.

Ap'teryx [Gr. ἀ-, without + πτέρυξ, wing]: a genus of flightless birds, peculiar to New Zealand. The term is used as a common name quite as much as the native name, kiwi-kiwi. The birds of this genus represent also the family *Apterygidae* and order *Apteryges*. They have a keelless sternum, no clavicles, rudimentary wings, with a claw on the second digit, which is the only one present except in the embryo. The bill is long and the nostrils open near the end, a unique feature among birds. There are no distinct tail-feathers, and the plumage is loose and somewhat hair-like. Five species are known; one (*Apteryx maxima*) only from the feathers in the dress of a Maori chief. *A. mantelli* inhabits the North island, *A. australis* and *A. haastii* the South island, *A. owenii* both islands. These birds are nocturnal in their habits, feed on worms, nest in holes, and lay a single egg, enormous when compared with



Apteryx.

the size of the bird. They are rapidly decreasing in numbers, largely on account of dogs and cats introduced by the settlers.

F. A. LUCAS.

Ap'thorp, EAST: a clergyman of the Church of England; b. at Boston, Mass., in 1733, and educated at the Boston Latin School and afterward at Cambridge University, England, where he became a fellow of his college. Returning to America, he became a missionary of the Society for Propagating the Gospel in Foreign Parts, and was stationed at Cambridge, Mass., where he built Christ church, still one of the finest models of church architecture in New England, and became distinguished as a controversialist, an author, and a divine. He was supposed to be thought of by the ecclesiastical authorities in England as a possible American bishop, and his stately home in Cambridge was called in the pamphlets of the time a "palace" on this account. Rendered uncomfortable by the bitterness of the controversy aroused by the proposed introduction of bishops into America, Mr. Apthorp returned to England, was made D. D. by Archbishop Cornwallis; was collated to the Church of St. Mary-le-Bow, London; was appointed Boyle lecturer; was collated to a prebend of St. Paul's Cathedral; was tendered the bishopric of Kildare, Ireland, and finally received the valuable living of Finsbury (London). He was a voluminous author, and no American of his time attained greater celebrity in letters or as a divine. His four letters to Gibbon in defense of Christianity (1778) were very favorably received. D. in London, Apr. 17, 1816.

WILLIAM STEVENS PERRY.

Apuleius, ap-yu-lee'yūs, LUCIUS: Latin Platonic philosopher and satirical writer; b. at Madaura, in Africa. He lived about 150 A. D., traveled extensively, and was distinguished for his learning and eloquence. After he had spent his fortune in travel, he married a rich widow, and was involved in a lawsuit with her relatives, who accused him of using magical arts to gain her affection. He defended himself with success by an *Apology*, which is still extant. He became popular as an orator at Carthage, the senate of which raised statues in his honor. His chief work is a fantastic and satirical romance entitled the *Metamorphoses, or the Golden Ass*, which is of importance for the history of manners. Among other episodes, it contains the charming story of Cupid and Psyche. It has been translated into English by T. Taylor (1822), by Sir George Head (1851), and by several others. Some of his works are lost. See G. F. Hildebrand, edition of complete works (Leipzig, 1842), and F. Eyssenhardt, ed. of *Metamorphoses* (Berlin, 1869).

Revised by M. WARREN.

Apulia, a-poo'leē-a [in It. *La Puglia*]: province of Southern Italy, bounded N. E. by the Adriatic Sea, and was a portion of Græcia Magna (see map of Italy, ref. 6-G). It was bounded on the S. W. by Lucania and Samnium. Among the chief towns of this once populous and famous region were Canusium, Arpi, Luceria, and Arpinum. The battle of Cannæ, and most of the important events of the second Punic war, occurred in Apulia. Many of its cities aided Hannibal, by whom it was occupied until B. C. 207, when it was abandoned to the Romans. It was conquered by C. Cosconius, B. C. 89, and by the Normans about 1042 A. D. Apulia was united to the Sicilian monarchy in 1127, and is included in the modern provinces of Foggia, Bari, and Lecce. The present province has the Abruzzi e Molise on the N. W. and Campania and Basilicata on the W., and consists of the compartments Bari delle Puglie, Foggia, and Lecce. Area, 8,541 sq. miles. Pop. (1890) 1,759,396.

Apure, āā-poo'rā: a river of Venezuela, rises in the Andes near lat. 7° N. and lon. 72° W. It flows eastward, and enters the Orinoco in lat. 7° 36' 43" N. and lon. 66° 45' W. Length, estimated at 736 miles.

Apurimac, a-poo'rēe-mak': a river of South America; one of the head-streams of the Amazon, rises in the Andes, in Peru, about lat. 15° 38' S., and about 75 miles from the Pacific Ocean. It flows nearly northward, and unites with the river Urubamba about 8° 38' S. The stream thus formed is called the Ucayale. Its length from its source to the Ucayale is estimated at 600 miles.

Apurimac: a department of Central Peru, the second in size in the state, Cuzco being the first. It is inclosed between Cuzco and Ayacucho, the former being on the N. and W., the latter on the S. and E. The river Apurimac (a tributary of the Ucayale, and hence of the Amazon) and its branch, the Pampas river, form the northern boundary, while the southern is the Cordillera de Huanzo. The area is 62,325 sq. miles. Pop. approximately 120,000.

M. W. H.

A'qua, plu. **Aquæ** [Lat., water]: in pharmacy, spring-water, or natural water in its purest attainable state. It is a compound of oxygen and hydrogen; symbol H_2O , or *Aq.* The principal varieties of water are distilled water (*aqua destillata*), river-water (*aqua ex flumine* or *aqua fluvialis*), sea-water (*aqua marina*), rain-water (*aqua pluvialis*), and spring-water (*aqua fontana*). These terms are used in pharmacy, in which various watery solutions are also called *aquæ*.

Aqua For'tis (i. e. strong water): a name given to nitric acid by the alchemists; is still the common commercial name of that compound. See **NITRIC ACID**.

Aqua Marine: sea-green or blue-tinted **BERYL** (*q. v.*).

Aqua Re'gia (i. e. royal water): a mixture of nitric acid with hydrochloric (muriatic) acid. The usual proportion is one of the former and two of the latter acid. This is remarkable for its power of dissolving gold, regarded as the king of metals. The product is auric trichloride, $AuCl_3$. See **GOLD**.

Aqua Regi'næ (i. e. queen's water): a mixture of concentrated sulphuric acid and nitric acid, or of sulphuric acid and niter. It has been used as a disinfectant.

Aqua'rians [from Lat. *aqua*, water]: those ascetic persons who used water in the sacrament instead of wine, because they had scruples against the use of the latter. This practice is said to have originated with Tatian in the second century.

Aqua'rium (pl. **Aquaria**), or **Aquaviva'rium**: a glass tank or vessel containing either salt or fresh water, in which living aquatic animals and plants are kept for scientific study. It must contain both animals and plants in something like a due proportion, as the animals depend for breath on the oxygen which is given out by the plants, and the latter are nourished by the carbonic acid gas which the animals exhale. The water should be often aerated by agitation, which may be effected by dipping up portions of it and pouring them in again from a small height. *Aquaria* are stocked with mollusca, algæ, conifers, crustacea, zoöphytes, goldfish, sticklebacks, minnows, and other fish, sea-anemones, etc. The presence of molluscous animals is necessary for the consumption of the vegetable matter which is about to decay and the numerous spores of the conifers, unless the water be continually renewed, as in the "fountain aquarium." No dead animal or decaying plant should be permitted to remain in the aquarium, the temperature of which should be kept between 50° and 70° F. See P. H. Gosse, *Handbook of the Marine Aquarium* (1855). The great aquarium situated at the Jardin d'Acclimation at Paris is 50 yards long and 12 yards wide, and was constructed in 1860.

Aqua'rius [from Lat. *aqua*, water]: the Water-Bearer; the eleventh sign of the Zodiac, into which the sun enters about Jan. 20. It is represented by ♒. *Aquarius* is also the name of a constellation which coincided with that sign at the time when the signs were named, but in consequence of the precession of the equinoxes it is now in juxtaposition with the sign *Pisces*.

Aquat'ic An'imals: those animals which live constantly in the water, as fishes, and those which frequent the water to swim on its surface or dive in search of food, as ducks and other web-footed birds, otters and beavers among quadrupeds, etc. Among the aquatic animals are the majority of the grand division of *Mollusca*; numerous tribes of the *Articulata*, as crabs, lobsters, and shrimps; and a large portion of the *Radiata*. Whales and dolphins are examples of aquatic animals of the class *Mammalia*. The total number of aquatic animals is greater than that of all terrestrial animals (exclusive of insects). Those which live partly on land, and can not breathe under water, are called amphibious. The peculiarities of structure by which they are fitted for swimming, wading, etc., are very admirable. Some water-fowls have long legs for wading; others have webbed feet which enable them to swim with ease, and have waterproof plumage adapted to their mode of life. In aquatic animals of the higher vertebrate classes provision is made for the maintenance of the proper degree of animal heat by a coat of blubber, fur, or plumage, as in the case of otters, ducks, etc. The air-breathing animals that inhabit salt water have an organic structure greatly modified, and their extremities resemble the purely aquatic type more than the terrestrial.

Aquatic Plants, or **Water-plants**: vegetable organisms that grow in water. All vegetation must have been originally aquatic, later some plants became terrestrial. Nearly

all the lower green plants are aquatic, even mosses and ferns show strong aquatic tendencies, while the flowering plants as a rule are terrestrial. It is true, however, that many of the latter live in water, but most of these root in the mud, and bring their leaves above the water. A few only are entirely immersed in the water. It appears that many of the higher plants which now grow in the water are really terrestrial, but have been crowded into the water by their stronger rivals.

CHARLES E. BESSEY.

Aquatics: See **ROWING**.

Aquatint: See **ENGRAVING**.

Aqua Tofa'na: a secret poison, the invention of which is ascribed to a Sicilian woman, a notorious poisoner, named Tofana. She lived about 1650–1730. It is said that there was, about 1660, a society of young married women in Rome who used this aqua Tofana to poison their husbands. It was sold in vials marked "Manna of St. Nicholas of Bari." Some suppose it to have been a solution of arsenic.

Aqua Vi'tæ (i. e. water of life; in French, *eau de vie*): a Latin term applied to brandy, and sometimes to other ardent spirits.

Aq'ueducts [from Lat. *aquæ ductus* (*du'cere*, lead), leading of water]: artificial constructions for bringing water from a distance for the supply of cities or which serve to convey the water of canals of navigation and of irrigation, and of mill-races, at an elevation across deep valleys or streams.

Works for supplying large communities with water appear to have been constructed at a very early date. There are remains in Persia and Syria of structures which are supposed to have been intended for aqueducts, but there is nothing definite in existence regarding their history. Recent discoveries of wells and conduits cut in the rock in the neighborhood of Jerusalem appear to establish the fact of there having been a system of water-supply for that city from the neighborhood of Bethlehem and Hebron. Portions of this conduit are composed of earthen pipes of about 10 inches diameter, eased with two stones hewn out to fit them, and covered over with rough stones cemented together. In the island of Samos there have been discovered remains of a tunnel 5,000 feet long, containing water-pipes about 9 inches in diameter, which are supposed to have been constructed about the year 900 B. C. A very ancient aqueduct of unknown date exists near Patara. This consists of an embankment of rough stone, 250 feet high and about 200 long, with archway at the center of the valley for the passage of a stream underneath. The conduit for water consists of stone blocks about 3 feet in each dimension, with a hole 13 inches in diameter through the center. The blocks are connected together by annular projections on one stone fitting into recesses on the adjoining stone, the joints being filled with cement.

The Romans appear to have been the first to construct extensive and durable aqueducts, first for the supply of Rome itself, beginning about 500 years before the Christian era, and continuing until the fall of the Roman empire, and at the present day the city of Rome is amply supplied with water, the greater part of which is brought over ancient aqueducts repaired by the popes. The Appian aqueduct, attributed to Appius Claudius Cæcus, is said to have been completed 311 years before the Christian era, after the building of the Appian Way. Its length was about 6 miles, and it brought by a devious course to Rome the waters of a spring whose fountain-head was 5 miles from the city, near Rustica on the Via Collatina. The Aqua Augusta was at a later period added to this aqueduct. It supplied the most ancient portion of the town and the Transtiberine city.

The Anio Vetus was built B. C. 272 by Manius Curius Dentatus. It brought its supply from near Augusta, in the valley of the Anio, 43 miles from Rome. It was almost entirely subterranean, and the only fragment now visible lies below the road and under the Aqua Marcia, outside the Porta Maggiore.

The Aqua Marcia (B. C. 145), built by the prætor Quintus Martius Rex, was 37 miles long, of which 6 miles were on arches still visible, crossing the Campagna by the Fraseati and Albano roads. This aqueduct is crossed by the Claudian aqueduct, which for some distance runs parallel to it. It has been restored.

Aqua Tepula (B. C. 126), the work of Cneius Servilius Cæpio and Cassius Longinus, is 10 miles long. Its channel or *specus* can still be seen at the Porta San Lorenzo and

Porta Maggiore in connection with the channels of the Aqua Marcia and Aqua Julia.

Aqua Julia (B. C. 34), by Augustus, named in honor of Julius Cæsar, 12 miles long. Its water was brought to the city in a *specus* or conduit above the Tepula, and, like that, upon the arches of the Aqua Marcia, which thus brought the waters of three different sources separately to Rome. Its channel is still to be seen at the gate of San Lorenzo and at the Porta Maggiore.

Aqua Virgo, also by Augustus. Its source is said to have been pointed out by a young girl, whence its name. Its course is mostly subterraneous, about half a mile only being on arches. It was restored by Pope Nicholas V. as the Aqua Vergine, and it still supplies Rome with its cool water. The fountains in the Piazza di Spagna, Piazza Navona, and the magnificent fountain of Trevi are supplied by this aqueduct, as are many others. On the fountain of Trevi, the virgin, pointing out the source to the soldiers sent by Augustus, appears among many other marble reliefs and statues. This is perhaps the finest fountain in the world. An inscription, still legible, in a cellar of No. 12 Via del Nazareno, near the Palazzo del Bufalo, states that it was repaired A. D. 52 by Claudius, after having been disturbed by Caligula in the construction of his wooden amphitheater.

Aqua Alsietina, 30 miles in length, built by Augustus; restored by Trajan, who added to its waters those of several springs along the hills to the W. of Lago Bracciano. Its original sources were around the smaller Lake Alsietinus, now the Lago de Martignano. It was restored by Paul V., and now supplies the fountains of the great Piazza of St. Peter's and the magnificent fountain Paolina, and turns the wheels of many flour-mills on the slopes of the Janiculum. It is known indifferently as the Aqua Alsietina and the Aqua Paolina.

Aqua Claudia, built by Caligula and Claudius (A. D. 36 to 50). Its sources were near Agosta, about 38 miles from Rome. Its devious course was over 46 miles in length, of which 36 were below the surface and 10 were on arches. Six miles of arches stretching across the Campagna still attest the power and liberality of the Roman empire. Repaired by Septimus Severus, by Caracalla, and by Pope Sixtus V., its arches now bring to Rome the Aqua Felice

obstructed the channels of many of these ancient aqueducts, especially those from the valley of the Anio.

It is estimated that Rome received daily 377,000,000 gal. of water. The Acque Vergine, Felice, Marcia, and Paola, having their sources in volcanic districts, supply a pure and delicious water, which does not obstruct its channels, and at this day they bring into Rome 160,000,000 gal. of water daily. By channels of masonry the water is led to fountains in every part of the city, and by pipes of metal and of burned clay it is distributed to most of the great houses or palaces, in each of which it flows constantly into a basin, frequently an ancient sarcophagus, of stone or marble. The water is rarely carried by pipes to the upper stories.

The Romans also constructed extensive aqueducts for the large cities in their provinces. Carthage before its destruction by the Romans had been supplied by an extensive system of underground reservoirs retaining the water from the roofs and paved areas of the city. After it was rebuilt by the Romans the supply was deficient for several years until about A. D. 120, when the Emperor Hadrian constructed the magnificent aqueduct of Zaghuan, about 60 miles in length, across valleys by one and sometimes two tiers of arches, in some places of stone, and in others of concrete made from the surrounding soil. Portions of this aqueduct are still in existence, and are used for the supply of water to the city of Tunis. Several arches still remain of an aqueduct supplying Constantine in Africa, 60 miles from the seacoast and midway between Algiers and Tunis. Another fine aqueduct was built in the third or fourth century at Nîmes in the south of France. This aqueduct is still in a good state of preservation, and consists of three tiers of arches of masonry with a rectangular channel 6 by 4 feet at the top. The lower tier consists of 6 arches, the second of 11 arches of the same span, and the upper tier of 35 arches of smaller span. The whole structure is 180 feet high and 873 feet long. The Roman aqueducts of Segovia and Seville in Spain still supply those towns with water. The former is about 2,400 feet long and 100 feet high, and is composed of two tiers of arches of uncemented stone. In the lower tier, which is 65 feet high, there are 42 arches of 15 feet span, and in the upper tier, 27 feet high, there are 119 arches. At Lyons and at Metz in France are remains of fine Roman structures.

For several hundred years after the fall of the Roman empire there do not appear to have been many extensive aqueducts constructed. In England the first important structure of the kind was that for bringing the New river to London, built in 1613. Water was brought a distance of 20 miles, crossing valleys by timber aqueducts, the water-way or trough of which was lined with lead. These wooden aqueducts have since been replaced by embankments. In 1738 an aqueduct was built for supplying Lisbon.

It is about 9 miles long, and for part of the way is in excavation, but near the city it is carried over a deep valley for a length of 2,400 feet by several arches, the largest of which is 250 feet high and has a span of 115 feet.

The aqueduct of Caserta, built in 1753, supplies water to Naples. This aqueduct is 37 miles long, and is a channel of masonry 5 ft. 3 in. wide by 7 ft. 6 in. high. In tunnels it is circular in section and of 7 ft. 6 in. diameter. Twenty valleys are crossed by masonry structures, the conduit of which is 4 ft. 9 in. wide and 7 ft. 4 in. high. One structure consists of three tiers of arches, 724 feet on top and 190 feet high. For 15 miles, from the end of the aqueduct to the city, the water is carried in iron pipes.

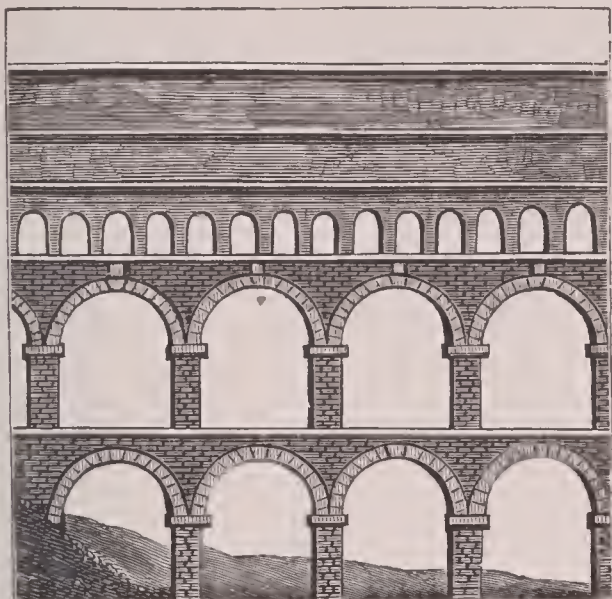


Ruins of the Aqua Claudia.

from the springs near the Osteria dei Pantani, on the road to Palestrina. They supply the Fontana dei Termini, near the railroad dépôt in the Baths of Diocletian, the fountain of the Triton, that of Monte Cavallo, and some twenty-four others in different parts of the city.

Anio Novus, also by Claudius, from the forty-second mile of the Via Sublacensis. This was the longest of the ancient aqueducts, having a course of 62 miles, 48 of which were underground. Its channel or *specus* is still visible above the Aqua Claudia on the arches of the Porta Maggiore. It is also visible at the Villa Braschi, near Tivoli, where it is 9 feet high by 4 feet in width, but is choked up by a calcareous deposit, which incrusts, and finally, unless removed,

The city of Constantinople was supplied for several years by an aqueduct built by the later Roman emperors. Since 1885 the water has been furnished by an aqueduct built by



Pont du Gard, Nîmes.

a French company, taking the supply from Lake Derkos, whence the water is pumped 358 feet into a reservoir, and then flows 27 miles to the city through an aqueduct of rubble masonry 3 ft. 5 in. wide by 5 ft. 3 in. high. Fifteen valleys are crossed by siphons of cast-iron pipe.

The city of Otumba in Mexico was supplied for 125 years by the aqueduct of Zempoala, which was built by a Spanish friar in 1554-71. This aqueduct is about 27 miles long, and 7,677 feet above the sea-level. Three valleys are crossed by masonry having, respectively, 13, 46, and 68 arches. In the last named the valley is 124 feet deep. The conduit is 8½ inches by 12 inches in dimensions, with a flat bottom and arched top. The flow of water through this aqueduct was discontinued about 1700, but it is said that slight repairs would enable it to be used again.

The discovery of the method of manufacturing cast iron into water-pipes has obviated the necessity of the construction of such enormous masonry structures for conveying water across valleys, but there are several fine examples of modern aqueducts of masonry, such as the High Bridge across the Harlem river in New York city, which is 120 feet high and 1,460 long, and was constructed in the year 1840. The Cabin John Bridge of the Washington, D. C., aqueduct, which is 101 feet high and has a single span of 220 feet, is the longest stone arch in existence.

The tendency of engineering at the present day is to construct aqueducts below the surface of the ground as far as possible, and where valleys have to be crossed to pass them by inverted siphons of iron pipe, rather than by elevated structures.

Among the best examples of modern aqueducts may be mentioned that of Vienna, which is 59 miles long and has a conduit of masonry varying in size from 5 ft. 8 in. by 6 ft. to 2 ft. 9 in. by 4 feet.

Glasgow is supplied through the Loch Katrine aqueduct 26 miles long, of which about 13 are in tunneling and about 4 of iron pipe across valleys. This was constructed in 1859. The conduit is of brick and is of a horseshoe cross-section 8 feet wide and 8 high.

In the U. S. the first important aqueduct was that for supplying water to New York city from the Croton river, a distance of about 40 miles. The first aqueduct was built in 1837-41 and is still in use. It is a covered masonry channel of horseshoe form, 7 ft. 5 in. wide and 8 ft. 6 in. high. In 1885-90 an additional aqueduct was constructed from the Croton river to New York city. By following a direct line and constructing the aqueduct principally in tunneling, the length of the aqueduct was reduced to 33 miles. In tunnels the conduit is circular, of 12 ft. 3 in. diameter. Where constructed by opening the surface of the ground it is of horseshoe form, 13 ft. 7 in. wide and 13 ft. 6½ in. high. The Harlem river is crossed by an inverted siphon of masonry lined with iron, in a tunnel 150 feet below the bed of the river.

The Washington aqueduct was constructed by the U. S. Government in 1855-60. It is a circular conduit of brick and rubble masonry 9 feet in diameter, and 11 miles long

from the Great Falls of the Potomac to the distributing reservoir.

The first aqueduct for supplying Boston with water was built in 1846-48, conveying water from Lake Cochituate, a distance of about 15 miles. The conduit is oviform in cross-section with the large end down, 6 ft. 4 in. high and 5 feet wide. In 1876-78 a new aqueduct was constructed from the Sudbury river to Boston. This aqueduct is generally in excavation, but with two fine bridges across the Charles river and the Waban valley. The conduit is of horseshoe cross-section, 9 feet wide and 7 ft. 8 in. high.



High Bridge, Harlem river.

Brooklyn, on Long Island, is supplied with water by an aqueduct constructed in 1856-59, about 10 miles long, leading from a series of lakes formed by damming streams. This aqueduct is entirely in excavation through a level country and below the surface of the ground-water. It is of horseshoe cross-section, 10 ft. wide and 9 ft. 8 in. high.

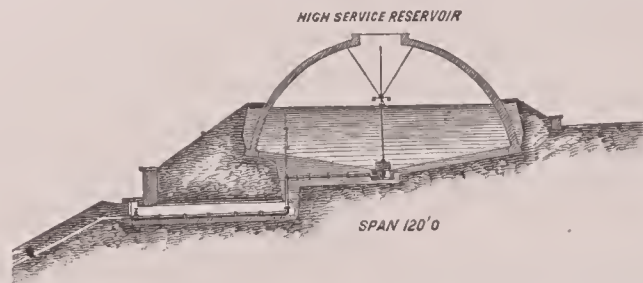
Baltimore receives its supply of water from Lake Roland through a brick aqueduct of elliptical cross-section, 5 feet wide and 8 ft. 10 in. high, constructed in 1857-62. There is an additional supply from the Gunpowder river, conveyed through a circular brick aqueduct 12 feet in diameter and about 8 miles long. This conduit is in a tunnel from 65 to 300 feet below the surface, and was constructed in 1875-80.

In California the use of wrought-iron pipes for aqueducts was first introduced to any great extent in the construction of the water-supply of San Francisco about the year 1865. Large additional works were constructed in 1878. At present the city is supplied through several conduits of wrought-iron pipe of from 22 to 40 inches diameter, laid following the undulations of the ground.

In the Eastern States, the first large wrought-iron conduit built was that at Rochester, N. Y., constructed in 1872-76, which is 36 and 24 inches diameter and 28 miles long. The aqueduct follows the surface of the ground, which in some places is 340 feet below the hydraulic grade line.

In 1890-92 an aqueduct of wrought-iron pipe was constructed to supply Newark, N. J., from the Pequannock river, about 15 miles. This pipe is 30 inches in diameter and is laid following the surface of the ground.

We defer till we treat of WATER-SUPPLY OF CITIES remarks upon the reservoirs and pipes for the distribution



through them of the water brought by the aqueduct from the source to their confines, noting only that the modern practice makes reservoirs much more extensive and capacious than the ancient. The Romans brought large supplies through aqueducts of rapid flow. A small portion only was stored in reservoirs, generally of masonry covered with arches, and the surplus was allowed to flow out through great fountains and cascades in constant streams.

Reserve Reservoirs.—The moderns provide large reservoirs in which the water not used is stored up to compensate during the periods of scarcity for the scanty supply of the original source. These reservoirs are sometimes covered with brick arches, as in London, but generally they are open ponds or lakes of many acres. Such magnificent cov-

cred reservoirs as that for the Roman fleet at Baie, and the arched reservoirs of Constantinople, supported on stone columns, are no longer constructed. They remain among the most stately monuments of the Roman empire. See the article WATER-WORKS.

Revised by J. JAMES R. CROES.

Aqueous Humor: See EYE.

Aquifolia'ceæ [from *Aquifolium*, a former name of the holly]: a family of exogenous plants, all trees or shrubs with simple leaves, and mostly natives of America. The ovary is superior, with two or more cells, each of which contains a solitary anatropal ovule, and generally becomes bony as a stone in the fruit, which is fleshy. Among the species of this order is the holly (*Ilex*). The flowers are white or greenish, and the species are quite numerous in the U. S.

Aq'uila (the *Eagle*): a constellation of stars in the Milky Way near the equator, and on its north side. It may be seen on the meridian during the evenings of August and September.

Aquila: a genus of birds. See EAGLE.

A'quila: a fortified town of Italy, capital of the province of Aquila; is situated on the Pescara, near the Apennines, 58 miles N. E. of Rome (see map of Italy, ref. 5-E). It contains several interesting churches. Here are manufactures of paper, linen, and wax. It was much injured by earthquakes in 1688, 1703, and 1706. Aquila was built by the Emperor Frederick II. about 1240, on or near the site of the ancient *Amiternum*. It contains a citadel built in 1534, and has a large trade in saffron, which is extensively cultivated in the surrounding territory. Pop. 19,027.

Aquila (usually *A. degli Abruzzi*): a province of Italy, formerly called Abruzzo Ulteriore II.; bounded N. E. by Ascoli, E. by Teramo and Chieti, S. by Campobasso and Caserta, W. by Rome and Perugia, and N. W. by Perugia. Area, 2,510 sq. miles. The chief products are grain, vegetables, rice, wine, oil, and fruits. Pop. (1879) 356,371; (1890) 372,710.

Aq'uila of Pontus: author of an extremely literal Greek translation of the Hebrew scriptures (about A. D. 130). His version was embodied by Origen in his *Hexapla* (q. v.). For the fragments now known, see Field's ed. of the *Hexapla*.

C. H. TOY.

Aquilaria'ceæ [so called from *Aquila'ria*, one of the genera]: a family of exogenous plants, all of which are trees and natives of the tropical parts of Asia. The leaves are entire; the perianth coriaceous, turbinate, or tubular; the stamens usually ten; the ovary two-celled, with two ovules; the fruit a drupe or capsule. The order comprises only ten known species, one of which produces the fragrant ALOES-WOOD (q. v.).

Aquile'ja, **Aquileia**, or **Aglar**: an old town of Austria; in the littoral provinces, near the Adriatic or Gulf of Venice, with which it is connected by a canal; is 22 miles W. N. W. of Trieste (see map of Austria-Hungary, ref. 8-C). During the Roman empire it was an important city, was called the second Rome (in Lat. *Roma Secunda*), and was the chief emporium of the trade between the north and south of Europe. The Emperor Augustus often resided here, and here were held several councils of the Church, the first of which was in 381 A. D. The bishops of Aquileja in the sixth century took the title of patriarch, and assumed the rank next to the pope. Aquileja was burned by Attila in 452 A. D., at which time it is said to have had 100,000 inhabitants. Pop. about 2,000.

Aqui'nas, **Saint THOMAS**: celebrated scholastic doctor and theologian, surnamed THE ANGELIC DOCTOR; b. in the castle of Rocca Sicca, near Aquino, in the neighborhood of Naples, in 1227. He was a grand-nephew of the Emperor Frederick I., Barbarossa. About 1243 he joined the order of Dominican monks, and became a pupil of Albertus Magnus. After he had studied theology and scholastic philosophy, he began to teach and preach at Paris with great applause. Having acquired a European reputation by his talents and learning, he left Paris in 1261, and was induced by Pope Urban IV. to remove to Rome, where he taught philosophy. He was distinguished for his modesty, and refused the offer of a bishopric, but he had great influence in the Church. The greatest of the Schoolmen were the Dominican Thomas Aquinas and the Franciscan Duns Scotus. They were founders of rival sects, which wrangled with each other for

two or three centuries. Aquinas wrote a number of works, the most important of which is his *Summa Theologiae* (Sum of Theology), which was regarded as the most complete compendium of scholastic divinity. He died at Fossanuova, in Naples, Mar. 7, 1274. His disciples were called Thomists. Aquinas was a great admirer of the philosophy of Aristotle, and all of his writings may be regarded as commentary designed to interpret Aristotle's doctrines to the support of Christian views of God, Freedom, and Immortality. He was canonized in 1323. Pope Leo XIII. is devoted to him, and has patronized an edition of his works (Rome, 1882, *sqq.*). See Renn D. Hampden, *Life of Thomas Aquinas* (1848); Maffei, *Vita di Tommaso d'Aquino* (1842); Tholnek, *Dissertatio de Thoma Aquinate* (1842); P. S. Carle, *Histoire de la Vie et des Écrits de Thomas d'Aquin* (1846); *Philosophie de Thomas d'Aquin*, par Charles Jourdain (Paris, 1857); *The Life and Labors of S. Thomas of Aquin*, by the Very Rev. Roger Bede Vaughan (2 vols., 1871-72). See the articles DUNS SCOTUS, PHILOSOPHY, and SCHOLASTICISM.

Revised by W. T. HARRIS.

Aquita'nia (in Fr. *Aquitaine*): the ancient Latin name of the most southwestern of the three divisions of Gaul. It originally included the country between the Pyrenees and the Garonne, but Augustus added to it the territory between the Garonne and the Loire. The ancient inhabitants were Iberian tribes. In the fifth century the country was conquered by the Visigoths, and thus brought in close connection with Spain. It was taken from the Goths and added to the possessions of the Franks by Clovis. It was an independent duchy under the feeble princes of the Carolingian dynasty, and became an English possession in 1152 by the marriage of Henry II. with Eleanor of Guienne, who was the heiress of the Duke of Aquitaine. It was united to France in 1451.

Arabesque, ar-a-besk': in the Arabian style or manner; an epithet applied to the fantastic decoration which was profusely employed in the architecture of the Arabs and of the Moors in Spain. Among the most beautiful specimens of Moorish arabesques are the decorations of the famous palace of the Alhambra. The name arabesque was applied to this mode of decoration because it had been long known and admired in the works of the Arabs before the discovery of the beautiful paintings in the Baths of Titus, by Raphael and his pupil Giovanni da Udine, made the world acquainted with a magnificent specimen of Roman work in the same style. The early Italian painters and sculptors, however, had always taken delight in this style of decoration as they found it in the antique Roman sculpture, where scrolls, flowers, fruit, and leaves are mingled with animals and genii. Raphael painted his famous arabesques in the Loggia of the Vatican in direct imitation of the frescoes on the Baths of Titus. He was largely assisted by Giovanni da Udine.

Arabgir', or **Arabkir'**: an important city of Asia Minor, on the Arabgir-Su, and on the road from Aleppo to Trebizond, 100 miles E. S. E. of Siwas (see map of Turkey, ref. 5-H). It has considerable trade, and a large community of Protestant Armenians. Pop. estimated at from 25,000 to 30,000.

Ara'bia [Arab. *Jeze'ret* (or *Jezi'ret*) -*el-A'rab*, i. e. the isle or peninsula of the Arabs; Turk. and Pers. *Arabistan*; Lat. *Arabia*]: a peninsula forming the extreme S. W. part of Asia; encompassed by the sea on all sides except the N. It is bounded N. by Asiatic Turkey, N. E. by the Persian Gulf and Sea of Oman, S. E. by the Indian Ocean, and S. W. by the Red Sea. It extends from lat. 12° 35' to 34° N., and from lon. 32° 10' to 59° 40' E. Its area is now estimated at 1,230,000 sq. miles. It is connected with Africa by the Isthmus of Suez at the N. W. corner. The Euphrates forms a part of the N. E. boundary of Arabia, the southern part of which is included in the torrid zone.

Topography.—The topography of the interior of this peninsula is imperfectly known to European geographers. We know, however, that it is generally arid and sterile, destitute of forests, has no large rivers, and few permanent streams. The surface is diversified by hills of naked rock, plains of sand, and ranges of mountains of no great elevation. The central part of Arabia appears to be occupied by an elevated table-land. A long range of mountains extends through the W. part nearly parallel with the Red Sea, from which it is not more than 80 miles distant, and in some parts less than that. The peaks of these mountains are from 5,000 to 8,000 feet high. In the vicinity of the

mountains, and of the torrents which flow from them, are a number of fertile valleys called *wadys*. Among the remarkable features in the geography of Arabia is Mt. Sinai, which is 7,497 feet high. Ancient and foreign geographers divided this country into three parts—namely, ARABIA FELIX, the Happy; ARABIA PETRÆA, the Stony; and ARABIA DESERTA, the Desert. The first comprises the southeastern part, bordering on the Persian Gulf, the Indian Ocean, and part of the Red Sea; Arabia Petraea includes the northwestern part, bordering on the Red Sea; and Arabia Deserta, the interior and northern portions.

Climate.—The climate is hot and extremely dry. Muscat and Mocha, both on the seacoast, are among the hottest inhabited spots on the earth. The temperature of the plains is often 100° in the shade. In many parts of Arabia rain never falls in the course of the year, and the sun is rarely obscured by a cloud. On the coasts of the Red Sea there is a rainy season of two or three months in summer, but on the southern or southeastern coast the scanty supply of rain falls in the winter, so that the hottest months of the year are also the driest. To the extreme dryness of the atmosphere may be ascribed the remarkable degree of cold sometimes felt in Arabia, for ice and snow frequently occur on mountains ranging from 6,000 to 8,000 feet in height in the part of the peninsula which is in the torrid zone. Among the remarkable phenomena of the climate is a hot south wind called *simoom*, the poisonous quality of which has been exaggerated by travelers.

Productions.—The soil, where it is irrigated, produces cotton, coffee, indigo, tobacco, tamarinds, the date-palm, barley, rice, sugar, and many aromatic plants. The flora of Arabia comprises the characteristic plants of its neighboring countries. Among the wild plants are the mimosa, the Euphorbiaceæ, lavender, jasmine, the aloe, and the trees which yield gum-arabic and olibanum. The animal kingdom is here represented by the camel, the antelope, the ibex, hyena, wolf, jackal, wild-ass, wild-boar, the jerboa, monkey, ostrich, eagle, etc. The Arabian horse is celebrated, and perhaps unrivaled, for docility, endurance, beauty, and speed. Among the mineral resources of Arabia are copper, iron, lead, coal, emeralds, carnelians, agate, onyx, alabaster, marble, sulphur, and saltpeter.

Trade.—Few nations of the world have been more nearly stationary or have made such little progress in industrial arts. The division of the Arabs into numerous independent and unsettled tribes, with consequent absence of national unity, is a great obstacle to their improvement and organization. The government is neither a monarchy, a republic, nor an aristocracy, but each tribe is subject to a chief called an emir, sheik, or inâm. Having the advantage of occupying the coasts between India on the east and Africa and Europe on the west, the Arabs distribute the cotton goods of India among the peoples of Africa and carry back ivory, guns, dye-woods, etc. Merchandise is conveyed across the deserts by large caravans of camels. The principal exports are dates, coffee, gum-arabic, myrrh, aloes, pearls, balsam, etc.

Population.—The population, formerly estimated at from 10,000,000 to 15,000,000, amounts, according to recent calculations, to little over 5,000,000, and is divided into two classes—the nomadic Bedouins, who have no habitations but tents, and have loose notions of the rights of property, and agricultural and mercantile Arabs, who live in towns and villages. The chief towns are Mecca, Medina, Loheia, Mocha, Aden, Muscat, Yembo (or Yambo), and Rostak.

Weights and Measures.—(1) Weight.—The unit of weight is the maund = 3 lb. av. = 1.3608 kilogs. Multiples, 10 maunds = 1 frazil; 15 frazils = 1 bahar. Sub-multiples, $\frac{1}{2}$ maund = 1 rattle; $\frac{1}{5}$ rattle = 1 vakia. At Mocha the maund of coffee contains but 29 vakias. Egyptian weights are also used.

(2) Length.—There are several measures which are not multiples of each other. The guz = 25 in. = 634.98 mm.; the cobido = 19 in. = 482.6 mm.; the kassaba = 4.1 yards = 3.75 meters.

(3) Surface.—The feddan = 400 cassabas (the cassaba for this purpose = 3.84 meters = 12.5986 feet) = 1.4782 acres = 0.589824 hectare.

(4) Volume.—For liquid capacity, the gudda or cuddy = 1.999 gallons = 7.567 liters. Sub-multiples, $\frac{1}{2}$ cuddy = 1 noosfia; $\frac{1}{6}$ noosfia = 1 vakia. Dry measure, the teman or toman = about $2\frac{1}{4}$ pints or 2 liters. Its value is not well ascertained; $\frac{1}{40}$ teman = 1 mecdema or kella. The teman of rice-weight, 168 lb. avoirdupois = 76.2 kilogs.

History.—Owing to the sterility of its soil, Arabia was

never touched by any of the great conquerors of ancient times. After the death of Alexander the Great the Arabians conquered a part of Chaldæa, and founded the empire of Hira. Another tribe founded the empire of the Ghassanides, on the river Ghassan. In 107 A. D. the Roman Emperor Trajan was the first to penetrate to the interior. With the advent of Mohammed the different tribes began to unite and act in concert, and, leaving their peninsula, founded large and powerful empires in three continents. (See MOORS and CALIPHS.) At the time of the conquest of the caliphate of Bagdad in 1258, and the expulsion of the Moors from Spain in 1492, the Arabian rule in Europe and Asia Minor came to an end. In the sixteenth century the Turks conquered Yemen, but were driven back in the seventeenth, but again gained the nominal authority over the holy cities and Hejaz. From 1508 to 1609 Muscat was subject to Portugal. The most important event of recent times in the internal history of Arabia is the advent of the WAHÂBĒES (*q. v.*) in 1770, and their defeat by Mehemed Ali in 1811. At present the only European power having possessions in Arabia is Great Britain, which has taken possession of Aden. In consequence of an attack made on the Christians in Jidda in 1858, the city was bombarded by the British. See CRICHTON, *History of Araby* (1852); SÉDILLOT, *Histoire des Arabes* (1854); MÜLLER, *Beiträge zur Geschichte der westlichen Araber* (1868); WEIL, *Geschichte der islamitischen Völker* (1868); MALTZAN, *Wallfahrt nach Mekka* (2 vols., 1865); *Annals of the Early Caliphates from Original Sources*, and *The Rise and Decline of Islam*, by W. Muir (4 vols., 8vo, Lond. 1858–61); Wrede, *Reisen in Hadhramaut* (1870); and the accounts of Niebuhr, Burckhardt, Burton, Palgrave, and others.

Revised by C. K. ADAMS.

Arabian Architecture: the style of architecture which prevails in or is characteristic of the Arabs. In their native land they had no architecture of importance. After their conquests of the former Roman provinces of Egypt, Syria, and Asia Minor, they caused mosques and other buildings to be constructed in the Byzantine style, as modified in accordance with their acquirements. This style was developed in richer and larger buildings at a later time, and was flourishing from the eleventh to the sixteenth century of the Christian era. The most important monuments that remain are in Cairo. The buildings erected in Persia since the Arab conquests are not often considered as Arabian, because the Persian art has always been of great importance and independent value; but, in fact, the ornamentation derived from Persia was the strongest influence, except the Byzantine method of building, and the style might well be called Perso-Byzantine. The Moorish architecture is a late and inferior modification of this style. See SARACENIC ART.

RUSSELL STURGIS.

Arabian Gulf: See RED SEA.


Arabian Language and Literature: (1) The *language:* Arabic belongs to what is termed the Semitic (or Shemitic) family of languages (see SEMITIC LANGUAGES), and is closely related to the Hebrew, which it resembles in its general grammatical structure, as well as in the form of many of its words. Like the Hebrew, it is written from right to left, and like it, also, the vowels are not written in the body of a word or name, but are indicated (if indicated at all) by certain marks placed above or below the consonants to which they belong (see below). The alphabet consists of twenty-eight letters, as follows:


Number.	Unconnected.	Final connected.	Medial.	Initial.	Name.	Transliteration.
1.	ا*	ا	ا	ا	alif,	'
2.	ب	ب	ب	ب	bâ,	b.
3.	ت	ت	ت	ت	tâ,	t.
4.	ث	ث	ث	ث	thâ,	th.
5.	ج	ج	ج	ج	jîm, gîm,	j, g.
6.	ح	ح	ح	ح	hâ,	h.
7.	خ	خ	خ	خ	khâ,	kh.
8.	د*	د	د	د	dâl,	d.
9.	ذ*	ذ	ذ	ذ	dhâl,	dh.

* The letters thus marked ought never, according to the rules of Arabic orthography, to be connected with those that follow them.

Number.	Uncon- nected.	Final con- nected.	Medial.	Initial.	Name.	Transliteration.
10.	ر*	ر	ر	ر	râ,	r.
11.	ز*	ز	ز	ز	zây,	z.
12.	س	س	س	س	sîn,	s.
13.	ش	ش	ش	ش	shîn,	sh.
14.	ص	ص	ص	ص	şâd,	ş.
15.	ض	ض	ض	ض	đâd,	đ.
16.	ط	ط	ط	ط	ţâ,	ţ.
17.	ظ	ظ	ظ	ظ	zâ,	z.
18.	ع	ع	ع	ع	'ain,	'.
19.	غ	غ	غ	غ	ghain,	gh.
20.	ف	ف	ف	ف	fâ,	f.
21.	ق	ق	ق	ق	kâf,	k.
22.	ك	ك	ك†	ك†	kâf,	k.
23.	ل	ل	ل	ل	lâm,	l.
24.	م	م	م	م	mîm,	m.
25.	ن	ن	ن	ن	nûm,	n.
26.	ه	ه	ه	ه	hâ,	h.
27.	و*	و	و	و	wâw,	w.
28.	ي	ي	ي	ي	yâ,	y.

* The letters thus marked ought never, according to the rules of Arabic orthography, to be connected with those that follow them.




† Written also, .

‡ Written also, .


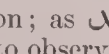
All the foregoing characters are regarded by Arab grammarians as consonants. Alif has been compared to the soft breathing (*spiritus lenis*) of the Greeks; 'Ain is a strong guttural of which the pronunciation is very difficult for foreigners.

When a consonant is doubled, this doubling must be brought out clearly and distinctly in the pronunciation.

VOWELS.

In Arabic there are three short vowels. These are indicated by signs called—1. *Fet'ha* (a*); 2. *Kes'ra* (i, sometimes ě); and 3. *damma* (oo or u †). Fet'ha is written over the consonant to which it belongs, thus ; kesra is placed beneath its consonant, thus ; damma (which is in fact a minute ʾ) is written over its consonant, thus . These vowels are always pronounced after the consonant above or below which they are written.

There are three long vowels, ā, ī, ū ‡, and to indicate these the Arabic makes use of the consonants alif, yâ, wâw, respectively, preceded by the marks of the corresponding short vowels. There are two diphthongs, ai and au, which are indicated by the consonants yâ and wâw, respectively, preceded by the fet'ha.

The vowel-signs are usually omitted in Arabic manuscripts and printed works (but not the consonants used to indicate the long vowels), and they are scarcely needed by the native Arabs, who are already familiar with the language; but they are of the utmost importance to foreigners in learning Arabic. The same may be said of the *jâzm* or *jëzm* (◌), a mark placed over a consonant to show that it has no vowel following it, as  (*azrak*, "blue," which without the *jâzm* might be pronounced *azrârk*), and the *teshdeed* or *teshdîd* (◌), placed on a consonant to show that it is to be doubled in pronunciation; as  (*Mohammed*).

It is proper to observe that when the Arabic article *al* or *el* is followed by the letters *t*, *th*, *d*, *dh*, *r*, *z*, *s*, *sh*, *ş*, *đ*, *ţ*, *z*, *n*, the sound of the *l* is changed to that of the letter following; thus *el-Deen* becomes *ed-Deen*; *el-Dowlah*, *ed-Dowlah*; *al-Rahman* or *el-Rahman*, *ar-Rahman* or *er-Rahman*; *al-Temeeme*, *at-Temeeme*, and so on.

* Often represented by *e*, and sometimes (in English) by *u* short.

† Often represented by *o*, as in the name of Mohammed.

‡ The long vowels in Arabic are to be pronounced very full and long.

The Arabic alphabet belongs to the Aramean family of alphabets. With the exception of the Latin alphabet it is used over a greater extent of territory than any other. By means of diacritical points and minor changes it has been adapted to such languages as Turkish, Persian, etc. There are two principal forms of the Arabic alphabet, the Kufic and the Neskhi. The Kufic is so called from the town of Kufa on the Euphrates, where, it is said, the transcription of the Koran was carried on extensively. It is a square character, not well adapted for ordinary use, but well suited for inscriptions on coins, etc., and for ornamental texts. It has long since fallen into disuse. The Neskhi, which is given above, is the form which is used in books and newspapers. On the history of this alphabet, see Isaac Taylor's *The Alphabet* (Lond. 1883).

The Arabic is one of the most extensively diffused languages in the world. It not only prevails in Arabia, in Syria, and in a part of Mesopotamia, but it is spoken in its various dialects (which are more or less corrupted) throughout a large part of Northern Africa, from the shores of the Atlantic to the Red Sea. It is the language of Egypt, which, since its conquest during the caliphate of Omâr, in 641 A. D., has been one of the principal centers of Arabian culture. From about the ninth to the twelfth or thirteenth century it was the prevailing tongue of a large part of the Spanish Peninsula, and its traces are still seen, not merely in many of the names, but in the language of Spain at the present day.

The Arabic, together with the Ethiopic, belongs to the South Semitic family of languages. Of the Arabic tongue there are two principal dialects, the northern or prevailing dialect, in which the Koran is written and which has come to be known as the Arabic language, and the southern or Sabean (formerly called Himyaritic), originally spoken in Yemen and in the extreme southern part of Arabia. The earliest distinctively Arabic writing dates from the early part of the sixth century, but there have been found in the northern part of Hijâz inscriptions written in an Arabian dialect and of a much earlier date. There seems little doubt that in the sixth century practically one and the same dialect was spoken over the larger part of Arabia. As time passed on, however, and the language began to be used in places far away from its original home, dialectical differences increased and were accentuated; new and different conditions required new and different words, till now each of the countries where Arabic is spoken has its own dialect, which differs not a little from the other Arabic dialects and from the classical Arabic. The local dialect is used in ordinary conversation even by the learned, but for books, letters, public speeches, or documents a classical or pseudo-classical Arabic is used, which does not vary greatly in the different countries. When one speaks of the Arabic dialect of a country it must not be forgotten that not only does the speech of different towns betray differences, but such differences have been detected in the language of the different quarters of the same large city.

The large number of gutturals in the Arabic, while making the pronunciation difficult for a foreigner, makes the language, especially when spoken by an uneducated person, rather harsh. When used by a master, however, it is by no means unpleasant.

The Arabic has a very large vocabulary. The life of the Arabs was necessarily rather monotonous, and their opportunity for observation limited, but within their narrow range they noted and named everything with great care and accuracy. Every feature of their life, every phenomenon of nature, every point of their horses and their camels, had its own individual name. Of course, when the desert Arab became acquainted with the culture of the lands he conquered he had to borrow or invent new words, and thus add to his already large stock. Arabic has proved itself admirably adapted for the discussion of abstract subjects, and Arabic journals and books seem to be able, with the help of some borrowed words, to express all modern ideas. On the Arabic and its relation to the other Semitic languages, cf. Nöldeke's *Die semitischen Sprachen* (Leipzig, 1887).

For the study of the classical Arabic, Wright's *Arabic Grammar* (Lond. 1874-75) is a standard work. The grammars of Sorin and of Lansing may also be mentioned. Lane's *Arabic Dictionary* (Lond. 1864) is a work of great value. Cuhe's *Vocabulaire Arabe-Français* (2d ed., Beirut, 1888) is an extremely valuable little book. Other dictionaries of value are: Freytag's *Lexicon arabico-latinum* (Halle, 1830-37); Cherbonneau's *Dictionnaire Arabe-Français* (Paris,

1876); Steingass's *Student's Arabic-English Dictionary* (Lond. 1884); Wortabet's *Arabic-English Dictionary* (Cairo, 1884).

For a study of two of the modern dialects, the following works will be found of value: Spitta Bey's *Grammatik des Arabischen Vulgärdialectes von Aegypten* (Leipzig, 1880); Vollers's *Lehrbuch der Aegyptio-Arabischen Umgangssprache* (Cairo, 1890); Hartmann's *Arabischer Sprachführer* (Leipzig); Landberg, *Proverbes et Dictons du Peuple Arabe* (Leyden, 1883).

(2) ARABIAN LITERATURE is very rich, especially in poetry and other productions of the imagination. Even before the time of Mohammed the Arabs had celebrated poets who sang the praises of heroes and the charms of beautiful women. During the great fairs at Okâz, near Mecca, poetic contests were held in much the same manner as at the games of ancient Greece. It was a great honor to be victorious in one of these conquests. These pre-Mohammedan poets "represent the highest pitch of the Arabic poetic imagination," and they were much imitated by the Moslem writers.

The Arabs have produced no epic or dramatic poems. It is in lyric and romantic composition that they most excel.

There is one kind of poetical fiction, called *Assemblies* (Arab. Maḳâmât مقامات), which may be said to be peculiar to Arabic literature. The *Assemblies* may be regarded as the first step toward dramatic composition. The author of this species of writing was Hamadânee (or Al-Hamadânee), who flourished toward the close of the tenth century. He imagined a witty and unscrupulous improviser, wandering from place to place and living on the presents which the display of his marvelous talents procured from his hearers, and a narrator or story-teller who should be continually meeting with the other, should relate his adventures and repeat his excellent improvisations. He gave to these compositions the name of *Assemblies*, because the improviser was always introduced as making his appearance in some company or assembly of strangers, where the narrator also happens to be, and is sure to be greatly astonished at the tricks, wit, and genius of the other, which he afterward relates in his own language, and these relations constitute the *Assemblies* as they are presented to us. Of this species of composition the *Assemblies* of Hareeree (Harîrî) furnish, perhaps, the best specimen. Hareeree is regarded by the Arabs as a consummate master of diction, and the highest authority in the use of language. "For more than seven centuries," says a recent writer, "his work (the *Assemblies*) has been esteemed as, next to the Koran, the chief treasure of the Arabic tongue. Contemporaries and posterity have vied in their praises of him. His *Assemblies* have been commented on with infinite learning and labor in Andalusia and on the banks of the Oxus." See Introduction to the *Assemblies of Al-Harîrî*, translated by T. Chenery (Lond. 1867).

In romance especially the Arabs may be said to excel. Among the works of this class we may name the *Feats of Antar*, the stories or fables of Ibn Arabshâh, etc. But perhaps the most universally popular, not merely of Arabian fiction, but of all fiction of which we have any knowledge, is the famous collection of tales known as the *Arabian Nights* (q. v.).

In philosophy, mathematics, history, geography, medicine, and physics, the Arabs, during the period of their power, rendered important services to science and civilization; the Arabic terms still found in the language of science, such as *alcohol*, *algebra*, *almanac*, *azimuth*, *nadir*, *zenith*, etc., sufficiently attest their influence on the early intellectual culture of Europe. During the period known as the Dark Ages the scientific works of Aristotle and other Greek philosophers were translated for the most part by Christian scholars who resided as physicians at the courts of the caliphs in great numbers. These works were diligently studied in the Mohammedan capitals of Bagdad, Damaseus, and Cordova, and served to diffuse a knowledge of those great writers among nations who otherwise would have remained in utter ignorance of them and of their writings.

The study of rhetoric and of grammar was pursued with great diligence and success, and an enormous amount of labor was devoted to the expounding of the Koran, the result of which may be seen in the numerous works dealing with the Koran and its exegesis.

The most glorious period of Mohammedan culture extended from about 750 to 1200 A. D. During this period the Abbasside caliphs, Haroun-al-Rashid, Mamoon, and Motassem, reigned at Bagdad, which, under their auspices, became

a magnificent center of science, letters, and the arts. In the far East, Mahnood of Gazna (about 990-1030), though a sanguinary conqueror, was ambitious of the distinction of a patron of literature. At his court flourished Firdousee (Firdausi), the greatest not only of all Persian* but of all Moslem poets, Mohammed only excepted. In Spain, under the caliphs of the Omeyyade dynasty, the period of Arabian culture was not less glorious, and was of much longer duration, than that under the Abbassides. Al-Hakem, Caliph of Cordova (961-76), had, it is said, a library of 600,000 volumes. The high reputation for learning of the Spanish Arabs is shown by the fact that some of the best students of Christendom visited Cordova in order to study the philosophy of Aristotle, medicine, and mathematics under Arabian professors. To the Arabs we are indebted for the preservation of many works from classical antiquity, which without their care and zeal would in all probability have perished during the long period of darkness and semi-barbarism that followed the overthrow of the Western Roman empire.

Among the most distinguished Arabian authors, besides those already mentioned in this article, we may name—(1) In poetry, Khansâ, a female poet contemporary with Mohammed; Ibn-Doreid (838-933); Al-Mootenabee (about 900-965); and Booseeree (or Busîrî), who flourished in Upper Egypt (about 1250). (2) In philosophy, Alchindus flourished under the Caliph Mamoon (about 820); Alfarabius, who lived at Damaseus (about 950); Avicenna (980-1037), who was even more celebrated as a physician than as a philosopher; Averroes (about 1120-98), wrote at Cordova, in Spain, a commentary on Aristotle, to which Dante alludes. (3) In medicine the Arabs excelled all the nations of that period; they are commonly regarded as the earliest experimenters in chemistry (alchemy). Among their celebrated physicians were Razes (or Rhazes)—870-930—who is said to have been the first to describe the smallpox accurately; Avicenna (Ibn Sînâ), already mentioned, the most famous of all the Arabian physicians; Averroes was also distinguished as a physician; Abuleasem (Abulcasis), the most distinguished of Arabian surgeons, is supposed to have practiced in Cordova (about 1050-1110); he left a treatise on surgery, the most valuable that has come down to us from early times. (4) In mathematics the labors of the Arabs were not less useful than in other branches of science, though they can not perhaps boast of so many famous names as in philosophy and medicine. They contributed greatly to simplify and improve the science of numbers by the introduction of the Indian numerals, with the decimal notation. They appear to have been the first to introduce the knowledge of algebra (which had been previously cultivated by the Greeks and Hindus) into Western Europe. Mohammed Ibn Moosa (who flourished at Bagdad from about 810-833) is said to have been the first of his countrymen who wrote on algebra. He also wrote on optics and astronomy. Albatēgnius (Albatenî), who died at Bagdad in 929, wrote some valuable works on astronomy; Abulfeda combined mathematics and astronomy with geography. (5) In history and geography, Masoodee, one of the first of Arab historians, was born at Bagdad, and died at Cairo in 956. His *Meadows of Gold and Mines of Gems* comprises the history, the politics, the religion, and the geography of many Oriental and European nations. Abulfeda (1273-1331) has left works of great value in this and other departments of knowledge. His *Description of the Countries* is considered the best work on geography which the Arabian writers have bequeathed to us. Abulfaragius or Elmaein (or Elmakin), though Christians, wrote valuable general histories in the Arabic language. Ibn Khaldoon (1332-1406) wrote a valuable history of the Arabs, Persians, and Berbers. Makreezee flourished at Cairo (1360-1442), and wrote some excellent historical works. Mak-karee, or Al-Makkari (1585-1631), wrote a history of the *Mohammedan Dynasties of Spain*, which has been translated into English by Gayangos (Lond. 1840).

Those who seek for a general view of Arabian literature are referred to Hammer-Purgstall's *Encyklopädischen Übersicht der Wissenschaften des Orients* (Leipzig, 1804), and his *Literaturgeschichte der Araber* (7 vols. 4to, 1850-56); Renan, *Averrhoes et l'Averrhoisme*; Whewell, *History of the Inductive Sciences*. Revised by J. R. JEWETT.

* Not only was the genius of the poetry of the modern Persians greatly modified by the influence of Islamism, but the Persian language itself includes a very large mixture of Arabic words and phrases. This is especially remarkable with respect to some of the later poets. To understand thoroughly the works of Saadi, for example, a very considerable knowledge of Arabic is absolutely requisite.

Arabian Nights, sometimes called **The Thousand and One Nights**: the title of a collection of wild and fanciful Oriental tales, first brought to the notice of Europe in the early part of the eighteenth century by Antoine Galland, a French Orientalist. These fascinating fictions are probably more widely diffused and read than almost any other production of the human mind. The origin and author of this collection are still unknown. According to some authorities the *Arabian Nights* may be properly divided into three portions, which may be respectively traced to a Persian, an Indian, and an Arabian origin. Throughout the entire work, however, everything appears to be conformable to the character and customs of the Arabian people, and to the Mohammedan faith. The fact that Haroun-al-Raschid figures in several of the stories goes to prove that they, at least, must have been written after his death; while the omission of any mention of coffee and tobacco (except in two or three instances where the names are supposed to be interpolations) shows that the work must have been composed before the introduction of those articles into Western Asia (in the latter half of the fifteenth century). "Many of the tales," says Mr. Lane, referring to this remarkable work, "are doubtless of different and early origins, and its general plan is probably borrowed from a much older production bearing the same title." After some further remarks, he states it as his opinion that the composition in its present form was probably commenced in the last quarter of the fifteenth and completed in the first quarter of the sixteenth century, and that the author or authors must have been Egyptian, because the description of Arab life as it is seen in Cairo is so minutely accurate in all respects. But respecting the date and place of its composition, Oriental critics are far from being agreed. It is noteworthy that the tales differ considerably in various Arabic texts. The work has been translated by W. Beaumont (1811), Macnaghten, Scott, Torrens, E. Foster (1802), and Lane (1839). Most of these translations were from the French. Among the best translations are those of Lane (already mentioned), Payne's literal translation (9 vols., 1882-84), and Sir Richard Burton's (10 vols., "Benares," 1885-87; with 5 supplementary volumes, issued in 1887-88), a slightly expurgated edition of which was published by Lady Burton in six volumes (London, 1886-87). The *Arabian Nights* has given rise to many imitations, among the best of which in English is *Tales of the Genii*, by Rev. James Ridley.

Revised by J. R. JEWETT.

Arabian Numerals, or Figures: the characters 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, which Europeans received through the Arabs from the Hindus. The use of these numerals was not general in Europe before the invention of printing.

Arabian Sea: the N. W. part of the Indian Ocean, lying between India, Arabia, Persia, and East Africa, anciently called *Mare Erythreum*. It has considerable commerce, mainly by virtue of being connected by the Red Sea and the Suez Canal with the Mediterranean.

Arab'ici (i. e. Arabians): a heretical sect which arose in Arabia in the third century, the founder of which was Beryllus, Bishop of Bostra. They denied Christ's divinity, and believed that the soul dies, and is raised again with the body. They were confuted by Origen.

Ara'bi Pasha' (AHMED-EL-URABY): the leader of the Egyptian rebellion of 1882; b. about 1835 on a state farm at Tantah, on the delta of the Nile, where he worked till he was twenty-six, and where his father was a laborer. Arabi received no education while young, but afterward learned to read and write a little Arabic. He was a private soldier in the Egyptian army for twelve years; but later was rapidly advanced to lieutenant, colonel, minister of war, and then pasha. The khedive had pledged all of Egypt and every possible source of revenue to the bondholders. The taxpayers refused to pay; the interest of the foreign loans could not be paid. Great Britain and France semi-officially interfered; the khedive was compelled to allow all high positions of trust to be filled by men sent from the British and French foreign offices; the natives were excluded, and thousands of them joined Arabi's party. Arabi proclaimed to the troops that he was inspired by the Prophet to fulfill a holy mission, the motto of which was "Egypt for the Egyptians," and he became the leader of a great rebellion. The massacre by his forces at Alexandria soon followed. The British intervened, and the forts at that place were bombarded and dismantled by their fleet July 11 and 12, 1882. The war lasted but a few months, and Arabi's army was

totally defeated at Tel-el-Kebir, Sept. 13, 1882, by the British under Gen. Wolseley. Arabi soon after surrendered himself to them, and was sentenced to death Dec. 3, 1882; but his sentence was commuted by the khedive to exile for life, and he was soon after sent to Ceylon.

Aracan: See ARAKAN.

Araca'ri, or **Aricari**: a bird of the genus *Pteroglossus*; a native of tropical South America, and nearly allied to the toucan, but smaller, with longer tail. The bill of one species of this genus is white, with a blood-red stripe along the middle. One of the most remarkable is the curl-crested aracari, having the feathers upon its head beautifully curled.

Araca'ty: a port in Ceara, Brazil; has three churches, several schools, and a trade in hides and cotton. It is on the river Jaguaribe; lat. 4° 31' S., lon. 37° 48' W. (see map of South America, ref. 4-II). There is a dangerous bar at the river's mouth. Pop. 6,000.

Ara'ceæ: a family of endogenous herbaceous plants, natives of temperate and especially of tropical countries, so named from *Arum*, one of its genera. The leaves are sheathing at the base, convolute in the bud; the flowers are naked, arranged on a spadix, which is usually inclosed in a spathe; the male flowers at the upper part of the spadix, and the female at the base. The genus *Arum* is the type of this order, which is characterized by an acrid juice and a nutritious amylaceous substance which is used for food. The *Amorphophallus* is cultivated in India for its roots (or corms), which are edible. See ARUM and AROIDS.

Arachis: See PEANUT.

Arach'nida [from Gr. ἀράχνη, a spider]: a class of arthropodous animals, characterized by having eight pairs of appendages adapted for eating and walking, by having the body divided into an anterior unjointed region* (cephalothorax), and a jointed or unjointed abdomen. They differ from the true insects in many particulars, among which may be mentioned the absence of antennæ, the situation of the sexual openings near the middle of the body, the development of the respiratory organs on the abdomen in connection with legs which disappear after the embryonic stages. They have rather more affinities with the Crustacea, and are to be closely associated with the living horse-shoe crabs (*q. v.*), and the extinct trilobites and enypterans. Seven orders are recognized: (1) *Scorpionida*, the scorpions; (2) *Solpugida*, or cylinder scorpions; (3) *Pseudoscorpia*, or false scorpions; (4) *Pedipalpi*, or whip-scorpions; (5) *Phalangida*, or "daddy long-legs"; (6) *Araneida*, the true spiders; and (7) *Acarina*, the mites. Almost all of the group are carnivorous, and many of them are well provided with poison organs. In some cases they may produce severe and even dangerous injury to man. J. S. KINGSLEY.

Arach'noïd [from Gr. ἀραχνοειδής, cobweb-like]: resembling a spider's web, applied to the second or middle membrane of the brain.

Arachnoid Membrane (sometimes called *me'ninx me'dia*): the fine cobweb-like serous membrane situated between the dura and pia mater of the brain or spinal cord. It

* In Galeodes and Solpuga the cephalothorax is three-jointed.



Aracari.

covers both brain and spinal cord. It is a closed sac, disposed in two layers.

Arad': a county of Hungary; bounded N. by Bihar, E. by Zarand and Transylvania, S. by Temes and Krasso, and W. by Csanad. Area, 2,488 sq. miles. In the E. it consists of high mountain-ranges, but the W. is a fertile plain, traversed by the White Körös. Grain of all kinds, wine, and tobacco are produced here in large quantities of an excellent quality. Chief town, Arad. Pop. 303,964.

Arad, NEW (Hun. *Uj-Arad*): town of Hungary; county of Temesvár; on the left bank of the Máros (see map of Austria-Hungary, ref. 7-1). Here is an extensive fortress, which is one of the strongest in the Austrian empire, and is used as a prison for political offenders. Pop. about 5,000.

Arad, OLD (Hun. *O Arad*): open town; capital of the county of Arad; on the right bank of the Máros; 35 miles E. of Szegedin (see map of Austria-Hungary, ref. 7-1). It is a bishop's see, has a Greek theological seminary, a normal school, and manufactures of tobacco, etc. It is an important cattle market, and has a considerable trade in grain. Pop. (1880) 35,556; (1891) 41,945.

Ar'adus [the *Arvad* or *Arpad* of the Bible]: one of the chief cities of ancient Phœnicia; was built upon the island now called *Rvad*, which is small and rocky, and is situated 35 miles N. of Tripoli, and 2 miles from the mainland. It long continued to be a place of great population and importance. It was supplied with water from submarine springs. It was destroyed and depopulated by the Moslems in the seventh century. Many relics of its former greatness remain. It has still a small population.

Arafat', Mount. or Jeb'el-er-Rahm' (i. e. the mountain of mercy): a granite hill of Arabia, 15 miles E. of Mecca, rises about 200 feet above the plain. To facilitate its ascent, steps have been cut in the rock or built of solid masonry. It is visited annually by a great multitude of Mohammedan pilgrims, who believe that this is the place where Adam and Eve first met after they had been expelled from Paradise and had been separated 120 years. It has a chapel on its summit, which is said by the Mohammedans to have been built by Adam.

Arafu'ra: an aboriginal or non-Malay race of the Spice islands, Celebes, Papua, etc., according to some ethnologists embracing the native race of Australia, and indeed all the Melanesian tribes, including the extinct Tasmanians and the black forest tribes (Negrillos) of Malacca and the Philippines. These people are all exceedingly rude. To cut off a human head plays the same part among their moral institutions as confirmation in many Protestant countries; a young man is not allowed to marry unless he has performed the deed. A white man's head is considered the greatest trophy, and is treasured up in the family sanctuary as the most valuable piece of property. Generally the people have black or very dark skins, and for the most part crisp or woolly hair; but from the character of their languages they are considered quite distinct from the black races of Africa. From this people the sea N. of Australia and S. of the Malay Archipelago is called the Arafura Sea. The name is of Portuguese origin, and originally meant "foreigners."

Ar'ago, DOMINIQUE FRANÇOIS: French astronomer and savant; b. at Estagel, near Perpignan (Eastern Pyrenees), Feb. 26, 1786; entered the Polytechnic School in 1803, and became in 1805 secretary to the Bureau of Longitudes. In 1806 Arago and Biot were employed by the Government to perform the measurement of an arc of the meridian from Barcelona to the Balearic isles, in order to complete an important operation which Delambre and Méchain had commenced. While he was engaged in this arduous work among the mountains, war broke out between the French and Spaniards. Arago escaped from the violence of the Spaniards, who suspected him to be a spy, but on his voyage toward home was driven by a tempest to Algiers, where he was held as a slave. He was finally liberated, and returned to France in July, 1809. In consideration of his services and sufferings he was elected a member of the Institute in 1809, although he was under the age the rules required. About the same time he was appointed Professor of Analysis in the Polytechnic School, where he lectured for many years. He afterward devoted much attention to optics, astronomy, and magnetism. In 1812 he began a course of lectures on astronomy, which were rendered very popular by a brilliant style added to their other merits. Arago and Gay-Lussac founded in 1816 the *Annales de Chimie et de*

Physique. He advocated the undulatory theory of light, and made several discoveries in the science of electro-magnetism. For his discovery of the development of magnetism by rotation, he received the Copley medal of the Royal Society of London in 1825. He became in 1830 director of the Observatory of Paris, and perpetual secretary of the Academy of Sciences. His reputation as a writer was increased by the eulogies which he composed on Condorcet, Ampère, and Carnot, and other members of that academy. He displayed a remarkable faculty of popularizing science in his writings and lectures. He promoted the revolution of 1830, and was elected in 1831 to the Chamber of Deputies, in which he acted with the *extrême gauche*, the advanced republicans. He was a member of the provisional government formed by the republicans in Feb., 1848, and co-operated with Lamartine in resistance to the socialists and in the maintenance of order. He officiated as Minister of War and the Marine for several months, and was one of the executive committee of five elected by the Assembly in May, 1848. About this time the voters of his native department elected him to the National Assembly. He opposed the election of Louis Napoleon to the presidency, and refused the oath of allegiance after the *coup d'état* of Dec., 1851. The emperor recognized his eminent services by accepting him from the enforcement of the law on this point. Arago died in Paris on Oct. 2, 1853, leaving a son, Emmanuel, noticed below. He was a friend of Alexander von Humboldt and of Faraday; was a man of a generous disposition, an ardent temperament, and great energy of character. A statue of him was unveiled at Perpignan in 1879. His works were edited by Barral with a biography, and appeared in Paris (1854-62, 17 vols.; 2d ed. 1865, *sqq.*). D. F. Arago's *Histoire de sa Jeunesse* (1854); J. A. Barral's *F. Arago* (8vo, 1853); Bertrand's *Arago et sa Vie Scientifique* (1865); Audiganne's *François Arago* (1869).

Arago, FRANÇOIS VICTOR EMMANUEL: politician; b. at Paris, June 6, 1812. He studied law, and gained distinction as an advocate and counsel for the defense in political trials. Like his father, D. F. Arago, he was a keen republican, and took an active part in the revolution of 1848. In this crisis he was selected by the republicans to protest in the Chamber of Deputies against the appointment of a regency. He was sent as commissary-general to Lyons in March, was elected to the Constituent Assembly in April, and was sent as minister to Berlin in May, 1848. He resigned in December in consequence of the election as president of Louis Napoleon, whose designs he constantly opposed. The *coup d'état* of Dec., 1851, and the *régime* that followed, excluded Arago from the public service. On the formation of a provisional government by the republicans in Sept., 1870, he became a member of the same. He was elected a member of the National Assembly in 1871, and to the Senate 1876 and 1891. D. in Paris, Nov. 26, 1896.

Arago, ÉTIENNE: dramatic author; brother of the great savant, D. F. Arago; b. at Estagel, near Perpignan, Feb. 9, 1802; produced a number of successful comedies and vaudevilles, which exhibit a talent for satire. Among his works is *The Aristocrats* (1847), a comedy in verse. He fought for the popular cause in the revolution of 1830, and founded the *Reform*, a daily republican journal, in 1834. He was director-general of the post-office from Feb., 1848, until December of that year, and in that position acted with much vigor and ability. As a member of the National Assembly he voted with the *gauche* and opposed the policy of Louis Napoleon. He was exiled in June, 1849. After the proclamation of the republic in Sept., 1870, he was appointed mayor of Paris, which position he held until November. In Feb., 1871, he was elected a member of the National Assembly, but soon resigned on account of his age. He became conservator of the Luxembourg Museum, 1879. D. in Paris, Mar. 5, 1892.

Arago, JACQUES ÉTIENNE VICTOR: French *littérateur*; brother of Étienne Arago; b. at Estagel, Mar. 10, 1790. He accompanied the exploring expedition of Freycinet as draughtsman in 1817, and on his return in 1821 published a *Tour Round the World in the Uranie*, etc. (2 vols., 1822). Among his works are several dramas. Although he had become blind, he joined a party that went to California in 1849 to dig for gold, and published *Travels of a Blind Man in California*, etc. (1851). D. in Brazil, Jan., 1855.

Ar'agon: a former kingdom of Spain; bounded N. by France, E. by Catalonia, S. by Valencia, and W. by Navarre and the Castiles. Length from N. to S., about 200 miles.

Area, 17,976 sq. miles. It is now divided into the provinces of Huesca, Saragossa (Zaragoza), and Teruel. The Pyrenees, which extend along the northern border of Aragon, rise to the height of 11,000 feet. The surface is diversified by several ranges of mountains and many fertile and beautiful valleys. Aragon is intersected by the river Ebro, which flows southeastward and divides it into two nearly equal parts. A considerable portion of the soil is sterile. Among the mineral resources of this region are copper, iron, lead, cobalt, quicksilver, marble, stone, coal, alum, and salt. Aragon was conquered by the Moors in the eighth century. The Christian kingdom of Aragon, founded in 1035, became a powerful state, which was united with Castile by the marriage of Ferdinand of Aragon and Isabella of Castile in 1469. The chief towns are Saragossa and Huesca. Pop. (1887) 910,830. See Schmidt, *Geschichte Aragoniens im Mittelalter*.

Arago'na: a town of the island of Sicily, in the province of Girgenti, 8 miles N. of Girgenti (see map of Italy, ref. 9-E). It has a ruined castle and large sulphur mines. Pop. 13,520.

Ar'agonite, or **Ar'ragonite**: a variety of carbonate of lime, first found in Aragon. It crystallizes in hexagonal prisms, or in crystals of which the primary form is a rhombic prism. It resembles calcareous spar in composition, but differs from it in the form of its crystals, and is reduced to powder by a heat in which calcareous spar remains unchanged. Satin spar is a variety of aragonite.

Aragnay, ăă-răă-gwī, or **Aragnay'a**: a large river of Brazil; rising in the mountains about lat. 18° 10' S., and lon. 51° 30' W. It flows northward; forms the boundary between Goyaz and Matto-Grosso, and after a course of 1,300 miles joins the Tocantins at São João. It is navigable for about 1,100 miles. About midway from its source to its mouth it incloses the island of Santa Anna, or Bananal, 210 miles long. The stream on the east side of this island is called *Furo*.

Arakan, or **Aracan** (called by the natives **Rakhaing'**): a province of Burma, extending along the east side of the Bay of Bengal. The greatest length from N. to S. is about 280 miles, and the area is 14,526 sq. miles. The surface is diversified and extensively covered with forests. The chief productions are rice, tobacco, indigo, cotton, salt, oil, ivory, hides, and timber. Arakan was conquered from the Burmese by the British in 1826. Chief town, Akyab. The principal rivers are the Naf estuary in the N., forming the boundary between the province and Chittagong, the Myu, the Koladyne, running into the Bay of Bengal and navigable for 40 miles, and the Lemyhu, a few miles S. of the Koladyne. Farther S. the rivers are short, and are unimportant except the Gwa, whose mouth forms a harbor. Pop. (1891) 669,540. See Hay, *Arakan: Past, Present, Future* (1892).

Arakan', or **Aracan**: a town of Burma, in province of same name; on the river Arakan; about 50 miles from its entrance into the Bay of Bengal, about lat. 20° 45' N., and lon. 93° 15' E. (see map of India, ref. 2-K). It was formerly the capital of the province and a populous town, but it is now much reduced. Pop. estimated at 10,000.

Ara'lia: a genus of plants of the family *Araliaceæ*, natives of the U. S., of the Himalaya Mountains, and other regions. It comprises a number of species which are used in medicine, as the ginseng, *Aralia quinquefolia*; *Aralia nudicaulis*, called wild sarsaparilla, which grows in the U. S.; *Aralia spinosa*, a native of Virginia, which is a stimulant diaphoretic, called angelica-tree, or toothache-tree; and *Aralia racemosa*, or American spikenard, which produces an aromatic gum-resin. Chinese rice-paper is cut from cylinders of the pith of *Aralia papyrifera*.

Araliaceæ, a-ră-li-ă'se-cē (so called from *Ara'lia*, one of its genera): a natural order of exogenous plants, natives of tropical, temperate, and cold regions in various parts of the globe. It comprises about 375 known species (trees, shrubs, and herbaceous plants), generally possessing stimulant or aromatic properties. The fruit consists of several one-seeded cells. The leaves of several species are used as fodder for cattle in India. One species of this order, the ivy, is a native of England.

Ar'al, SEA OF: a large inland sea in Asiatic Russia, about 150 miles E. of the Caspian Sea. It is included between lat. 43° and 47° N. Length, estimated at 262 miles; breadth, about 184 miles. Area, 26,900 sq. miles. Next to the Cas-

pian, it is the largest inland sea of Asia. Having no outlet, it is saline or brackish. The S. W. part, called Lake Landau, is shallow, and not more than 5 feet deep in the deepest part. The Aral is fed by the large river Oxus or Amu, which enters the sea at its south side; it also receives the river Sihon or Sir-Daria from the E. The latest measurements make it 157 feet above the level of the sea. Seals, sturgeons, and other fish are found in it.

A'ram, EUGENE: an English felon; b. at Ramsgill, Yorkshire, in 1704. He had not the advantage of a liberal education, but he acquired a good knowledge of the Latin, Greek, Hebrew, Chaldee, Arabic, and Welsh languages. He became a schoolmaster at Knaresborough, where he was intimate with a shoemaker named Daniel Clarke. The latter, having purchased some goods on credit, suddenly disappeared, leaving his debts unpaid. Aram was suspected of being an accomplice of Clarke in an attempt to defraud. A portion of the goods which Clarke had purchased was found in the garden of Aram, who was tried, but acquitted, after which he removed from Knaresborough. In 1759 a man named Houseman having confessed that he was accessory to the death of Clarke, whom Aram had killed, Aram was tried for the murder, and made an elaborate argument in his own defense, but was convicted, and afterward confessed his guilt. He was hanged at York, Aug. 6, 1759. His story forms the subject of one of Bulwer's novels, and of a poem by Hood. See Scatcherd, *Memoirs of Eugene Aram* (1832).

Aramæ'a [from *A'ram*, the son of Shem]: the ancient name of a region of Asia, the boundaries of which are not well defined. It extended from Mt. Taurus on the N. to Arabia on the S., and coincided nearly with the countries called by the Greeks Syria, Babylonia, and Mesopotamia. The Aramaic language, a branch of the Semitic, was divided into two forms or dialects—the Syriac or West Aramaic, and the Chaldee or East Aramaic. The former was the language commonly spoken by the Jews in Palestine at the Christian era.

Aramaic, ăr-a-mă'ik: geographically the middle member of the North Semitic group of languages. The original seat of Aramaic is unknown; but in historical times it was spoken over the somewhat indefinite area called ARAMÆA (*q. v.*). Its formal characteristics are as follows: In phonetic decay it has advanced about as far as Hebrew, somewhat farther than Assyrian. In both verb and noun the univocalic form predominates in trilaterals. The roots usually have simple dentals where Hebrew has sibilants and Arabic spirants. In the declension of the noun it employs the termination 'a to denote the emphatic or definite state; and its plural termination is *n*. It forms passives by the prefix 'eth. In vocabulary it is similar in part to Assyrian and in part to Hebrew. In syntax it is marked by great flexibility.

Aramaic is naturally divided into two branches—West or Palestinian Aramaic, and East or Mesopotamian Aramaic.

West Aramaic has for its most striking peculiarities the preformative *y* in the third person of all imperfects, and the preformative *h*, or more rarely 'a, in the causative stem of the verb (Haphel and Hophal). About 1000 B. C. (and doubtless long before this) it was used in Syria proper, and thence down into the region E. of the Sea of Galilee. In some way it came into use in Western Asia as the medium of international intercourse during the Assyrian supremacy, and so continued even under the Persian dominion. Thus the oldest West Aramaic, and indeed the oldest Aramaic, writing is that found on weights, seals, gems, pottery, and clay contract-tablets, from Assyria-Babylonia, and dating from the period between the first year of Shalmanezar, King of Assyria (727 B. C.), and the nineteenth year of Darius Nothus (407 B. C.). In Nabataea also this use of Aramaic as an international language has left inscriptions on stone of about the sixth century, and in Egypt inscriptions on gems, seals, stones, pottery, and papyri of the fifth to third centuries. All of these are written in the old Phœnician character. The language of these inscriptions presents the West Aramaic peculiarities, but has borrowed words from the languages of the foreigners by whom it was used. The religious character of some of the Nabataean and Egyptian inscriptions moreover shows that Aramaic was known rather more intimately than as a mere medium of intercourse.

The most extensive and important part of the old West Aramaic literature is the Aramaic portion of the Old Testament: Ezra iv. 8-vi. 18; vii. 12-26; Dan. ii. 4 b-vii. 28; Jer. x. 11; Gen. xxxi. 47. The language used in these places

has been falsely called Chaldee on the supposition that it was spoken in Chaldea (that is, Babylonia), and had been brought thence by the Jews. But Aramaic was the native language of the people living in the region just N. of Israel. And it was after the exile that this dialect, owing, perhaps, to its phonetic simplicity and its syntactical flexibility, began to work its way down among the Hebrews as the common speech of the people. By the third century B. C. Aramaic was known and used alongside of the Hebrew, and this parallel use of the two may account for the sudden changes in Daniel and Ezra from one to the other. For it seems probable that here parts of the Hebrew text had been lost, and were replaced from Aramaic translations which had been made for a certain class of Jews. From the end of the third century the Hebrew began to yield to the Aramaic, becoming first the language of learning, and then in the first century merely that of the public worship.

Of this biblical Aramaic the portion in Genesis (consisting of but two words) and that in Jeremiah (a later interpolation) require no comment. The difference between the Aramaic of Daniel and that of Ezra is almost entirely lexical, with the exception of a few pronominal forms. Both present the West Aramaic characteristics, except that in the third person imperfect of the verb "to be" they have the preformative *l*, apparently an East Aramaism. This *l*, however, may be merely the particle *l*, used as in Assyrian without precative force to avoid writing the imperfect in *y*, which for this verb "to be" has the same Aramaic form as the sacrosanct divine name Yahweh. In general, the Aramaic of the Bible seldom differs from that of the Targums of Onkelos and Jonathan, and then mostly in orthography. Further, in some of the greatest of these differences biblical Aramaic is found to agree with the Palmyrene and the later Nabataean inscriptions (9 B. C.—300 A. D.). It also contains a number of Persian and Greek words, and some of these latter are not found in Greek earlier than Aristotle. So, as nearly as can be made out, the Aramaic of the Bible is that of the third, second, or even first century B. C. In agreement with this, from other considerations, it seems probable that the passages in Ezra were written between 250 B. C. and 300 B. C., and that in Daniel about 165 B. C.

The Targums of Onkelos, Jonathan, and those known as Jerushalmi i. and ii., the Mishna, the Gemara of the Jerusalem Talmud, and scattered places in the Babylonian Talmud and the Midrashim, are also written in West Aramaic. See TALMUD and TARGUM.

During the supremacy of West Aramaic in Palestine that language came into use in Nabataea also. The remains found there consist of tombstone inscriptions dated from 9 B. C. to 75 A. D. The script is a square cursive development of the old Phœnician. The language is formally the same as the biblical Aramaic, and, like the latter, contains Greek words. But the predominating influence is Arabic. Arabic words and constructions abound; and as the proper names are almost entirely Arabic, it seems that Aramaic had here made its way among an Arabic people nearly as it did among the Hebrews.

About this time in Syria itself, at Palmyra (Tadmor), Greek had crept in alongside of the Aramaic. Near that place have been found a number of Aramaic inscriptions on stone, usually accompanied by Greek translations, and dated in the first three centuries of the Christian Era. They are votive, dedicatory, memorial, and political, the last sort giving decrees of the Senate and the people of Palmyra. The language is about the same formally as the biblical Aramaic and the Nabataean; but shows a much greater Greek influence.

The people about Samaria also used a West Aramaic dialect which came in time, at least in the written language, to be mixed with Hebrew. See SAMARITANS.

West Aramaic, though hard pressed by Greek and Syriac, maintained itself in Palestine down to the Arabic period. A number of Aramaic words and phrases occur in the New Testament; see Kautzsch's *Grammatik*, p. 7. And between 300 A. D. and 600 A. D. a West Aramaic translation of the New Testament was produced which has come down to us under the name of *Evangelium Hierosolymitanum*. This translation shows a strong Syriac influence. But after the Arabic conquest, Arabic gradually took the place of Aramaic and the other languages in the lowlands and the cities. In the mountains, however, Aramaic lingered on, and to-day is still spoken, along with Arabic, in Ma'lula and two other villages of Anti-Lebanon, but in fragmentary form and rapidly decaying condition.

Eastern Aramaic, while it seems to have been spoken for centuries in Northern Mesopotamia, is not known to have been used as a written language previous to the Christian Era. It is characterized formally by the preformative *n*, and its variation *l*, in the third person imperfect of the verb, by the preformative 'a in the causative stem ('Aphel) and by the absence of the Hophal as the passive of the causative. It is divided into several dialects, of which the principal are Syriac, Babylonian Aramaic, Mandæan and Modern Syriac. The differences between these dialects are mostly lexical and orthographic, except that the later Aramaic shows numerous phonetic and grammatical changes.

The earliest East Aramaic, Syriac, first came into prominence at Edessa, where a cursive script called Estrangelo (*στρογγύλος*) was developed from the old Phœnician character. At this city, in the second century A. D., the translation of the Bible known to us as the Pēshīttā (the simple) was made. Through the influence of this translation Edessa became the center of Aramaic Christendom; and this Edessene literary language spread, especially eastward among the Aramaeans of the Tigris region, in which at Nisibis another center of learning was soon established. Then from the name of that whole indefinite region, which was called Assyria, or Syria, by the Greeks, this language written in the Edessene script came to be called Syriac. By 700 A. D., Syriac literature, fostered by the schools of Edessa and Nisibis, had passed its prime and produced its greatest writers, such as Ephrem Syrus (306-73), Narses (d. 496), James of Sarug (522), and Philoxenus of Mabug (d. 520). During this time, owing to theological controversies, Syriac Christendom split into three parts. The most of the Eastern Syrians were Nestorians, while the most of the Western were Jacobites (Monophysites). A small third part remained orthodox Catholics. In 489 the academy at Edessa was closed for heresy; and from that time Nisibis was the center of religion and learning among the Eastern Syrians, or Nestorians. The two sects produced two sets of writings, scarcely two dialects. The greatest difference was in the script. The Nestorians continued to use the old Estrangelo, with slight changes, so that indeed it came to be called Nestorian, while the Jacobites used a development pointed with Greek vowels, and called after them Jacobite. Largely on account of this division a literal translation of the New Testament from the Greek was made for the Jacobites by Philoxenus, Bishop of Mabug, about 500 A. D. and revised by Thomas of Harkel at Alexandria in 616 A. D. In 617 Paul of Tella, also for the Jacobites, made a very close translation of Origen's text of the Septuagint. Both translations are useful for textual criticism, and together with the Pēshīttā are the most valuable of the Syriac productions of the period.

After the Arabic conquest, Syriac remained for some centuries the spoken language of Northern Mesopotamia; but Arabic gradually came in, especially as the language of commercial and official intercourse. Syriac became more and more the language of the school and the church until, in the eighth century, it was practically dead. The identification of Syriac with the Christian Church, however, served to maintain it in use among the learned. Even in the present century the Nestorians have used books written in the now half-understood literary Syriac, and the Maronite College at Rome has kept up a special cultivation of it. During this period a great number of writers were busy producing a mass of literature, mostly theological and ritualistic. The most original and important of these was Bar Hebraeus, or Gregory Abul Faraj (1226-86), whose chronicles are the main source of information for the civil and ecclesiastical history of the time. Probably the most notable work of the Syrians under Moslem rule was the transmission to the Arabs of the knowledge of Greek literature. And in general it may be said that the ablest of the Syriac writers were mere translators and adapters and the most useful, bare chroniclers. From the time of the Assyrians their country was overrun and held by enemies. The separate Aramaic communities never had a chance to unite in peace, and develop a national character; and so they never produced any distinctly original literature.

East Aramaic was adopted by the Jews of Babylon as West Aramaic was by those of Palestine; and the Babylonian Talmud was written in an East Aramaic dialect closely resembling Mandæan. See TALMUD.

In Southern Babylonia and on the shores of the Persian Gulf a dialect of East Aramaic was developed by the sect of the Mandæans, so-called from Manda d' Hayye (*γνώσις ζωής*), whom they think to be the Saviour. They call them-

selves Nazeraye, or Nazarenes, and hold to a queer mixture of Christian and heathen ideas. Their oldest literature consists of three religious works dating from the period between 650 and 900 A. D.; and, being written at a time when the dialect was still a living speech, they present it in its greatest purity, though it already shows a general phonetic decay. From 900 on, several astronomical and ritualistic works are known, whose language shows a greater and greater breaking down in grammar and orthography. But the modern dialect of the sect still contains Aramaic elements mixed with Persian and Arabic.

The region between Lake Urmi, the district of Salamas, and the Tur Abdin Mountains is inhabited at the present time by a mixed population of Moslem Kurds and Christian Aramaeans. These Aramaeans, while the priests own and to some extent understand books written in the old literary Syriac, speak a division of Aramaic called Modern Syriac, which is "not exactly the daughter of the old Syriac" (Nöldeke). It is rather a descendant of the folk-speech from which literary Syriac itself was developed. The language, however, shows great phonetic change and strong foreign influence, especially in vocabulary. It is divided into a number of minor dialects due to varying foreign and religious influences. Modern Syriac has been made known to European scholars mainly by American missionaries, who for religious purposes have made a literary language out of the Urmi dialect, and have printed in it translations of the Bible and of other books.

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East Aramaic Literature.—The Babylonian *Talmud*, and the Mandæan and Modern Syriac works are mentioned above. The principal classical Syriac works are as follows:

FIRST PERIOD.—Up to the Mohammedan conquest A. D. 636.

Bible Versions.—A. The *Peshiftā* or *Peshito* (i. e. the simple) edition, the oldest Syriac literature that has come down to us. It exerted an immense influence in molding the language, as well as all the subsequent literature, and has remained the accepted version among all parties of the Syrian Church. (a) *New Testament.*—Made at Edessa in the second century. Editions: Widmannstadt and Moses of Marden (2 vols., 1555), *editio princeps*, best, but very rare. Serviceable is Henderson's edition of Gutbier's text, published by Baxter. Cureton has published in his *Remains of a very Ancient Recension of the Four Gospels in Syriac*, etc. (London, 1858), a text of the Peshito different from that of the MSS. on which our printed editions are based. (b) *Old Testament.*—Valuable translation,

made directly from Hebrew. It is the work of Christian editors, and probably contemporaneous with the version of the New Testament. Editions: *Vet. Test. Syriace*, S. Lee (Lond. 1823); also many editions of the Psalter. Ceriani, *Photolithograph of Cod. Ambrosianus* (Milan, 1876-79).

B. *Philoxenian Version* of the New Testament. Editions: White (Oxford, 1778-1803, 4to); Bernstein, *Evang. des Johannes* (Leipzig, 1853).

C. *Hexaplar Version of O. T.* (formerly called *Figurata*). MS. is in Milan. Various portions of it have been edited by Norberg, Bugati, Middeldorpf, Ceriani, De Lagarde, and a photolithograph of MSS. has been published.

Authors.—See Land, *Anecdota*, vol. iv. (Leyden, 1875). Ephrem Syrus, *S. Ephraem. Syri Opera omnia* (Rom., 1732-46, 6 vols. folio), edited by Petrus Benedictus and S. E. Assemani. Narses (d. 496); James of Sarug (522), *De Vita et Scriptis S. Jacobi Sarugi*, etc., ed. by Abeloos (Louvain, 1867); Isaac the Syrian; Xenagas or Philoxenus of Mabug (d. 520).

SECOND PERIOD (636-1318 A. D.).—Period of decay of Syriac; Arabic and Syriac spoken languages. James of Edessa (d. 708), learned scholar, celebrated grammarian, and linguist. Barhebraeus: (a) *Chronicon Syriacum*, ed. Bruns and Kirsch (Leipzig, 1789, 2 vols.). (b) *Chronicon Ecclesiasticum*, ed. Abeloos and Lamy (Louvain, 1873). Besides this he wrote a number of grammars, treatises, commentaries, etc. Ebed Jesus (d. 1318).

THIRD PERIOD (1318).—Arabic the spoken language; Syriac cultivated only as a learned and ecclesiastical language, chiefly in the Maronite College in Rome. Amira (1644), grammarian; the Assemanis. (a) Joseph Simon: *Bibliotheca Orientalis* (Rom., 1719-28, 3 pts., 4 vols. fol.), a complete history of Syrian literature, and the source from which our knowledge of it is largely derived. (b) Stephan Evodius: *Acta Sanctorum Martyrorum* (Rom., 1748, fol.).

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C. II. TOY.

Aran'ida, JOSÉ JIMENEZ: a Spanish genre-painter; b. at Seville in 1832; well known in the U. S. First class medal, Paris Exposition, 1889; studio in Paris. W. A. C.

Aranda, DON PEDRO PABLO ABARACA DE BOLEA, Count of: Spanish statesman; b. of a noble family at Saragossa, Dec. 21, 1718. He served many years in the army, and rose to the rank of general. In 1765 he became president of the council of Castile and prime minister. He used his power to promote reform and a liberal policy, and procured the expulsion of the Jesuits from Spain in 1767. In 1773 he was removed from power by the intrigues of the clergy, but was sent as an ambassador to France, where he remained until 1787. He was again prime minister for a short time in 1792, and was driven from power by Godoy. He died on his estate in Aragon in 1799.

Arane'ida [from Lat. *ara'nea*, a spider]: the order of *Arachnida*, which includes the SPIDERS (*q. v.*).

Aranjuez, āar-āan-khweth' (in Lat. *A'ra Jo'vis*, i. e. altar of Jupiter): a town and royal residence of Spain, in New Castile, in the modern province of Toledo, and situated on the left bank of the Tagus, 30½ miles by rail S. S. E. of Madrid (see map of Spain and Portugal, ref. 16-E). It is situated in a beautiful valley, has spacious streets, elegant squares and a royal palace, and gardens laid out by Philip II. Here are also a theater, a hospital, and several summer-

houses in the royal gardens. Aranjuez suffered severely from the French during the Peninsular war. The treaty of 1772 between France and Spain was concluded here. It was the scene of the insurrection which ended in the abdication of Charles IV. in Mar., 1808. Pop. (1881) 8,154.

Arau'sas Bay, sometimes called **Arausa'zua**, or **Arausaso, Bay**: on the coast of Texas, in the N. W. part of the Gulf of Mexico, about 15 miles N. by E. of Corpus Christi Bay, and is about 18 miles long and 8 miles wide in its broadest part.

Arausas Pass: the principal inlet to Aransas Bay and Corpus Christi Bay, Tex., between St. Joseph and Mustang islands. It is becoming commercially important, but has a troublesome shifting bar. The lighthouse is of brick, 40 feet high, and stands on Low island, inside the pass; lat. 27° 51' 51" N., lon. 97° 2' 58" W. The Confederate works at this pass were captured by the Federal troops, with 100 prisoners and some guns, Nov. 20, 1864.

Ar'any, JÁNOS: a popular Hungarian poet; b. Mar. 7, 1817; became in 1851 professor at Nagy-Körös, in 1859 member of the Hungarian Academy, and in 1860 director of the Kiszaludy Society at Pesth. His first work was a humorous poem called *The Lost Constitution of the Past* (1843), which gained a prize. He wrote, among other poems, *Buda Halála*, which in 1874 was crowned by the Hungarian Academy. D. at Budapest, Oct. 22, 1882.

Arapahoes: See ALGONQUIAN INDIANS.

Arapai'ma: a genus of fresh-water fishes found in the rivers of South America, and highly esteemed for food. They are the largest fresh-water fishes in the world, and are allied to the *Clupeidæ* or herring family. Some of them measure about 15 feet long, and weigh 400 lb. or more. The body is covered with strong, bony, compound scales.

Arapiles, aar-a-pee'les: a small village of Spain, situated 4 miles S. E. of Salamanca; was the scene of a severe engagement which was called "the battle of Salamanca," between the allies under Wellington and the French under Marmont, July 22, 1812, in which the latter were defeated.

Ararambo'ya: the dog-headed boa or bojobi, a green snake most abundant in Brazil.

Ar'arat: a celebrated mountain of Western Asia; rises from the plain of the Aras (or Araxes) about 33 miles S. W. of Erivan. It is called by the Persians Koh-i-Nooh, "Mountain of Noah." It is on the boundary between Persia, Asiatic Turkey, and the Russian possessions. The highest peak is in lat. 39° 42' N. and lon. 44° 35' E., is covered with perpetual snow, and has an altitude of 17,212 feet above the level of the sea, or 14,200 feet above the plain of the Aras. It is a volcano, the last eruption of which occurred in July, 1840, when a great earthquake shook the surrounding country. See James Bryce's *Transcaucasia and Ararat* (1877).

Ararat, LITTLE: a peak S. E. of the preceding, and rises in the form of a cone to the height of 12,840 feet above the level of the sea. The summits of these two mountains are 7 miles apart in a direct line, but their bases are nearly in contact. According to the eighth chapter of Genesis, the ark rested "upon the mountains of Ararat."

Ararat, or **Pilot Mountain**: a hill in Surrey co., N. C., between the Ararat and Dan rivers, is 3,000 feet high. It is visible at a distance, and serves as a landmark to travelers.

Arari, THE SERRA: a low mountain range between the Brazilian states of Piahy and Ceara; part of a general range which nearly crosses Brazil from the coast near Parnahyba, southward. It forms the watershed between the Parnahyba river and the coast streams to the E.—principally the Jaguaribe and San Francisco. It takes on several names in its course. Beginning at the N., these are the Serra Grande, the Serrania, the Serra Arari, the Serra dos Irmaos, and Serra do Piahy. M. W. H.

Aras' (the ancient *Arax'es*): a river of Armenia; rising in the Turkish pashalic of Erzurum. It flows eastward, passes near the northern foot of Mt. Ararat, and traverses the Persian province of Adzerbijan. It afterward turns toward the N. E., and enters Georgia or the Russian dominions, and unites with the river Kur about 60 miles from its entrance into the Caspian Sea. Its whole length is about 500 miles.

Arat'us (in Gr. *Ἀρατος*): a Greek poet and astronomer; b. at Soli, in Cilicia; flourished about 290–260 B. C.; contemporary and friend of Theocritus and Callimachus. He lived

as physician at the court of Antigonus Gonatas, at whose instance he composed the poem which is his title to a place in literature, *Phænomena* (*Φαινόμενα*), or *Aspects of the Heavens*, an astronomical poem, in 1,154 verses based on Eudoxus and Theophrastus. The concluding portion, *Signs of Weather* (*Διοσημεία*), is called by Cicero *Prognostica*. The versification is smooth, the language is an imitation of Homer, the plan an imitation of Hesiod. The poem was much admired and highly valued. The astronomer Hipparchus wrote a commentary on it, which is still extant, and it was translated into Latin by Cicero and Germanicus among others. Elaborated ed. by Buhle (1793–1801); critical ed. by I. Bekker (1828). B. L. GILDERSLEEVE.

Aratus of Sicyon: a Greek general and statesman; b. at Sicyon in 271 B. C.; son of Clinias, who was assassinated about 264. Aratus then escaped to Argos, where he was liberally educated. In 251 B. C., with the aid of other exiles, he liberated Sicyon from the tyrant Nicocles, and united it with the Achaean League, of which he was chosen general (*strat'egos*) in 245. An important object of the league was to maintain the independence of the Greek states against the King of Macedonia. He expelled a Macedonian garrison from Corinth in 243 B. C., was many times re-elected general-in-chief, and managed the affairs of the league with much ability. About 226 the league was involved in a war against Cleomenes, King of Sparta, who defeated Aratus in several battles. Aratus formed in 222 an alliance with Antigonus of Macedon against the Spartans. He died in 213 B. C., leaving the reputation of a true patriot. Philip V. of Macedon is said to have procured his death by poison. He left thirty books of memoirs, which were drawn upon by Polybius and Plutarch.

Arauca'nia, or **Arauca'ua**: once an independent state in the S. of Chili, bounded E. by the Andes and W. by the Pacific. It extended from the river Bio-Bio on the N. to Valdivia, or to lat. 40° S., being about 190 miles long. The physical features, climate, and productions are like the rest of Chili. The Araucanians are remarkable for their independent spirit and their successful resistance to foreign domination. The Spaniards made an unsuccessful attempt to subdue them in 1537 and at several subsequent periods. On this subject Ercilla, a Spaniard, wrote a celebrated epic poem called *Araucana*. It is said that they possess many noble qualities, and cultivate poetry, but abhor the restraints of civilization. They recognize a Supreme Being and a future state, but build no temples. The government was administered by four hereditary *toquis*, each of whom ruled over one of the provinces into which their country was divided. The most important national questions were decided by the grand council composed of these *toquis*, or by a general assembly. In 1860 a French lawyer, De Tonneins, who had gained considerable influence among the Araucanians, proclaimed himself, under the name of Orélie Antoine I., constitutional King of Araucania. He was in 1861 taken prisoner by the Chilians and sent back to France. In the treaty of Jan. 22, 1870, the Araucanians promised to recognize the authority of Chili. See Molina, *History of Chili*; Edward R. Smith, *The Araucanians*, etc. (New York, 1855). Only some 50,000 of the original inhabitants are left at the present time.

Arauca'ria [derived from ARAUCANIA (*q. v.*), name of a territory in Southern Chili]: a genus of plants of the natural order *Coniferae*, natives of the southern hemisphere; all evergreen trees, distinguished by having the male and female flowers on separate trees, the pollen contained in from ten to twenty scales pendent from the apex of each scale, the female flowers two under each scale, each having one ovule. The *Araucaria imbricata*, or Chili pine, a native of the Chilian Andes, attains the height of 150 feet, and produces a seed which is an important article of food; also a fragrant resin in abundance. The timber is hard, heavy, and suitable for the masts of ships. This tree is cultivated as an ornament of landscapes. The Norfolk island pine, which is about 200 feet high, is *Araucaria excelsa*, a noble tree, and Australia has two or three fine species.

Arauco: a marine department of Chile, forming the bold projection into the Pacific Ocean called Punta de Levapie, the south wall of Arauco Bay. On the E. are the departments of Concepcion, Bio-Bio, Malleco, and Cautin. The territory bearing this name was formerly much more extensive. It is now a strip of coast. Area, 4,248 sq. miles. Pop. (1891) 70,064. Principal towns, Arauco and Lebu, ports, and Nacimiento and Tucapel.

Araujo d'Azevedo, a-row'zhō-daã-zā-vā'dō, ANTONIO (Count da Barca): Portuguese statesman; b. at Ponte de Lima, May 14, 1754. He negotiated at Paris, and signed, a treaty of peace with France in 1797, but the French Directory annulled it. He became Minister of Foreign Affairs in 1806. After Napoleon had invaded Portugal and captured Lisbon, Araujo accompanied the king, John VI., to Brazil in 1808. He was appointed Minister of Marine in 1814, and in 1817 sole minister. He was a man of various accomplishments; he wrote poetry and gained distinction by his scientific attainments. D. at Rio de Janeiro, June 21, 1817.

Araujo Porto Alegre, MANOEL, de: Brazilian poet; b. at Rio Pardo, Nov. 29, 1806; first attracted attention as a painter, and, in fact, continued throughout his life to devote himself largely to the fine arts. His fame, however, rests chiefly upon his poems and plays. Of the latter, few have been published, in spite of the fact that they may be said to have brought into being the modern Brazilian drama. Of his poems, most noteworthy are: *As Brazilianas* (1843, *seq.*), lyrics upon Brazilian themes, and *Colombo*, an epic poem of some length.

A. R. MARSH.

Arau're: a city in Zamora, Venezuela; on the Acarigua, a branch of the Portuguesa; on the northeastern flank of the Cordillera de Merida (see map of South America, ref. 1-C). It is in a fertile district, yielding cotton and coffee, and pasturing many cattle. Pop. 10,000.

Aravali, or **Aravalli**, āa-ra-vū'li: a mountain range of Hindustan; traverses Ajmir, and is about 300 miles long. The highest summits are about 5,000 feet above the level of the sea. It constitutes the watershed between the Arabian Sea and the system of the Ganges. The general direction of the range is N. N. E. and S. S. W.

Ar'bases (Gr. Ἀρβάκης): a Median general who revolted against Sardanapalus, captured Nineveh, his capital, and on the ruins of the Assyrian empire founded the kingdom of Media, about 876 B. C.

Arbe'la, now **Arbeel** (**Arbil** or **Erbil**): a small town of Asiatic Turkey, in Kurdistan, about 40 miles E. of Mosul (see map of Turkey, ref. 6-J). The modern town has some large mosques and bazaars. Arbela gave its name to the battle in which Darius was finally defeated by Alexander the Great, in 331 B. C., but it was fought at Gaugamela. Pop. about 6,000, mostly Kurds.

Ar'biter (Lat., supreme judge): a person chosen by parties in a controversy to decide a question; sometimes applied to a person who has the power of judging and determining, or who is able to control the destiny of others. Some cases among the ancient Romans were decided by an arbiter, especially when the parties differed in respect to the amount of money which one of them should pay to the other.

Arbitra'tion [from Lat. *arbitrari*, act as arbiter or judge]: a submission of some matter in dispute to the judgment and decision of a person called an "arbitrator." It applies to civil cases only, and may be either oral or written. It is voluntary in its nature, as any party has a legal right to have an adjudication upon his case by a court of justice. Statute law sometimes makes arbitration compulsory, as where the investigation of a long account is necessary. Even after parties have agreed to submit a controversy to arbitration, one of them may withdraw his consent against the will of the other at any time before the hearing is closed. The only remedy of the other party is to bring an action for damages, which would usually be nominal. However, when parties enter into a contract, they may stipulate that no rights of action shall accrue under its provisions unless there is a submission on their part to arbitration; in which case the duty to submit becomes a condition precedent, and can not be avoided. The result of the arbitration is termed an *award*. It is not, however, equivalent to a judgment of a court, and if not performed the regular course of the successful party would be to bring an action upon the award, and thus make it a judgment of a court. To avoid this inconvenience, statute law frequently provides that on reducing the submission to writing a clause may be inserted that the award may be entered on the records of a specified court as a judgment, whereupon it shall have the like force and effect. Having the characteristics of a judgment, the award falls under the control of the court, and modes are provided by which mistakes and errors may be rectified by judicial action. As a general rule, there is no review of the result of an arbitration. There are no methods of appeal provided, as the theory of

the proceeding is that the arbitrator is to be the judge of the difference between the parties. This rule does not prevent the rectification of mistakes in matters of fact, nor does it include the case of fraud or the violation of the first principles of justice; as, for example, the act of hearing one party, and not the other.

Revised by HENRY WADE ROGERS.

ARBITRATION as a means of settling labor disputes may be either voluntary or compulsory. In the former case it has much in its favor. The French courts of conciliation (*conseils de prudhommes*), dating from 1791, which provide a means for talking over the points at issue between employers and workmen, have done a great deal in preventing trouble, and there have been similar experiences on a smaller scale in Great Britain, especially in Nottingham (1860) and Wolverhampton. The efforts of Parliament, in 1824 and 1872, to provide official facilities for arbitration on the French models have not been very successful, and the same thing may be said of similar efforts at State boards of arbitration in New York and other parts of the Union. It is hard to make compulsory arbitration of any avail, because the workmen can always, and the employers can generally, avoid obeying an arbitrator's award. See STRIKES AND LOCK-OUTS and TRADES-UNIONS.

ARTHUR T. HADLEY.

ARBITRATION between states. Between the breaking out of an international difficulty and a final recourse to war there are several methods of settlement which should be first resorted to. These are, in the language of the publicists, amicable conference, mediation, and arbitration. The first is hardly to be distinguished from that diplomatic negotiation which always attends a quarrel, and which in a majority of cases is able to settle it. Mediation is the decision of a dispute by some third power which offers its services, but whose award is recommendatory, not binding.

Arbitration is a voluntary submission of certain definite points in dispute to the decision of a third party, whether an individual, a number of individuals forming a court, or simply the representative of a friendly power. It is essential that the exact questions to be submitted be definitely agreed upon in advance, since a failure to pass judgment upon the points submitted is a fatal defect in the award. This was the flaw in that award given by the King of the Netherlands in 1831 in our northeastern boundary question. Instead of deciding which of the two lines claimed was the one intended by a certain treaty, he recommended a third line as a compromise. This was very properly rejected by both parties.

International arbitration thus far has been used to settle particular questions. It has been suggested, but not often adopted, as an obligatory method of deciding *all* the controversies which may arise between two or more states. (See PAN-AMERICAN CONGRESS.) Being intended to meet a particular known exigency, its adoption will usually be the result of a convention negotiated for the purpose, in which all the details of the arbitration will be formally laid down, the composition of the court, its place of meeting, the character and method of award, even sometimes the rules to be applied in judging national conduct. For a most instructive example, see ALABAMA CLAIMS.

In default of rules to govern the award, in the agreement to arbitrate, the rules of the Roman law are held to apply. Thus unless unanimity in the court is necessary, a majority vote decides. There was, therefore, no ground for the protest in the U. S. Senate against the Halifax fishery award, which was made by a majority vote. The decision of a court of arbitration is binding upon the contestants, save and except only in these cases: (1) If the award is outside of the questions submitted; (2) if there is proof that fraud or corruption has influenced it; (3) if it involves an impossibility; (4) if it is equivocal or unintelligible; (5) if (according to some writers) it is an open denial of justice. But in this last case the defeated litigant will be judge in his own behalf, and this exception should be held doubtful.

That arbitration is a fair and valuable method of settling what may be called business controversies between nations is beyond question. Under INTERNATIONAL LAW are given many instances of its successful employment, particularly in recent times. In 1883 Switzerland proposed a general arbitration agreement to the U. S. and other American republics. This principle was actually incorporated into several commercial treaties between Italy and other powers. A general treaty of arbitration was framed also between the U. S. of Colombia and the republic of Honduras. Of sixteen cases of arbitration between Great Britain and other

states prior to 1880 seven were in the last decade. But when we ask whether some general international court of arbitration may not be established to settle *all* international disputes, the answer is not a simple one. The advocates of some such substitute for war have been many. They urge the immense evil of war, its economic waste, its destruction of productive human lives, its suffering, cruelty, barbarity. They point to the many and constantly increasing instances of happy resort to arbitration by differing powers. They suggest tribunals or courts of arbitration made up in various ways, but all needing, to be effective, (1) a code of law recognized by the powers, (2) a body of arbitrators to apply this code, (3) the military power of Europe to enforce their decision. This discloses the weakness of the advocates of such a measure. Without the three essentials given, no general arbitration scheme could be made applicable to *all* controversies between states. An international court, like a court of civil or criminal law, must know the law and have the power of execution behind it. Now, as yet there exists no international code, nor is there any sign of one. Bluntschli and Field have codified the body of international law provisionally, but no single state has moved for its adoption. Nor can one easily conceive of a body of arbitrators who would be acceptable to all nations. The states of Europe, for instance, are not, have never been, can not be practically equal. Still more is this true with the republics of this continent. A powerful state will continue to be powerful through its influences with such a court, otherwise it could not afford to consent to the arrangement. To assume the contrary presupposes the millennium, when quarrels would never arise. And again the award of such a court to be effective must be capable of enforcement. Here is the crucial difficulty. The scheme if entered upon bids fair either to be impotent, from inability to execute its judgments, or, if such execution is attempted, might lead to a general embroilment, perhaps war. The truth is that there may come crises in the life of a nation when the national honor or the national life can not be jeopardized before a court. Great Britain could not surrender the control of the Suez Canal to Russia, the North could not have settled its struggle with the South, in accordance with the award of arbitrators. There are differences which words can not settle.

Setting aside all such questions as *could* not be submitted to arbitration, it is desirable and conceivable that all others concerning damages, limits, the rights of individuals, and so on, should be arbitrated. But even here it is wiser to submit each case to such a method of settlement separately, rather than strive for a general standing court, or consent to a general agreement to arbitrate, for a state ought not to be expected to go into such a scheme blindfold. In arbitrating a particular case, it knows the worst which may happen in consequence. It still retains its liberty of choice. There are other projects, approaching the same ideal from other standpoints, which perhaps promise better results. The growth of neutral trade, the growing importance of neutral states, limit the effects of war upon commerce. The spread of a humane system of warfare lessens its hardships. All minor quarrels between states to-day are settled without recourse to war. We should look to the changed spirit of our age, rather than to a mechanical device, for the maintenance of that dream of all ages—perpetual peace.

THEODORE S. WOOLSEY.

Arbois, aăr'-bwăă': a town of France; department of Jura; about 25 miles S. W. of Besançon (see map of France, ref. 5-H). It is celebrated for its wine, and has manufactures of paper and earthenware. Here are some Roman antiquities. Pop. about 4,900.

Arbois de Jubainville, MARIE HENRI, d' (däär-bwăă' de-zhü'-bän-veel'): French palæographer and Celtist; b. at Nancy, Dec. 5, 1827; became professor in the Collège de France, 1882. He has published much upon the early history of France, the origins of the French language, and the literary history of the Celtic race. Among his works are: *Histoire des ducs et des comtes de Champagne* (7 vols., 1859-69); *La Déclinaison latine en Gaule à l'époque mérovingienne* (1872); *Études grammaticales sur les langues celtiques* (1881); *Les Celtes et les langues celtiques* (1882); *Introduction à l'étude de la littérature celtique* (1883); *Essai d'un catalogue de la littérature épique de l'Irlande* (1883); *Le Cycle mythologique irlandais et la mythologie grecque* (1884); *Recherches sur l'origine de la propriété foncière et des noms de lieux habités en France* (1890); *Les noms gaulois chez César et Hirtius* (1891).

A. R. MARSH.

Arbole'da, JULIO: South American statesman, soldier, orator, and poet; b. in New Granada, June 9, 1817. Educated in England and on the Continent, he carried home with him a wide knowledge of English, French, and Italian, as well as of Spanish literature. In 1839 he was editing the journal *El Independiente* when the revolution led by José M. Obando broke out. During this and the many subsequent upheavals in New Granada, Arbole'da took always the line of liberal conservatism, opposing both ultra-socialistic and anarchistic doctrines, then very prevalent among his countrymen. In his journal, *El Misoforo*, founded in 1850, he advocated law, order, and the pursuit of legitimate prosperity, but without much success. He was several years a member of the legislature of New Granada, and more than once refused the vice-presidency of the republic. As a poet he is well known in Spanish America for a small number of poems full of passionate love of liberty and justice. Among these are *Al Congreso Granadino*, *Estoy en la Cárcel*, and an unfinished epic entitled *Gonzalo de Oyón*.

A. R. MARSH.

Arbor Day: a day set apart in most of the States and Territories of the U. S. for the voluntary planting of trees by the people. The object is to encourage the planting of trees, and to stimulate public interest in forestry. The importance of the day has been greatly increased by interesting the children of the public schools in its observance. The day is made a school holiday, and special and often elaborate programmes of exercises are carried out. Arbor day was inaugurated by the Nebraska State Board of Agriculture, which in 1874 recommended that the second Wednesday in April of each year be dedicated to the work of planting trees. The following States and Territories have since then established an annual Arbor day: Alabama, California, Colorado, Connecticut, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Montana, Missouri, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Tennessee, Texas, Vermont, West Virginia, Wisconsin, and Wyoming. See LEGAL HOLIDAYS.

C. K. ADAMS.

Arboriculture [from Lat. *ar'bor*, tree + *cullu'ra*, cultivation]: the art and science of growing trees. See FORESTRY, NURSERY, and discussions of the various fruit-trees under their proper heads.

Ar'bor Vi'tæ (Lat., tree of life): the thick mass of white substance in either hemisphere of the cerebellum. This mass, on section, presents a tree-like appearance.

Arbor Vitæ: a plant of the genus *Thuja*, and family *Conifera*. *Thuja* consists of evergreen trees or shrubs, with compressed or flattened branchlets, and small, scale-like, and imbricated leaves. The *Thuja occidentalis* is a native of the U. S., and is often planted as an ornamental tree in the parks and pleasure-grounds of America and Europe. It is one of the trees known as white cedar. The Chinese arbor vitæ (*Thuja orientalis*), a native of China, has larger cones and more upright branches than the preceding. It is cultivated in Europe and the U. S. as an ornamental tree, and produces a resin which has been supposed to possess medicinal virtues. The genus comprises several other species.

Ar'broath, Ab'erbroth'wick, or Ab'erbroth'ock: a seaport-town of Scotland; in Forfarshire; at the mouth of a small stream called the Brothock; 16 miles N. E. of Dundee, with which it is connected by railway (see map of Scotland, ref. 10-J). It has a public library, and manufactures of coarse linens, canvas, leather, etc. About 100 vessels (tonnage 13,896) belong to this port. Here are picturesque ruins of a richly endowed abbey, founded by William the Lion in 1178. Robert Bruce and the Scottish nobles met in this abbey in 1320 to organize a resistance to Edward II. Pop. (1901) 22,372.

Arbuthnot, JOHN, M. D., F. R. S.: author and physician; b. at Arbuthnot, near Montrose, Scotland, in 1667. He studied at Aberdeen, where he graduated, and settled in London. His first work was an *Examination of Dr. Woodward's Account of the Deluge* (1697). His reputation was increased by his *Tables of the Greek, Roman, and Jewish Measures, Weights, and Coins* (1705). He was appointed physician to the queen in 1705, and obtained an extensive practice. He was an intimate associate of Pope, Swift, and Lord Bolingbroke. In 1712 he published a humorous political

allegory entitled a *History of John Bull*, in which the great powers then involved in war were personated by John Bull the clothier, Nick Frog the linen-draper, and Louis Baboon (Louis XIV.). This work displays a great talent for satire. He produced another humorous and ironical work, called *The First Book of the Memoirs of Martinus Scriblerus*. This was part of an unfinished work which Pope, Swift, and Arbuthnot projected in partnership, and which was designed to be a satire against pedantry and the abuse of learning. In 1723 he was chosen second censor of the Royal College of Physicians, and in 1727 was made an elect of the college. D. in London, Feb. 27, 1735.

Arbutin: a principle found in the leaves of the red bearberry (*Arctostaphylos uva ursi*).

Arbutus: a genus of plants of the family *Ericaceae*, mostly natives of America and Southern Europe. They are evergreen shrubs, bearing a fleshy fruit which has five cells and many seeds. The arbutus mentioned by Vergil was the *Arbutus unedo* or strawberry-tree, which bears bright red and yellow berries, with beautiful foliage, and is cultivated as an ornamental evergreen. The fruit has narcotic properties, and is used for making wine in Corsica. Another species, the *Arbutus andrachne*, a native of the Levant, is admired as an ornamental plant, and bears an esculent fruit. The *madroña* of California is a species of this genus; but the *manzanita*, and also the bearberry (or *Uva ursi*, a trailing shrub of the northern hemisphere, the leaves used as an astringent tonic in medicine) belong to the related genus *Arctostaphylos*, although formerly included in *Arbutus*. "Trailing arbutus" is *EPIGÆA REPENS* (*q. v.*).

Revised by CHARLES E. BESSEY.

Arc [from Lat. *arcus*, a bow]: a portion of a line, the straight line being excluded. The length of an arc, when the nature of the curve is given, may be found by the integral calculus. (See RECTIFICATION.) The length of an arc is always greater than that of the straight line joining its extremities, which is called the chord of the arc. The word is most commonly used in the case of the circle; and the principal properties of circular arcs are given in Euclid's works. The length of a circular arc divided by the entire length of the perimeter is equal to the angle subtended at the center, expressed in degrees, minutes, etc., and divided by 360.

Arca: a genus of bivalve mollusks, the type of a family called *Arcadeæ*. The hinge is straight, and is coextensive with the whole breadth of the shell, the breadth being greater than the length. Numerous species are known, some of them fossil.

Arca'dia (in Gr. Ἀρκάδια): a celebrated state of ancient Greece; the most central part of the Peloponnesus (now called the Morea). It was bounded N. by Achaia, E. by Argolis, S. by Laconia and Messenia, and W. by Elis. The area was about 1,600 sq. miles (see map of Greece, ref. 17-J). It was inclosed on nearly all sides by mountains, and a large part of it was occupied by fertile valleys and verdant mountain-ridges. The principal river was the Alpheus. It was also watered by the Helisson, the Ladon, the Erymanthus, and several smaller streams, which cut their way in numerous instances by underground channels through the limestone rocks. There were a number of lakes in the E. The Arcadians were a simple, pastoral people, inferior to most of the other Greeks in genius and culture. This inferiority may be ascribed to their isolated position, which deprived them of the influence of the sea and of the advantages of commerce. The chief towns of Arcadia were Mantinea, Tegea, Orchomenos, and Megalopolis. The Arcadians resembled the Swiss in their love of freedom and money, and in their tendency to enlist as mercenaries in foreign armies. Among the Ten Thousand whose famous retreat Xenophon described, more than two thousand were Arcadians. This country was a favorite of ancient pastoral poets, who praise the peaceful and happy life of the Arcadian shepherds. At present, Arcadia is one of the sixteen nomarchies of the kingdom of Greece. Area, 2,020 sq. miles. Pop. (1889) 148,285.

Arca'dius (in Gr. Ἀρκάδιος): Emperor of the East; eldest son of Theodosius the Great; b. in Spain in 377. In 395 Theodosius died, after he had divided his empire between Arcadius and Honorius, the latter of whom received the western part. The eastern empire, of which Byzantium was the capital, included Thrace, Asia Minor, and Syria, and extended from the Adriatic to the Tigris. During the

minority of Arcadius, Rufinus and Eutopius successively acted as regents of the empire. The Empress Eudoxia acquired the control over Arcadius, who was a feeble and indolent prince. He died May 1, 408, and was succeeded by his son, Theodosius II.

Arca'ni Disciplina (i. e. instruction in the mystery): a term for the first time used by the Protestant theologian Dalaus in 1666 for the secrecy observed in the early Church with respect to certain doctrines; as, for example, those of baptism, the Eucharist, and some others. These doctrines were withheld from candidates until after they had been received into full communion with the Church, and they were only alluded to in the public preaching by some such phrase as "the initiated knows." After the sermon the uninitiated were shown out by the deacons, and the doors closed. Then the Eucharist was celebrated. Thus the Christians imitated the heathen mysteries. The practice is not primitive. It first comes up in the middle of the second century and disappeared in the sixth century, being, in fact, synchronous throughout with the institution of the catechumenate. It is defensible upon the two grounds—(1) that truth should be given no faster than it can be assimilated. So it is proper that a heathen should gradually be instructed in Christianity. (2) The danger of irreverent speaking of the deeper truths of Christianity if they were discussed in mixed assemblies. But the practice is not to be taken as proof that there was any body of secret teaching which was primitive but publicly revealed only in a later period. The secret instruction related to those truths which are taught in the New Testament. The only novelty was the way in which they were defended. Soon after the introduction of the term, the subject gave rise to a very animated controversy between Roman Catholic and Protestant theologians, which has continued ever since. The former used it to account for the silence of the early Church writers as to certain doctrines and practices of their Church. Protestant writers generally regard it either as a natural outgrowth of the oppressed condition in which the Church found itself at that time, or a degeneration of the simple forms of primitive Christianity in the interest of the hierarchy. The best modern treatises on the subject are: On the Roman Catholic side, J. A. Toklot, *De arcani disciplina, quae antiqua in ecclesia fuit in usu* (Cologne, 1836); Adalbert Weiss, *Die altkirchliche Pädagogik dargestellt in Katechumenat und Katechese des ersten sechs Jahrhunderte* (Freiburg, 1869); on the Protestant side, Th. Harnack, *Der christliche Gemeindegottesdienst* (Erlangen, 1854); G. v. Zezschwitz, *System der Katechetik* (Leipzig, 1863); Huyskens, *Zur Frage über die sogenannte Arcandisciplin* (Münster, 1891). For a comprehensive study, see Bonwetsch's art. *Wesen, Entstehung und Fortgang der Arcandisciplin* in *Zeitschrift für historische Theologie* (1873, ii. 203, sqq).

Revised by S. M. JACKSON.

Arca'num (plu. *Arca'na*): a secret, a mystery; sometimes applied to a medicine the composition of which is kept a secret. This term was much used by the alchemists, whose object was to discover the grand arcanum, the philosopher's stone.

Arcanum: village; Darke co., Ohio (for location of county, see map of Ohio, ref. 5-C); on the Peoria Division of the "Big Four" and the D. and U. R. R.; 26 miles from Dayton. It has good graded schools, fine city buildings, an opera-house, and two banks. The village is surrounded by a thriving agricultural country. Chief industry, tobacco. Pop. (1880) 778; (1890) 1,134; (1900) 1,225.

Ar'ce, MANUEL JOSÉ: a general who in 1824 was chosen president of the republic of Central America for four years. He favored the clerical party, at whose instigation he arrested Barrundia, governor of Guatemala, in Sept., 1826. This act provoked a popular revolt and a civil war, in which Arce was defeated in 1827. He was expelled in 1829.

Arcesila'us (Ἀρκεσίλαος): Greek philosopher; b. at Pitane, in Æolis, about 315 B. C.; founder of the New (or, as it is sometimes called, the Middle) Academy. He was a pupil of Theophrastus, and was an admirer of Plato, but taught a modified form of Platonic philosophy. He was eloquent, witty, and ingenious in argument, revived the Socratic method of teaching, and recommended an abstinence from dogmatism. It appears that he left no written statement of his doctrines, which are known to us only through the medium of his pupils and successors. Among the sayings ascribed to him is that "he knew nothing, not even his own ignorance."

D. in Athens in 241 B. C. See Erehmann's *History of Philosophy*.

Arch [O. Fr. *arche* < Lat. *arca*, chest; it has, however, assumed the meaning of Lat. *arcus*, a bow]: a curved structure of stone or brick intended to cover the space between two piers or two columns, and to support at the same time a superincumbent weight. The wedge-shaped pieces of which the arch is composed are called *voussoirs*. The middle stone of the arch is called the *keystone*, and the lowest stone on either side is the *springer*. The highest part is the *crown*, the sides are termed *haunches*, the inner curve is the *intrados*, and the exterior or upper curve is the *extrados*; while the base which supports the lowest *voussoir* or

springer on each side is the *impost*. The impost-stones are a part of the *abutments*, which support the structure at each end, and also resist its horizontal thrust. The arch probably originated in Egypt. The great pyramid of Cheops (2170 B. C.) has a false room above the ceiling of the sarcophagus-chamber, whose roof is formed of large inclined stones acting like rafters. In pyramids built several hundred years later similar roofs have been found having two inclined stones, and one placed horizontally between them, thus forming a rude arch of three *voussoirs*. A tomb of the date 1550 B. C. contains a brick arch of 11 feet span, formed of four courses, and having a total thickness of nearly 4 feet. The arch was also known to the Ethiopians, the Assyrians, the Greeks, and the Etruscans, though no one of these peoples made any extensive use of it, since the lintel system met all their wants. The Grecians did not allow curved lines in any important visible parts of their structures; hence their magnificent buildings retarded rather than encouraged the development of arches.

The Romans used the arch extensively, not only in buildings, but also for drains, aqueducts, and bridges. A great sewer called Cloaca Maxima, still seen in Rome, is believed to be one of the oldest of the Roman arches, dating from about 500 B. C. As shown in the cut, it consists of two arches, one within the other, the inner one being 13 feet in diameter. These were built of large blocks of tufa about 5½



Mouth of Cloaca Maxima at Rome.

feet long and 3 feet thick, laid without cement. The Roman arches were of the most simple form, usually semicircular or of a segment of a circle.

Gothic or pointed arches, introduced during the ninth century, were quickly developed in numerous forms, such as the equilateral arch, the ogee, and the foiled arches, so ex-

tensively used for the windows of churches. For bridges these forms are not well adapted, the sections employed being arcs of circles described from three or four different centers, or sometimes ellipses.



Cabin John arch.

The use of the arch for bridges originated with the Romans, and many monuments of their skill are still to be seen in different parts of the ancient Roman empire. Near Narni, in Italy, four stone arches were built in the time of Augustus, one of which now remains; the spans of these were 75, 114, 135, and 142 feet. Trajan's famous bridge over the Danube (A. D. 105) was 4,770 feet in length, and consisted of 22 wooden arches, some of which were 180 feet in span. During the Middle Ages a number of stone bridges were erected. Perronet mentions one built at Verona in 1354, consisting of 3 arches, one being nearly 160 feet in span, and another, erected in 1454, of 184 feet span and 71 feet rise.

Only 2 stone arches exceeding 184 feet in span now exist. One of these, built in 1820 over the river Dee at Chester, in England, has a span of 200 feet and a rise of 42 feet. The other, constructed by Gen. M. C. Meigs in 1861 to carry the Washington aqueduct over the Cabin John creek, has a span of 220 feet, a rise of 57 feet, and a width of 20 feet; the arch stones are 4 feet thick at the crown, and 6 feet at the springing lines. The keystone was laid in cold weather, so that in summer the crown rises. One of the most beautiful stone structures in the U. S. is High bridge, built in 1840 by J. B. Jervis, to carry the Croton aqueduct over Harlem river; this has 8 arches of 80 feet span, and 7 of 50 feet span.

The largest stone arch ever constructed was built in the latter part of the fourteenth century over the river Adda, in Northern Italy, and was 251 feet in span. This arch is not standing, but it is said that the *voussoirs* were of granite and in two courses, the inner one 3 ft. 3 in. thick and the outer one 9 inches thick.

When the face of an arch is oblique to the direction of its axis it is called a skew arch. Owing to the necessity of making the joints of stone perpendicular to the directions of the pressures that come upon them, many radial joints, which in an ordinary structure are plane surfaces, become warped surfaces in the skew arch, and the *voussoirs* are laid in spiral instead of horizontal courses. Skew arches are rarely constructed, and none of large span have been built. Falls bridge, over the Schuylkill river near Philadelphia, completed in 1856, had 6 arches of 83 feet span and 24 feet rise, each arch consisting of 8 square-built ribs of 3 by 3 feet in section, and each rib being placed 18 inches back of its fellow, thus making a skew of 12 feet in a width of 24 feet. Skew arches without ribs are, however, those usually built. One of the finest in the U. S. is the structure at Reading, Pa., which consists of a central span of 40 feet over a roadway, and two side spans of much less width over the sidewalks.

No complete theory of the stone arch exists, but several theories, more or less approximate, enable computations to be made with sufficient accuracy. For a linear arch, that is an imaginary arch ring without thickness, the formulas given by Rankine furnish the means of fully discussing parabolic and circular forms under certain conditions of load-

ing. The *horizontal thrust* of an arch is that force, acting at the crown in a horizontal direction, which would hold one half of the structure in equilibrium were the other half removed. As the point where this is applied is generally indeterminate, the thrust itself can not be precisely computed for a real voussoir arch. The tables of Woodbury (*Treatise on the Well-proportioned Arch*, New York, 1858), are useful for segmental and circular forms. Among the best short theoretical discussions are *Vousoir Arches*, by William Cain (New York, 1879), and *Skew Arches*, by E. W. Hyde (New York, 1876).

The word ARCH is also applied to curved structures of timber, iron, or steel, used for roofs or bridges. The distinctive feature of an arch, as opposed to a girder or truss, is that it exerts horizontal pressures upon the abutments or points of support. Arched roofs are often provided with

river at Rochester, N. Y., designed by L. L. Buck, and completed in 1890, is formed by a three-hinged arch span of 428 feet span and two approaches of 103 and 93 feet; the roadway is 212 feet above the bed of the river.

The Washington bridge, completed in 1890, over the Harlem river at 181st Street, New York, has two of its spans composed of two-hinged arches of 508 feet span, which have solid web-plates connecting the ribs instead of diagonal bracing; the radial depth of these arches is 13 feet, and the hinge-pin at each end is 18 inches in diameter. The chief engineer of this bridge, William R. Hutton, has written a book describing its construction in detail.

The great bridge over the Mississippi river at St. Louis has three main spans of 497, 515, and 497 feet, respectively, the central one being the largest arch in the U. S. In each of these spans there are four arches composed of steel tubes

9 inches in exterior diameter, and connected by lateral bracing. Each section of tube between the joints is straight, the joints being formed by wedge-like plates which give the necessary curvature. In the construction of this bridge many difficulties were encountered and overcome, particularly in the founda-

tions. The chief engineer was James B. Eads. A history of the construction of this bridge was written by C. M. Woodward, and published at St. Louis in 1889. The cut shows only about one-third of one of the steel spans. The arch is a structure without hinges, and its ends are rigidly fixed to the abutments.

The theory of the equilibrium of braced arches with three hinges is quite simple, since the horizontal thrust must pass through the center hinge, and thus can be readily determined. The arch with two hinges and the arch with fixed ends require the elastic properties of the material to be known before the reactions and stresses can be found, and the computations are often quite intricate. The most complete development of the theory of the subject is given in Weyrauch's *Theorie der elastigen Bogenträger* (Munich, 1879). The methods of Winckler are also good, and these may be seen in Du Bois's *Elements of Graphic Statics* (New York, 1875).

The arch of longest span yet constructed is on the Garabit viaduct in Central France. It is a metal structure of

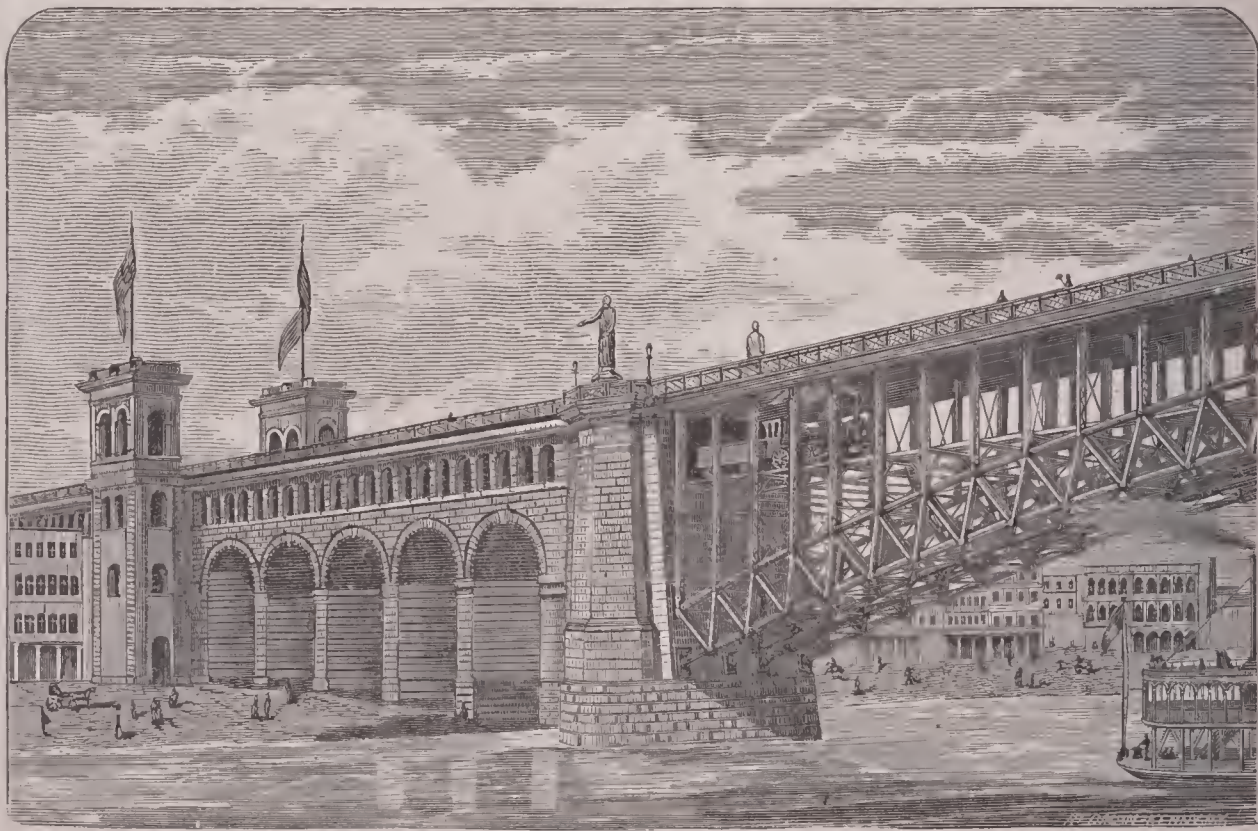


Rock creek arch, Washington, D. C.

horizontal tie-rods in order to prevent the outward motion of the walls which support them. Cast-iron arches were first built in England—one of 100 feet span and 45 feet rise in 1779, one of 130 feet span and 27 feet rise in 1795, and a bolder design of 240 feet span and 30 feet rise in 1796. This last, known as the Sunderland bridge, is probably the longest cast-iron arch ever built, it being equaled but not exceeded by the Southwark bridge, erected in 1818. A unique construction is the Rock creek bridge in Washington, D. C., whose arches are formed of two cast-iron pipes, through which the water from the Potomac aqueduct enters the city; these arches are 200 feet in span and 20 feet rise, each being formed of sections of water-pipe 4 feet in diameter and $1\frac{1}{2}$ inches thick. The Rock creek bridge was built in 1861, and since that date the only cast-iron arch worthy of mention is that over the Schuylkill river at Chestnut Street in Philadelphia, which was completed in 1866, consisting of two spans, each of 150 feet.

Wrought-iron and steel arches formed of parallel ribs, braced together with diagonal members, and hence often called "braced arches," have been built both in Europe and America since 1850, some of which rank among the boldest bridge structures. In order to eliminate stresses due to temperature, hinges or pins are sometimes used to connect them with the abutments, in which case they are called two-hinged arches. A third pin added at the crown renders the stresses more determinate still, and these receive the name of three-hinged arches. If no hinges exist the arch is very stiff, but extra material must be used to resist the stresses due to temperature.

A three-hinged arch of 64 feet span and 12 feet rise carries railway tracks across Thirtieth Street in Philadelphia, and one of about the same span forms a highway bridge over Mill river in New Haven, Conn. The highway viaduct over the Genesee



Approach and steel arch, St. Louis bridge.

541 feet span and 169 feet rise, erected by M. Eiffel in 1885. Next to it ranks the Douro arch, on the Oporto viaduct in Portugal, which is 525 feet in span and 123 feet in rise. A

vague statement concerning a stone arch of 600 feet span, built long ago on the line of the Chinese wall, found in several books, can not be traced to any reliable authority.

A stone arch is always built upon a timber framework (see CENTERING). A metal arch is, however, sometimes built out from the abutments, panel by panel, being sustained by suspension guys and cables, until the two arms meet at the center of the span. See ARCHITECTURE, BRIDGES, ROOF, TUNNELS, FOUNDATION.

MANSFIELD MERRIMAN.

Arch, Triumphal [in Lat. *arcus triumphalis*; in Fr. *arc de triomphe* or *arc triomphal*]: a monumental structure erected in honor of a victorious general or in commemoration of some important event or victory. It was usually placed at the entrance of a city or over a grand avenue. The ancient Romans built numerous triumphal arches at Rome and elsewhere. Scipio Africanus erected one on the Capitoline Hill, about 190 B. C. Magnificent structures of this class were raised by Augustus at Rimini and Ancona, the latter of which stands at the head of a great pier stretching out into the sea; it is in perfect preservation. Several structures of this sort have been erected in the U. S. as gateways to parks and cemeteries or as memorial structures. In 1891-92 a marble arch was erected at the foot of Fifth Avenue, New York city, in commemoration of the hundredth anniversary of Washington's inauguration, which had been celebrated in 1888, when a similar structure in wood had been put up for the temporary purpose. Three large triumphal arches at Rome are still extant—namely, the Arch of Titus, which commemorates the conquest of Judea; the Arch of Septimius Severus; and the Arch of Constantine, a beautiful and imposing structure adorned with bas-reliefs. There are also several smaller ones. The most magnificent of modern triumphal arches are those of Paris, and the finest among these is the Arc de l'Étoile, erected by Napoleon I. at the Barrière de Neuilly. It has three arches, the central one of which is 95 feet high. The whole structure, which is equal in grandeur and splendor to the ancient Roman arches, is about 160 feet high and 150 feet in length.

Arch, JOSEPH: founder and first president of the National Agricultural Laborers' Union of England; b. at Barford, Warwickshire, England, Nov. 10, 1826. He was brought up as a farm-laborer, educated himself as best he could, and became a Primitive Methodist preacher. When the union movement arose among the agricultural laborers he became its recognized leader. In 1872 he founded the National Agricultural Laborers' Union, of which he became president. In 1873 he visited Canada to inquire into the labor and immigration questions. In 1885 he was elected to Parliament for Northwest Norfolk, but was defeated for re-election after the dissolution of 1886; was re-elected in 1892, and again in 1895. He has been the recognized leader of the movement for the elevation of the rural laborers. See Heath's *English Peasantry* (1874).

C. H. THURBER.

Archæology [Gr. *ἀρχαιολογία*; *ἀρχαῖος*, ancient + *λέγειν*, discuss]: literally the science of antiquities. Dionysius of Halicarnassus gave the title of *Roman Archæology* to a work of general history, and the Jewish history of Josephus was likewise entitled "*Ἰουδαϊκὴ Ἀρχαιολογία*." The term in its widest sense includes the knowledge of origins, language, religion, laws, institutions, literature, science, arts, manners, customs—everything, in fact, that can be learned of the ancient life and being of mankind. Archæology may thus be made to comprehend a part of many branches of knowledge which are recognized as distinct or independent pursuits; but in its narrower and perhaps more popular significance it is understood to have reference to the *materials* from which a knowledge of the ancient condition of a country is to be attained. These materials are written, monumental, and traditional. Written archæology includes both the science of ancient writings and the knowledge of printed books. The second, monumental archæology, admits of almost endless subdivisions, according to the character of the remains to be studied, which may be works of art, such as buildings, sculptures, paintings, inscriptions, coins, armorial bearings, furniture, enamels, glass, porcelain, etc.; works of engineering, such as roads, canals, aqueducts, mines, etc.; articles of dress, armor, or personal ornament; tools, weapons, utensils, habitations, etc.; forms of sepulture; vestiges of man and animals, such as bones, etc. The third, or traditional archæology, may be said to include the oral literature of a people, their dialects, legends, proverbs, ballads, as well as their sports, customs, and superstitions.

In regard to the application of the words archæology and antiquities, it may be remarked that the latter has reference properly to the objects studied, the former to the study itself. And though archæology in its more limited signification refers to the materials studied, those materials are considered not as individual specimens, but in their totality. Thus while we might say a "collection of antiquities" (i. e. of antique objects), we could not so properly say "a collection of archæology," though we might say "an archæological collection." The study of archæology was long almost exclusively confined to the antiquities of the Greeks and Romans, but about the middle of the sixteenth century attention was turned to the antiquities of other ancient nations and of the Middle Ages. Since the discovery of the Rosetta Stone, which gave a key to its hieroglyphics, the archæology of Egypt has made astonishing progress; while the discoveries of Layard, Rawlinson, and others have already far advanced that of Assyria. Within the last few years the archæology of India and that of China have been successfully prosecuted. The rude and scanty remains of the aboriginal inhabitants of North America have occupied the attention of men of letters in this country; while the more stately and instructive monuments of Central and South America have fully rewarded the investigations of antiquaries. Prehistoric archæology, or the study of the relics of man as he existed before the dawn of history, is of late attracting much attention. The Royal Society of Antiquaries at Copenhagen has given this branch of the subject especial attention, Northern Europe being peculiarly rich in remains of the prehistoric ages.

In Great Britain, too, prehistoric remains of the most ancient origin have been abundantly found, and there can be but little doubt that many ancient relics which have been regarded as Druidical are in reality ante-Celtic. But in France and Belgium, especially, have the labors of Boucher de Perthes, Lartet, De Vibraye, and others been rewarded by the discovery of very ancient human relics. In Switzerland (see LAKE-DWELLINGS), in Italy, Greece, Turkey, etc., the study of these profoundly interesting prehistoric remains has aroused much enthusiasm. But the work is as yet in its early infancy. The cyclopean walls of the southern peninsulas of Europe are now generally assigned to the prehistoric ages. The fruits of the discoveries near the supposed site of ancient Troy are by many referred to prehistoric times. The later heroic age of Greece has left many undoubted relics, the most remarkable of which are associated with the discoveries of Dr. Schliemann (see MYCENÆ). The discovery of Phrygian ruins of similar character is interesting, although it does not appear that the civilization of Mycenæ in Greece can be referred to Phrygian origins. The deeply interesting discoveries in Cyprus (see CYPRUS and CESNOLA, DI) have shown us unquestionably the works of historic times. The discovery in 1873 of the key to the reading of the strange inscriptions in the syllabic alphabet of Cyprus has thus far given no evidence of their being of very remote origin, and the inscriptions themselves are in Greek of a very marked dialect.

While prehistoric archæology opens to us a world of mystery and wonder, the archæology of later times serves to dispel mysteries; the resulting effect of the two being to remove the mysterious age farther backward into the past. Much that has hitherto been unexplained is receiving light from the labors of archæologists in the valley of the Euphrates-Tigris, as well as in that of the Nile. Biblical archæology is greatly forwarded by the labors of the English and Americans in the Holy Land. The Asiatic societies find abundant material for examination in Southeastern India, a new and almost untrodden field. Oslander, Fresnel, and other Semitic scholars would appear to have solved the riddle of the Himyaritic inscriptions in Arabia; and the wonders of the semi-civilizations of America before the time of Columbus have been much diminished by the simple and yet admirable generalizations which have been of late brought forward with regard to them. But an interest hardly less intense than attaches to the above-mentioned works is, and long has been, felt in the antiquities of the Middle Ages, both ecclesiastical and social. The civilizations of ancient Rome and Greece are quite clearly marked off from ours, while the Christian civilization that sprang up on the ruins of the old is our own civilization, and must possess for ever a deep interest to the student of modern humanity. The French and Italians have given special attention to this department.

Among other recent archæological investigations may be

mentioned the labors of Mariette Bey, Lepsius, Brugsch Bey, Maspero, and Flinders Petrie in Egypt, extending from the delta of the Nile up to the Sudan; the excavations at Carthage and Cyrene (Greek Africa); at Ephesus, Pergamon, and Assos in Asia Minor; on the island of Delos, on the Acropolis of Athens (see ATHENS); at Eleusis, Epidaurus, Olympia, and Delphi in Greece; and chiefly at Rome and Pompeii, and among the Etruscan cemeteries, in Italy. The monumental archæology of Brazil, Ecuador, Peru, and the rest of South America has been studied with important results.

The quite modern science of "folk-lore," which examines and compares the traditions, legends, superstitions, and immemorial customs of existing peoples, links itself inseparably with some departments of archæology; and it is from the study of long-overlooked traces of the old Aryan and Sanskrit traditions, legends, superstitions, and customs that they receive much of the light which has lately been shed upon them—a light which shows very plainly that a common, if very remote, kinship unites all the Indo-European peoples. Such considerations show that the true archæologist is no mere antiquarian curiosity hunter, but a student of matters which have a very wide and deep interest to nearly every thoughtful mind.

The foundership of archæological research has lately been claimed in behalf of Rienzi, the Roman tribune, who was an enthusiastic antiquarian (1313–54). But classical archæology appears to have worn the aspect of a collector's hobby until a vitalizing spirit was infused into the science of the concrete remains of antiquity by Winckelmann. The interpretation and illustration of ancient art, as one of the principal fields of mental activity and production, has since been the leading idea of archæologists, more particularly in France and Germany. These countries were the first to establish schools of archæology in Rome and Athens; their example has since been followed in Athens by the U. S. and Great Britain, and by the Italians themselves in Italy. There is also a French school of archæology on Egyptian soil, while the science is systematically taught at most of the continental and some of the British and American universities. The proper correlation of the fragmentary literary testimony of antiquity is perhaps the most interesting and difficult problem with which archæologists are constantly occupied.

The science of archæology has been greatly promoted by the publication of chronicles, records, catalogues, etc., by the formation of clubs and societies, and by the establishment of museums for the collection and classification of antiquities. Among the societies formed for this purpose may be mentioned the Society of Antiquaries of London, which was founded in 1572, but was not incorporated by royal charter until 1751; the Society of Antiquaries of Scotland, chartered in 1780; and the Royal Irish Academy, for promoting "the study of science, polite literature, and antiquities," which was chartered in 1786. The last two have good museums of national antiquities. Among the most celebrated antiquarian collections are those of the British Museum in London, which contains, besides a great collection of early manuscripts, galleries of Assyrian, Egyptian, Etruscan, Greek, Roman, British, and mediæval antiquities; the museums of the Louvre and the Hôtel de Cluny in Paris, which contain an unrivaled collection of mediæval in addition to more ancient antiquities; the collections at Florence and Rome, and the Royal Museum at Naples, which contains most of the objects recovered during the last one hundred years from the ruins of Herculaneum and Pompeii. Among the best works on classic antiquity are those of Montfaucon, particularly his *Antiquité Expliquée* (10 vols., 1719), and Winckelmann's *Geschichte der Kunst des Alterthums* (1766), and his *Monumenti antichi inediti* (1766). On Egyptian archæology, see the works of Champollion and Bunsen. Among the recent works on archæology those by Westropp, *Handbook of Archæology* (1867); J. H. Parker's *Archæology of Rome* (vol. i., 1874); Newton, *Essays on Art and Archæology*; Waldstein, *Essays on the Art of Phidias* (1856); Lanciani, *Ancient Rome in the Light of Archæology* (1887); and J. H. Middleton's *Remains of Ancient Rome* (1892) deserve to be here mentioned. On prehistoric archæology see Lubbock, *Prehistoric Times* (2d ed. 1869); Baldwin, *Prehistoric Nations* (1869), and *Ancient America* (1872); C. C. Jones, *Antiquities of the Southern Indians* (1873); Foster, *Prehistoric Races of the United States* (1873); Nadaillac, *Prehistoric America*. Among the writers upon Scandinavian prehistoric remains

we may mention N. M. Petersen, Finn Magnusen, and Worsaae. The *Journal of Hellenic Studies* and the *American Journal of Archæology* are the best periodical repositories of archæological news and investigation published in English. Revised by ALFRED EMERSON.

Archæology, Biblical: the science which treats of those things which illustrate the public and private life of the people and places mentioned in the Bible. Our knowledge of these subjects is obtained from the ancient literature both of the Jews and Gentiles, and from the monumental and other remains of ancient nations, such as inscriptions, ruins, coins, etc. The principal literary sources of archæological knowledge of this kind are the Bible, Josephus, Philo, the rabbinical and Arabian writers, Herodotus, the writings of the Christian Fathers, the later classical authors, and a great number of modern works of travel and literary research. The monumental sources of knowledge include the interesting literary and other remains of ancient Egypt, the coins of the Phœnicians, of the Maccabees, and of the Syrians, the cuneiform inscriptions of Babylon, Assyria, and Persia, the Moabite Stone, the catacombs of Rome, and the remains of the ancient cities of Palestine and the neighboring countries.

Among the immense numbers of older treatises upon this subject we may mention J. D. Michaelis, *Commentary on the Laws of Moses* (1770, 2d ed. 1775; Eng. trans., London, 1814, 4 vols.); J. Jahn, *Biblical Archæology* (1796–1805, Eng. trans., Andover, 1823; 5th ed. 1849); J. L. Saalschütz, *Archæologie der Hebräer* (Königsberg, 1855–56, 2 vols.); Edward Robinson, *Biblical Researches* (Boston, 1841–56, 4 vols.). More recent works are Ewald's *Die Alterthümer des Volkes Israel* (3d ed. 1866; Eng. trans., London and Boston, 1876); Keil's *Handbuch* (2d ed. 1875); E. C. Bissell's *Biblical Antiquities* (Phila., 1888); the *Transactions and Proceedings* of numerous archæological societies; the Bible dictionaries of Smith, Kitto, Riehm, and Schaff, and the general religious encyclopædias of Herzog and Plitt, the Schaff-Herzog, the Wetzer and Welte (n. e. Kaulen), and McClintock and Strong. Revised by W. J. BEECHER.

Archæop'teryx [from Gr. ἀρχαῖος, ancient + πτέρυξ, bird]: a remarkable fossil bird found in the lithographic limestones (Jurassic) of Solenhofen, Bavaria. It is the oldest bird of which we have any record, and is in many points of structure intermediate between birds and reptiles. It had, however, undoubted feathers. As in some of the eretaceous birds, the jaws were furnished with teeth. The wing was very bird-like, but three fingers being present. These were, however, terminated with claws. One of the most striking features is the long, reptile-like tail, composed of many vertebrae, from which feathers diverge on either side. Two specimens are known, representing two species.

Archaic Art: art in its earliest stages, characterized by a striving after ideals as yet unrealized and only imperfectly discerned, with a resulting uncouthness and stiffness of expression which disappear as the ideals become more clearly defined, and experience and developing taste bring with them greater facility of expression and an improved technique. In this early and immature stage the arts are the objects of careful study on the part of archæologists and artists, not merely because of the light they throw upon the influences of, and the relations between, the older civilizations and the rising one, but also because of the simplicity, sincerity, and naïf charm of many of the works themselves.

Singularly enough, the oldest of all civilizations—that of Egypt—has left us practically no traces of its archaic stage, and but little has come down to us from the Euphrates-Tigris valley that can properly be called archaic. The art of Greece, on the other hand, and that of the neighboring Asiatic peoples have bequeathed to us an extraordinary number of vases, sculptures, rock-carvings, and architectural fragments belonging to the archaic periods of their several civilizations, while the arts of Cyprus and Etruria seem never to have emerged from the immaturity and uncouthness of archaism.

The archaic vases of Greece have little of the grace of the later more perfect ceramic art; the most ancient are adorned with concentric rings or circles in black, with zig-zags and ernde frets, and sometimes with rows of what appear like caricatures of beasts and human figures. The later archaic vases, belonging to the sixth century B. C., display more decorative skill; are adorned with pictorial compositions, elaborate honeysuckle ornaments of rather Asiatic character, and other decorations in black and white

upon the light yellow or nearly white clay of the vase itself. The archaic sculptures of Greece, starting from the *Xoana* or log-idols of prehistoric times, show a gradual and steady advance in anatomical knowledge, truth to nature, and action. The transition from archaism is marked by the disappearance of the "archaic smile" of the countenance, by the mastery of the expression of perfect and dignified repose, by the horizontal position and more truthful modeling of the eyes, and by the freedom and naturalness of the pose, especially of the feet and hands, with a corresponding freedom and boldness in the drapery.

In the later periods of Greek and Roman art the practice was introduced of imitating the archaic formalism of the earlier ages. These counterfeitings are easily detected by experts, and are called *archaistic*, to distinguish them from their genuine prototypes.

The nascent art of early Christian and mediæval times is not usually called archaic, nor is the term applied to the productions of savage and barbarous or primitive races or tribes, elaborate and beautiful as these often are. The element of a *developing* civilization is usually understood to underlie the application of this term. A. D. F. HAMLIN.

Archangel, or **Archangelsk'** (referring to *Archangel Michael*): a government or province of European Russia; bounded N. by the Arctic Ocean, E. by the Ural Mountains, S. by Wologda and Olonetz, and W. by Finland. It comprises Russian Lapland, and is divided into two parts by the White Sea. The surface is flat and the soil mostly barren, but produces valuable timber. The climate is very severe. Area, 331,640 sq. miles. Pop. (1897) 347,560.

Archangel: a seaport of Russia; capital of the province of that name; on the Dwina, about 20 miles from its entrance into the White Sea; lat. 64° 32' N., lon. 40° 33' E. (see map of Russia, ref. 4-E). The houses are mostly of wood. It has about twelve churches and an ecclesiastical college. The harbor is closed by ice except about three months, from July to September, during which period it is visited by many foreign vessels. The chief articles of export are fish, furs, lumber, tallow, flax, linseed, tar, iron, and bristles. This place, which was founded in 1584, was for a long time the only seaport of Russia. Pop. 19,702.

Archbish'op [from Lat. *archiepiscopus*; Gr. ἀρχι-, chief + ἐπίσκοπος, overseer. See BISHOP]: the chief bishop of an ecclesiastical province containing several dioceses, who has also a diocese of his own. The title came into use in the fourth century, and is said to have been first employed by Athanasius. It was hardly known in the Latin Church before the seventh century after Christ. The Church of England has two archbishops—one of Canterbury, who is Primate of all England and ranks next to the princes of the blood-royal; and the other of York, who is Primate of all England and ranks next to his brother of Canterbury.

Arch'dale, JOHN: an Englishman and member of the Society of Friends; became Governor of Carolina in 1695. He introduced the cultivation of rice, and in several respects promoted the prosperity of the colony. In 1707 he published a *Description of the Province of Carolina*.

Archdea'con [from Lat. *archidiaconus*, from Gr. ἀρχιδιάκονος; ἀρχι-, chief + διάκονος. See DEACON]: an ecclesiastic whose jurisdiction is immediately subordinate to that of a bishop. An archdeacon was originally an assistant of the bishop, and an overseer of the deacons and younger clergy. The archdeacon is called the *oculus Episcopi*, "the eye of the bishop." The importance and authority of the archdeacons gradually increased, although neither the name nor the office is mentioned in the Apostolical Constitutions. The office practically became distinct from that of the bishops, so that in the twelfth century they were recognized as influential as prelates. Since that time the power and influence of archdeacons have been much reduced. The Church of England has seventy-one archdeacons, who have a limited vice-episcopal territorial jurisdiction. In the Episcopal Church in the U. S., archdeacons have been introduced in a number of the dioceses, e. g. New York, Connecticut, Maryland, Chicago, Iowa, and elsewhere. These archdeacons are generally charged with the supervision of the missionary work, though in some cases they are also connected with the cathedral. See DEACON.

Archduke' and **Archduch'ess**: titles assumed by all the sons and daughters of the Emperor of Austria, and inherited by their descendants through the male line. The title of archduke was first taken by the dukes of Austria in the

fourteenth century, or earlier, but their claim to that mark of precedence over the other dukes of the German empire was not recognized by the emperor and the electors until 1453.

Arche'an E'ra, or **Archean Pe'riod** [*archean* is from Gr. ἀρχαῖος, ancient]: the earliest division of geologic time. Crystalline rocks of this era were formerly called Primitive in the belief that they constituted part of the original crust of the earth, before the formation of sedimentary strata. The name *Azoic* (without life) was afterward applied to all rocks older than the Cambrian, and to the time occupied in their formation, in the belief that life began with the Cambrian. Still later, structures supposed to be organic were found in the oldest rocks (see Eozoön), and the name *Eozoic* (pertaining to, or marking the dawn of life) was proposed for the pre-Cambrian era. With the progress of investigation it became known that some of the crystalline rocks were originally sedimentary, but had been metamorphosed to a crystalline condition; great doubt arose as to the possibility of distinguishing portions of the original crust, if they exist at the surface, from metamorphic strata; and the name Primitive no longer seemed appropriate. With the progress of evolutionary ideas it came to be believed that animals so highly organized as those of the Cambrian must have a long ancestry, and thus the name Azoic ceased to be an appropriate title for pre-Cambrian time. Not all were agreed that the obscure structures discovered in the oldest rocks were really fossils, but most students thought them inorganic. It still seemed possible that part of pre-Cambrian time was zoic (marked by the presence of life) and part azoic, and so the term Eozoic did not represent the prevalent opinion of geologists. Thus each title proposed for the pre-Cambrian era proved unsatisfactory by reason of the theory it implied, and need was felt for a term free from theoretic implication. In 1872 J. D. Dana proposed the name *Archean*, and it was immediately adopted by nearly all geologists.

Complicated structure, metamorphism, and the lack of fossils made the classification of Archean rocks a matter of great difficulty, but the fact that they contain important deposits of iron ore and of other economic minerals secured for them patient study, and substantial progress has been made in the discovery of their sequence and history. It has been found in several districts that one or more series of sedimentary rocks antedate the Cambrian, separated from one another by unconformities, and usually exhibiting different degrees of metamorphism. There occur also extensive bodies of rock older than the series just mentioned, and in these older bodies metamorphism has gone so far that it has not been found possible to determine whether they were originally igneous or sedimentary. In 1887 R. D. Irving proposed to restrict the term Archean to these fundamental crystalline rocks, and establish a new category from the various series of sedimentary rocks intermediate between them and the Cambrian. His proposition was widely accepted by American geologists, and the newly recognized period was named Algonkian (see ALGONKIAN).

As thus restricted, the Archean includes a complex aggregate of gneisses and allied schists, traversed by igneous dikes and veins of many ages and kinds. Its rocks occur in the Grand Cañon of the Colorado, in various mountain ranges of Arizona, Nevada, and Utah, in Southwestern Montana, in Texas, in the Lake Superior region, north of Lake Huron, about Hudson Bay, in Newfoundland, and probably in the Laurentian Mountains, in New England, and in the southeastern belt of the Appalachian Mountains. Similar rocks occur also in Scandinavia, Scotland, Central Europe, India, Australia, and New Zealand. The literature of American Archean is summarized by C. R. Van Hise in *Archean and Algonkian* (Bulletin 86, U. S. Geological Survey, 1892). See GEOLOGY, HISTORIC. G. K. GILBERT.

Archegone, or **Archegonium** [from Gr. ἀρχέγονος, original, founder of a race; ἀρχε-, first + γόνος, race]: the female reproductive organ in mosses, ferns, and their relatives. It is a flask-shaped, many-celled structure, containing a germ-cell which must be fertilized by an antherozoid from the ANTHERID (*q. v.*). CHARLES E. BESSEY.

Archegosau'rus [from Gr. ἀρχηγός, leader + σαῦρος, lizard]: a fossil animal, so named because it was supposed to have been the beginning of reptilian life. It is found in the Bavarian coal-measures. Goldfuss in 1847 described three species discovered in the coal-field of Saarbrück, and gave them the generic name of *Archegosaurus*. Prof.

Owen considers this animal as a remarkable connecting link between reptiles and fishes. Agassiz and Dana regard it as a ganoid fish, while others class it with salamandroid batrachians.

Archela'us: a Greek philosopher, surnamed **Physicus**, because he applied himself chiefly to physical science; was a native of Miletus, or, as some say, of Athens. He was a pupil of Anaxagoras, and flourished about 450 B. C. Socrates was one of his pupils. Archelaus taught that there were two principles of generation—heat, which moves, and cold, which remains at rest. His works are preserved only in fragments, quoted by Diogenes Laertius, Simplicius, Plutarch, and others.

Archelaus: King of Macedonia; son of Perdiccas II., whom he succeeded in 413 B. C. He patronized Euripides and Zeuxis and other Greek poets and artists. Socrates was invited to his court at Pella, but did not go. This king promoted the prosperity of Macedonia by roads and other internal improvements. Murdered in 399 B. C.

Archelaus: an able general of Mithridates the Great; was a native of Cappadocia. He commanded a large army which that king sent to oppose the Romans in Greece in 87 B. C. He captured a number of islands and occupied Athens, where he was attacked and besieged by Sulla. Having been forced to evacuate Athens, he retired to Thesaly in 86 B. C., and was defeated by Sulla at Charonea and Orchomenus. He signed a treaty of peace with Sulla in the year 85, and deserted to the Romans in 81 B. C. and commanded on their side in the second Mithridatic war. He is last heard of in 74 B. C.

Archelaus: a son of the preceding; became high priest of Comana about 63 B. C. He pretended to be a son of King Mithridates, and by that imposture induced Berenice, Queen of Egypt, to marry him. After he had reigned about six months in Egypt, he was defeated and killed by the Romans in 55 B. C. He left a son, Archelaus, who was high priest of Comana until he was deprived of that office by Cæsar in 47 B. C.

Archelaus: son of Herod the Great by Malthace, a Samaritan woman. On the death of his father (4 B. C.) he became ethnarch of Judea, Samaria, and Idumea; his full brother Antipas and his half-brother Philip receiving the rest of the kingdom. Fear of him sent the parents of Jesus into Galilee. In 7 A. D. he was deposed by Augustus, and banished to Vienne, Gaul, where probably he died.

Archencephala, ar-ken-sel'a-la [from Gr. ἀρχε-, first, chief; ἐγκέφαλος, brain]: the highest division of the class Mammalia, to which the order *Bimana*, composed of the solitary genus *Homo*, belongs.

Archenholz, aär'-khen-hölts, JOHANN WILHELM, Baron von: German historian; b. at Langfuhr, near Danzig, Sept. 3, 1743; took part in the Seven Years war, and afterward traveled extensively. He wrote a number of historical works, among which his *Geschichte des siebenjährigen Krieges* is the most celebrated and popular. D. at Oyendorf, Feb. 28, 1812. JULIUS GOEBEL.

Archers and Archery: An archer is one who shoots with a bow. In ancient times archers formed an important portion of the armies of most Oriental and of all barbarous or semi-barbarous nations. Among the ancients, the Cretans, Parthians, and Thracians, and in the Middle Ages the English, were especially distinguished for the skill and efficiency of their archers. The use of the bow and arrow in war was probably first introduced into Britain by the Romans, but it was under the Norman rule in England that archery was extensively practiced and greatly improved. Her archers became superior to those of all other nations. The English archers decided the fate of the day in the important battles of Crécy, Poitiers, and Agincourt. Among the Asiatic Turks, the Persians, the Tartars, and other nations of the East, as well as certain native African tribes and some American Indians, the bow and arrow are still used as weapons of war. In England archery is now no more than a pastime; it is promoted by archery clubs or societies. During the reign of Charles II. of England archery was much patronized by the court. After his reign archery fell into disuse for about a century. Toward the latter part of the eighteenth century it was revived as a fashionable pastime, even ladies often taking part in the trials of skill. The exercise, especially in the form of target-shooting, is still popular.

Archer, BRANCH T., M. D.: b. in 1790 in Virginia; studied medicine in Philadelphia, and was long a prominent physician and politician in Virginia. He went to Texas, in 1831 took part in the revolution, was in 1835 president of the "Consultation," and was sent as a commissioner to the U. S. He was a member of the first Texan Congress, and Speaker of the House of Representatives and Secretary of War 1839-42. D. in Brazoria co., Tex., Sept. 22, 1856.

Archer, JOHN, M. D.: b. in Harford co., Md., June 6, 1741; graduated at Princeton in 1760; was the first person who received the degree of M. D. in America. This degree he received from the Philadelphia Medical College in 1768. He served as an officer in the Revolutionary war, and was a member of Congress (1801-07). D. in 1810.

Archer, FREDERIC: See the Appendix.

Archer-fish: a small East Indian fish of the family of *Toxotidae*. The archer-fishes are said to project drops of water at insects, which they thus cause to fall from the air



Archer-fish.

into the water, and then devour them. *Toxotes jaculator*, one of these archer-fishes, is a native of Java, and about 6 inches long. The only remarkable peculiarity in the form of this fish is its elongated lower jaw, which may aid it in directing the liquid missile upon which its subsistence partially depends, as does that of the hunter on the accuracy of his rifle. "So powerful," says Wood, "is the projectile force, and so marvelously accurate is the aim [of the *Toxotes jaculator*], that it will strike a fly with certainty at a distance of 3 or even 4 feet."

Arches, Court of: a court of ecclesiastical law in England; the chief court of appeal from the courts of the several bishops or ordinaries within the province of Canterbury, which includes nearly all England. The dean of arches has long been the Archbishop of Canterbury's principal official, and in this capacity his jurisdiction, originally confined to the thirteen London parishes belonging to the see of Canterbury, has been extended to the "peculiar," i. e. the fifty-seven parishes which, though situated in various dioceses, are subject only to the archbishop. This court is so called because it was anciently held in the Church of St. Mary-le-Bow (*de Arcubus*). Abolished by act of Parliament, 1874.

Archetype [from Gr. ἀρχέτυπον, pattern: ἀρχε-, first + τύπος, stamp]: the original pattern or model of a work; the original type on which others are formed. Among Platonic philosophers the term archetype was applied to the original patterns or ideas existing in the Divine mind before the creation.

Archiac, ÉTIENNE JULES ADOLPHE DESMIER DE SAINT-SIMON, Vicomte d' (dar'shee-ak'): French geologist and author; b. at Rheims, Sept. 24, 1802. He published, besides

other works in French, a romance entitled *Zizim, or the Chivalry of Rhodes* (3 vols., 1828), and a *History of the Progress of Geology from 1834 to 1863* (8 vols., 1847-62). The latter was published at the expense of the state. D. in Paris, Dec. 24, 1868.

Ar'chias, AULUS LICINIUS: a Greek poet; b. at Antioch about 120 B. C.; became a resident of Rome in 102 B. C., and obtained the right of citizenship. Having been accused of assuming citizenship illegally, he was defended by Cicero in his famous *Pro Archia*, about 60 B. C.

Archia'ter, or **Archiator** [from Gr. ἀρχίατρος, ἀρχι-, chief + ἰατρός, physician]: a title given by the Roman emperors to some of their medical attendants; also to certain officials who were paid by the state or city, and were expected to give gratuitous medical treatment to the poor.

Archibald, SIR ADAMS GEORGE, LL. D.: Canadian statesman; b. at Truro, Nova Scotia, May 18, 1814; educated at Pictou Academy; admitted to the bar in 1838; represented Colchester in N. S. Assembly 1851-67; in Dominion Parliament 1869-70, and re-entered that body in 1888. He was a member of the Executive Council of Nova Scotia; a delegate to Great Britain on the subject of mines and the union of the provinces in 1857; to the Quebec union conference in 1864; and to the final conference in London to complete the terms of union 1866-67. He was Secretary of State for the provinces 1867-68; Lieutenant-Governor of Manitoba and Northwest Territories 1870-73; Lieutenant-Governor of Nova Scotia 1873-83. He was one of the directors of the Canadian Pacific R. R.; president of the board of governors of Dalhousie College, Halifax; and was knighted in 1885. D. at Truro, N. S., Dec. 14, 1892.

NEIL MACDONALD.

Archibald, ANDREW WEBSTER, D. D.: Congregational minister; b. at New Kingston, N. Y., Apr. 10, 1851; graduated at Union College, Schenectady, N. Y., in 1872 at the head of his class, and in the theological department of Yale College, New Haven, Conn., in 1876. His pastorates have been in Iowa and at Hyde Park, Mass. He has been a trustee of Iowa College at Grinnell since 1888. He is the author of *The Bible Verified* (1890), which in eighteen months passed to its third edition, and of *The Trend of the Centuries* (Boston, 1901).

Archida'mus II., became King of Sparta about 470 B. C. He waged war against the Messenians, and commanded the army which invaded Attica in 431 B. C., but the Athenians declined a battle. This was one of the earliest campaigns of the Peloponnesian war. He was the father of the famous Agesilaus. D. in 427 B. C.

Archidamus III.: King of Sparta; grandson of the preceding and son of Agesilaus II. He defeated the Arcadians and Argives in 367 B. C. in a battle which was called the "scarless" or "tearless," because no Spartan was killed in it. In 362 he defended Sparta with success against Epaminondas. He began to reign on the death of his father, 361 B. C., and was an ally of the Phocians in the Sacred war. Having led an army to Italy to aid the Tarentines, he was killed in battle near Manduria, on Aug. 2, 338 B. C.

Archidamus V.: the last king of the Proclid line. He was a brother of Agis IV., whom he succeeded in 240 B. C. He was soon killed by the parties that murdered Agis.

Ar'chil, **Or'chil**, or **Orseille** [from O. Fr. *orchel*, from Ital. *orcella*: of unknown origin]: a reddish purple dye obtained from various species of lichens, among which are the *Lichen roccella* or *Roccella tinctoria*, *Roccella fuciformis*, and *Lecanora tartarea*. These are gathered from rocks near the shores of the Canaries, the Azores, the Cape de Verde isles, Sardinia, Corsica, Ceylon, Madeira, Lower California, Auvergne, the Pyrenees, Sweden, and many other countries. The lichens do not contain the coloring-matter ready formed, but they contain colorless acids, *erythric*, *lecanoric*, *orsellinic*, *evernic*, etc., which readily change to ORCIN (*q. v.*). By the action of air and ammonia the colorless orcin changes to purple *orcein*, which is the coloring-principle of archil. To produce the archil, the weeds are reduced to pulp, a little putrid urine or ammoniac carbonate is added, and the whole is allowed to putrefy or ferment. In a week or ten days the color is fully developed. By adding potassium or sodium carbonate, as well as ammonia, a blue color, LITMUS (*q. v.*), is obtained instead of archil. *Cudbear* is a variety of archil made at Glasgow. Archil produces beautiful shades of purple, violet, mauve, red, etc., but, unfortunately, they are not, as generally employed, permanent. Dr.

Stenhouse suggested some improvements in the manufacture of archil, which were in 1856 put in practice by M. Marnas, of the firm of Guinon, Marnas & Bonnet, of Lyons. He treated lichens with milk of lime, filtered, precipitated the color-producing principles by hydrochloric acid, washed them on a filter, dissolved them in ammonia, and subjected the solution to a temperature of from 153° to 160° for twenty or twenty-five days. The color being at this time fully developed, he precipitated it by adding calcic chloride. The purple lake thus obtained was sold as *French purple*. To dye with this lake it is mixed with oxalic acid and water, boiled, and filtered. The color all goes into solution, a little ammonia is added, and on introducing the silk, wool, or mordanted cotton (mordanted with albumen, or as for Turkey-red), they become dyed with magnificent fast shades of purple. Unfortunately for M. Marnas, in the same year that he developed his *French purple* (1856) Mr. Perkin discovered his *mauve*, which was the starting-point in the great aniline-color industry. Archil has therefore a comparatively limited application. C. F. CHANDLER.

Archil'ochus of Paros: a famous Greek poet, ranked by ancient critics as second only to Homer; flourished about 650 B. C. A soldier, he was in battles often, and showed a soldier's philosophy at the loss of his shield in a fight between men of Thrace and men of Thasos, to which island he had emigrated in his youth. A soldier, he met a soldier's death in a war between Paros and Naxos. A pioneer in poetical art, he is said to have invented or perfected the elegiac verse and the iambic; and other lyric measures still bear his name. He was a master in odes, in elegies, in the fable, but his great and formidable gift lay in satire; and his lampoons are said to have driven his fickle love, Neobule, and her false father, Lycambes, to suicide. He opened the world of realism to song; and his intense passion made the unheroic heroic and gave wings to the language of everyday life. His name is a proverb for remorseless bitterness, but his works have perished save the few fragments in Bergk's *Poetae Lyrici Graeci* (4th ed. 1878-82).

B. L. GILDERSLEEVE.

Archima'gus: the chief of the ancient Persian magi. This title and office belonged to the reigning King of Persia after the time of Darius I., who, having ordered a general massacre of the magi, directed that it should be recorded on his monument that he was the master of the magi. Archimagus is also the name of a powerful and wicked magician in Spenser's *Faerie Queene*.

Archiman'drite [from Gr. ἀρχιμανδρίτης; ἀρχι-, chief + μάνδρα, inclosure, monastery]: an ecclesiastic who presides over monasteries of the Greek Church. The Russian bishops are chosen from the archimandrites. The title is retained in the Greek rite of the Roman Catholic Church.

Archime'des (in Gr. Ἀρχιμήδης): the greatest of ancient geometers; b. at Syracuse about 287 B. C. He was of Greek extraction, and is said to have been a pupil of Conon and a kinsman of Hiero II., King of Syracuse, by whom he was patronized. He enriched geometry, mathematics, and mechanics with important discoveries, and invented several useful and powerful machines. King Hiero, suspecting that a goldsmith had mixed alloy with a golden crown which he had made for him, applied to Archimedes to detect the fraud. The solution of this problem suggested itself to him as he entered a full bathing-tub, and perceived that his body must displace a volume of water equal to its own bulk. Greatly delighted with the discovery, he ran out of the bath, without having dressed (as the story goes), exclaiming "Eureka!"—"I have found it!" He discovered the proportion which a sphere bears to a cylinder by which it is inclosed. He was the author of a celebrated saying, "Δὲς ποῦ στῶ καὶ τὴν γῆν κινήσω"—"Give me where I may stand and I will move the world" (or universe). When Syracuse was besieged by the Roman general Marcellus, Archimedes exerted his ingenuity in the invention and construction of powerful machines or engines for the defense of that city. The tradition that he burned the Roman ships by mirrors is not confirmed by Polybius and Plutarch, and is discredited by many writers. He was killed, it is said, at the capture of Syracuse, in 212 B. C., by a Roman soldier, who would have spared his life if Archimedes had not been so absorbed in a problem that he would not comply with the soldier's summons to surrender or to follow him. He wrote numerous works, of which eight are extant, namely: *On the Sphere and Cylinder*; *The Measurement of a Circle*; *On the Equilibrium and Center of Gravity of Planes*; *On Conoids and*

Spheroids; On Spirals; The Quadrature of the Parabola; The Arenarius; and On Floating Bodies. According to his direction, a cylinder inclosing a sphere was engraved on his tombstone, to commemorate his discovery of their relation. The latest edition of his extant works is by J. L. Heiberg (Leipzig, 1880-81, 3 vols.). There is a complete French translation (Paris, 1807), and one in German (Stralsund, 1824). "He possessed," says Prof. Donkin, of Oxford, "in a degree never exceeded, unless by Newton, the inventive genius which discovers new provinces of inquiry, and finds new points of view for old and familiar objects, and the power and habit of intense and persevering thought, without which other intellectual gifts are comparatively fruitless." See *Journal of the American Oriental Society* (vol. vi., 1860).

WILLIAM JACOBS.

Archimedes: a genus of *Bryozoa* of the family *Fenestellidae*, quite common in certain limestones of the lower Carboniferous in the Mississippi valley, to which the name "Archimedes limestone" has been applied. The part of the fossil more frequently met with is the central screw-like axis around which, in the perfect form, was spirally wound a reticulated lamella very similar to the *Fenestella*. Pieces of such lamellæ are often found in place upon the central axis, showing the structure and arrangement of the pores from which the true nature of the fossil has been determined. Several species have been described from the rocks of Iowa and Illinois and elsewhere. The genus is not known outside the carboniferous system.

H. S. WILLIAMS.

Archimedes, the Principle of: an important principle in the science of hydrostatics, the discovery of which is ascribed to Archimedes. It is this: "A body immersed in a fluid loses exactly as much of its weight as is equal to the weight of the fluid which it displaces."

Archimedes's Screw: an engineering appliance, said to have been invented by Archimedes, for the purpose of lifting water. A tube is wound like a screw around a cylinder, the ends of which are fixed on pivots. The cylinder is placed in an inclined position, with its lower end beneath the surface of the water to be raised, and is then rotated by means of a handle at its upper end. As the cylinder turns round the water in the lower part of the tube rises above the water, and continues to rise from bend to bend as a fresh charge is taken in at the lower mouth, until it reaches the upper mouth and flows out. This contrivance is also sometimes called *spiral pump* and *water-screw*.

Archine: a measure of length in Russia, exactly equal to 28 English inches.

Archipel'ago [from Ital. *areipelago*, the Ægean; *arci-* (from Gr. ἀρχι-, chief) + *pelago*, pond, from Gr. πέλαγος, sea]: a name originally applied to a part of the Mediterranean called the Ægean Sea, which lies between Greece and Asia Minor and incloses numerous islands. They are mostly arranged in two groups, the Cyclades and Sporades. The principal islands of the former group are Melos or Milo, Naxos, Paros, Andros, Tenos, Delos, Seripho, Syra, Cythnos, and Thera. These islands, with Negropont, which is the largest island in the Archipelago, belong to Greece. Some writers include Crete in the Archipelago. Among the Sporades, which belong to Turkey, are Rhodes, Samos, Scio (Chios) Lemnos, Metelin, or Mitylene, Imbro, Samothraki, and Thasos. The islands of this sea are generally of calcareous formation, and have a fertile soil, beautiful scenery, and a pleasant climate. Many of them have produced famous philosophers, artists, and poets, and have been the scenes of interesting events of ancient history. (See ÆGEAN SEA.) In modern times the term is applied to any sea or expanse of water which contains many islands, or to a group of islands, as the Malay or Eastern Archipelago.

Archipelago, EASTERN: See EASTERN ARCHIPELAGO.

Arch'itecture [from Lat. *architectu'ra*, deriv. of *architectus*, master-builder, a translation of Gr. ἀρχιτέκτων; ἀρχι-, chief + τέκτων, builder, carpenter; Sanskr. *tákshan-*, builder]: Although sometimes applied to building showing systematic and scientific design without intended decorative effect (as military architecture), and so used even of the work of certain animals (as beavers or honey-bees), architecture, strictly speaking, denotes the art, as distinguished from the science, of constructive design. It is the highest of the industrial arts, and the most useful of the fine arts, having for its object to produce effects pleasing to the eye and mind, as well as to satisfy the requirements of conven-

ience and stability. Vitruvius defines its essential qualities as "*firmitas, utilitas, venustas*" (stability, utility, beauty),



FIG. 1.—The Greater Temple at Ipsambul.

and the most perfect architecture is that which most completely reconciles these requirements without sacrificing one

to another. The architect may impart to his work sublimity, splendor, grace, playfulness, variety or solemnity, and beautify it by grace of proportion, picturesque outline, play of light and shade, richness of carving and detail, or splendor of color, at the same time that he consults and satisfies the demands of durable construction and convenient arrangement; so that architecture, arising out of the humblest necessities of man, may minister to his highest aesthetic emotions, and rank as a fine art with painting and sculpture.

As an art of design, architecture comprises *planning*, or the distribution of the parts and divisions of each floor of a building; *composition*, or the general arrangement and proportioning of its voids and solids, outlines and masses; *constructive design*, by which the supporting and supported parts of its constructive framework are scientifically disposed; and *decoration*, or its embellishment by carving, sculpture, color, or other ornament. As a *profession*, it involves

the preparation of working drawings for the erection of the building, and the superintendence of its actual construction; besides much semi-legal business, in which the architect stands as the legal agent of the proprietor. The superintendence of the construction requires familiarity with several branches of engineering and of the mechanical trades; so that architecture has become one of the most complex of modern professions, instead of the simple industrial art of the master-builder of ancient days.

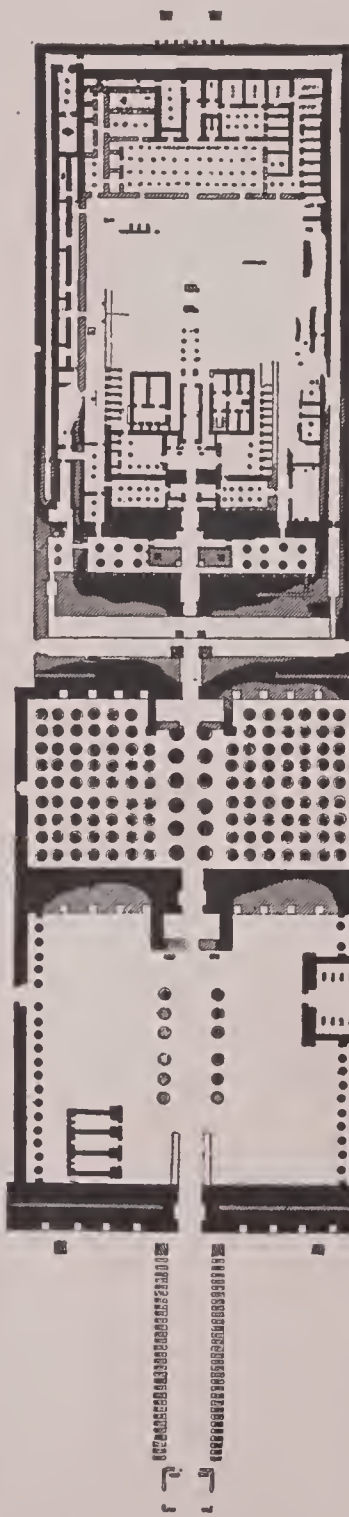


FIG. 2.—Plan of Great Temple at Karnak.

As architecture more than any other art reflects the political, religious, social, and aesthetic conditions out of which it has grown, we find its history falling into divisions more or less sharply outlined by limitations both of time and space. Different nations, provinces, and races, having invented or adopted each a particular principle or system of design, have developed their architecture along the lines of these various dominant principles until it has reached perfection, in which case decline has finally supervened; or until the influx of new ideas and principles, or conquest by a foreign race, has crowded out the old system and effected a revolution in the forms and methods of the art. Thus only have *styles*—i. e. the customary and characteristic systems of form and methods of design of given peoples and epochs—arisen and passed away by a law of evolution, and not by any mere caprice of fashion or scintillation of genius. To

EGYPTIAN.—The valley of the Nile, as the seat of the oldest civilization known to history, may be called the birthplace of historic architecture. Long before any known appearance of permanent buildings in Europe or Asia, the

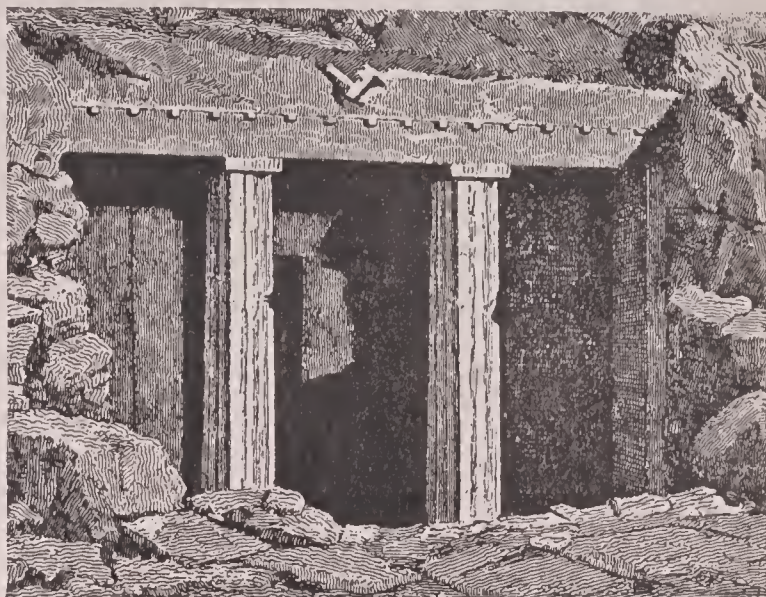


FIG. 7.—Tomb at Beni-Hassan.

pyramids of Ghizeh, near Cairo, had been reared as tombs for kings who died at least 3500 years B. C. They attest the advanced civilization and mechanical skill of that early age; that of Shufu or Cheops is the most colossal work ever reared by man. From a base 760 feet square, covering 13 acres, it rises 480 feet into the air, built mainly of huge limestone blocks, with intricate passages and chambers of polished granite, in one of which is the royal sarcophagus, long since rifled of its mummy. The other two pyramids of the trio that dominate the group at Ghizeh are smaller than "Cheops"; one was built by Shafra and the other by Menkeres, both of the fourth dynasty. Nearly a hundred others are scattered in groups between Abu-Roash and Illahouh, some of stone, others of brick, but none rivaling the three giants of Ghizeh. Near the latter is the Sphinx, a colossal, rock-cut, symbolic figure, lion-bodied and human-headed, supposed by some authorities to antedate the pyramids; and a small, sand-buried temple, of nearly equal antiquity, built of square piers and lintels of granite, imposing in spite of its diminutive size.

The monuments of Egyptian architecture are almost wholly religious, consisting mainly of tombs and temples; the domestic architecture of Egypt has wholly perished, owing, probably, to its use of wood and sun-dried brick as building materials, and to its relative unimportance architecturally. The houses, as shown in the reliefs, were but one or two stories high, and comprised several rooms surrounding an open court, with verandas and porches of wood. But the religious architecture of the Egyptians was of the most imposing and enduring character, building up colossal combinations of columns, lintels, and pictured walls; or cutting the solid rock itself into architectural caverns of surpassing magnificence. Of the latter sort are the two temples at Ipsambul, whose gigantic sculptured façades and gloomy halls are thus hewn in the side of the mountain. The funeral temple of Hatasu at Deir-el-Bahari combined the two systems, being partly structural and partly excavated in the rock.

We can not delay to mention particularly even such great temples as those at Luxor, Medinet Abu, and Abydos, belonging to the great age of the Rameses and Setis of the nineteenth dynasty (1450 B. C.); nor the magnificent temples at Edfou, Denderah, and Philae, belonging to the Ptolemaic period when Egyptian architecture underwent an extraordinary revival. Even the vast temple at Karnak, which embodies all the characteristic features of Egyptian temple architecture on a colossal scale, can only be summarily described. It covered 420,000 sq. feet, measuring some 1,200

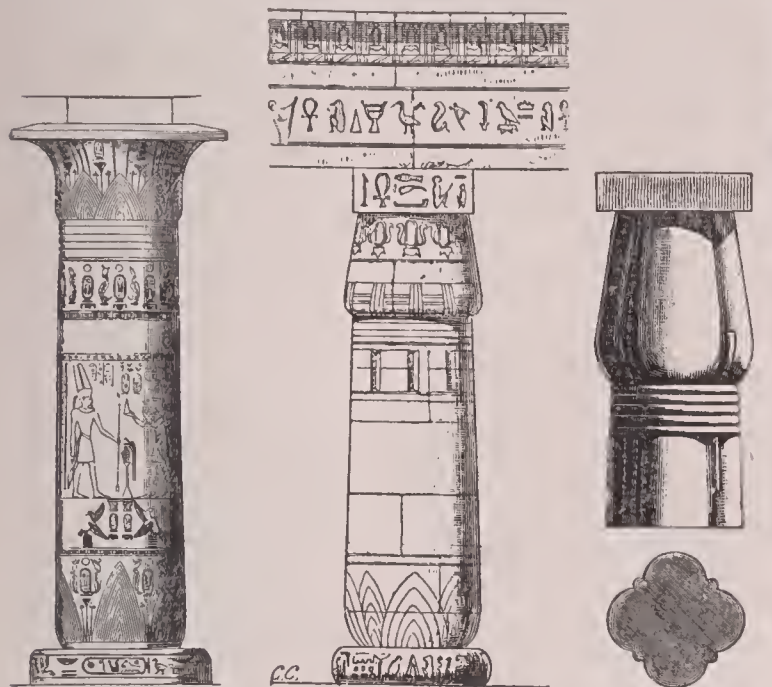


FIG. 3.—Egyptian column.

FIG. 4.—Egyptian column.

FIG. 5.—Capital at Beni-Hassan.

the different styles, according as we wish to indicate national or epochal characteristics, we give special names, as Arabian, Greek, French architecture; classic, mediæval, modern architecture.

Of the historic development of architecture only the broadest outlines can be given in a short article; for details, the reader is referred to the numerous histories of the art, or of special periods of its development, by Rosengarten, Fergusson, Lübke, Reber, Perrot and Chipiez, Viollet-le-Duc, and others.

Although architecture has grown up from the crude efforts of primitive man to provide a shelter for himself and his gods, these primitive and uncouth works—wigwams, huts, tents, and caverns—are destitute of true art, and do not enter the domain of architectural history. Moreover, the



FIG. 6.—Temple of Chensu at Karnak.

transitional structures which would reveal the successive stages by which a noble art was evolved from these rude beginnings have all perished. The most ancient existing edifices display the well-developed art of a high civilization, so that the origins and early stages of the art can only be conjectured. The rude monuments attributed to the Druids (see Fergusson's *Rude Stone Monuments*), and even the megalithic walls and fortifications of Greece, have no connection with the architecture of subsequent ages, and will therefore be passed over with only casual mention in this article.



FIG. 8.—Osiris Pier: Temple of Medinet Abu.

feet in length by 350 feet in width; and was begun by Osirtasen I. of the twelfth dynasty. It was continued and extended by many subsequent monarchs, especially Thothmes III., Amenophis III., Seti I. and II., and Rameses I. and II., of the "great age."



FIG. 9.—The Lion-gate at Mycenæ.

Like the other temples, its oldest portion was also the smallest and the most sacred—the sanctuary; to which were added through the centuries successive halls, chambers, and open courts, each addition fronted by a huge double pylon, i. e. a gateway between twin truncated pyramidal masses, and usually flanked by colossal sitting figures of the king. Each addition surpassed in size the earlier structures; so that, entering the first (really the latest) pylon, one traverses successively diminishing courts and halls up to the small, solemn, and gloomy *sekos* or sanctuary, surrounded by the chambers of the priests. The whole was inclosed by a massive and unpierced wall, covered with incised sculptures, and again by a second circuit-wall of brick. But the most imposing feature was the *hypostyle hall*, near the center of the group, measuring 342 by 170 feet, its stone ceiling supported by 134 columns in sixteen rows, those in the two central rows being 11½ feet in diameter and 62 feet high. (A model of this hall to the ½ scale is in the Metropolitan Museum in New York.) This and the other lesser halls and courts were made gorgeous with symbolic and decorative carvings and pictures, covering every available surface and richly colored. In the dim light which entered through the doors, or through clerestory windows, the effect must have been most solemn and impressive.

The structural forms used were few and simple. Round columns of sturdy proportions, carrying capitals imitating the buds or blossoms of the lotus, or swelling into bell-shaped forms simple or compound, and square piers fronted by figures of Osiris, were the supports chiefly used. The architraves were plain, and the pylons and walls externally were crowned with a simple, overhanging eavetto cornice. Colored symbolic pictures were the chief decorative resource.



FIG. 11.—Greek Doric order.

a, Plinth or abacus; b, echinus or ovolo; c, fluted shaft; d, neck; e, groove; f, architrave or epistylium; g, metope; h, triglyph; i, cornice.

ASSYRIAN.—Assyrian architecture was developed under the limitation of poor and scanty building materials; sun-dried and burnt brick, alabaster slabs, and wood being chiefly used. The ancient temples of Chaldæa, dating from a very remote antiquity

(perhaps 2000 B. C.), and the elaborate palaces of Assyria were alike built of these perishable materials. Immense terraced mounds, held by retaining walls of stone (as at Khor-sabad), or of brick, were the only means of attaining the altitude made necessary by the flatness of the land; and enameled brick and alabaster slabs carved in low relief were almost the only available resources for decoration. Nevertheless the Assyrians and Babylonians were able to produce results of great splendor in spite of these limitations; but, as was natural, their construction was far inferior to their decorative art. The latter borrowed much from Egypt, and invented much besides; many of its forms, perpetuated in part by the Persian art which succeeded it, and in part by that of neighboring Asiatic races which borrowed from it, were by them transmitted in more or less modified shape to the Greeks, who developed them into a wholly new and vastly superior art of exquisite beauty. See articles ASSYRIA, ASSYRIAN ART, and ASSYRIAN EXPLORATION.

The Persians, who conquered Babylonia in the sixth century B. C., adopted the Assyrian ornamental forms and symbols, and adapted them to a columnar architecture derived, apparently, from earlier wooden prototypes of their own. The ruins of Persepolis and Susa exhibit the singular but imposing results of this combination.

GREEK.—The beginnings of Greek art are lost in obscurity. The "cyclopean" walls of Greece and Southern Italy, the subterranean "treasuries" of Mycenæ and Orcho-

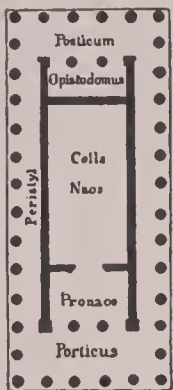


FIG. 10.—Plan of Temple of Theus.

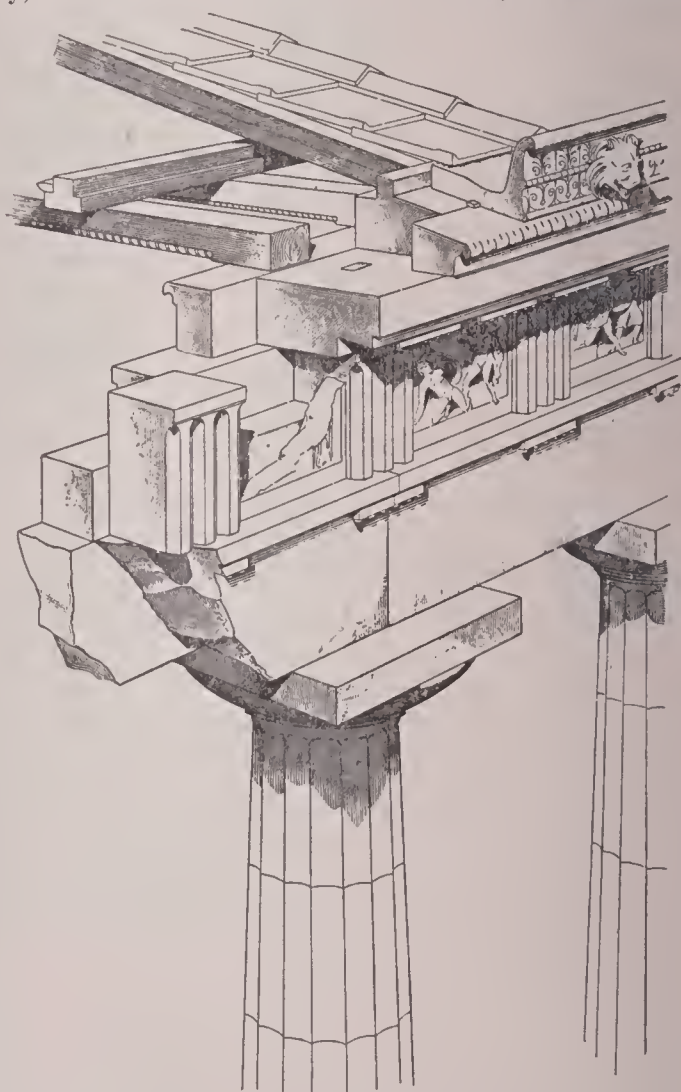


FIG. 12.—Doric construction.

menos, the Mycenæ "lion-gate" and fortifications, and the walls of Tiryns, belong to a prehistoric age, and have little or nothing to do with the architecture of later times. The oldest remains of historic Greek architecture are the ruins of the temple at Corinth, erected about 650 B. C., and those of a temple at Selinous, in Sicily, of not much later date. These, like all the known Greek temples previous to the Persian wars, are in what is called the *Doric* style, and differ from the most perfect temples of the fifth century B. C. only by their less refinement of detail and proportion, and by the absence of sculptural decoration. The efforts of Greek architects seem to have been concentrated for two hundred years upon the perfecting of the proportions, profiles, and decorations of this their national style, and not upon the altering of its fundamental elements or the invention of new forms. The question naturally arises, Whence

came this style, and how and where was the temple-form developed which we find so complete and well understood even in these early shrines of Corinth and Selinous? This can only be answered by conjectures; and it must be confessed that none of the theories hitherto advanced quite satisfactorily accounts for the apparently sudden appearance on Greek soil of so well developed an architectural style, for no vestige remains of the experimental stages which must have preceded it. As in Egypt, so here, all the buildings of a transitional age and character seem to have been demolished to make way for the superior products of later days. Some would explain the Doric order as borrowed from Egyptian models like the tombs of Beni-Hasan; but this does not account for the temple-plan, which is utterly un-Egyptian. Others ingeniously account for Doric forms by a supposed translation into stone of forms developed in an earlier and long-vanished architecture of wood. This may have a grain of truth in it, but, even so, only partially explains the enigma. Prof. Melani, the Italian savant, argues for an Etruscan origin of the Doric system, both as to plan and details; but here again evidence seems scanty for the theory, and the question still remains in debate.

The typical Greek temple consisted of a windowless hall, called the *cella*, often divided into two unequal chambers, the *naos* containing the statue of the deity and the *thesauros* or treasury; the whole standing on a platform in two or three steps, and surrounded by a colonnade or *peristyle*, whose front portion (usually to the E.) was called the *pronaos*, and the opposite end the *opisthodomus*. The columns

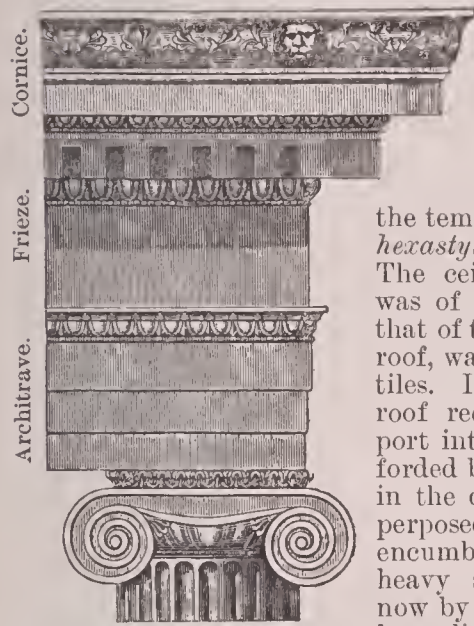


FIG. 13.—Ionic order.

forming each end of the colonnade supported a low gable or *pediment*, usually filled with sculpture; and according as there were four, six, eight, or ten columns in the end row, the temple was called *tetrastyle*, *hexastyle*, *octastyle*, or *decastyle*. The ceiling of the colonnade was of stone slabs and beams; that of the *cella*, with the whole roof, was of wood covered with tiles. In the larger temples the roof required additional support internally, which was afforded by two rows of columns in the *cella*, usually in two superposed ranges, to avoid the encumbrance of very large and heavy shafts. The temple is now by many supposed to have been lighted only through the doors at the ends or by artificial light. The existence of *hypæthral* (partially open-roofed or roofless) temples, such as Vitruvius vaguely describes as "*sine tecto et sub divo*," is now seriously questioned. Many ingenious theories have been proposed by Fergusson, Chipiez, and others to remove the many obvious difficulties and objections incident to any hypæthral system, but so far without really satisfactory or convincing results. That of Chipiez, shown in the splendid model of the Parthenon in the Metropolitan Museum at New York city, seems the most plausible of them all.

The Doric order, which was the exclusive national style for two hundred years at least, employed alike for temples and civic buildings, is characterized by sturdy shallow-fluted columns without bases, and having simple capitals, consisting of a spreading circular cushion or *echinus* and a plain square cap or *abacus*. It employs a plain architrave or lintel, a frieze divided into square panels or metopes by vertical grooved or channeled blocks called *triglyphs*, and a cornice with a plain shelf-like corona, decorated on the under side with slightly projecting panels or *mutules* ornamented with rows of peg-like projections or *guttae*. Above the corona are two or three small moldings, and (except along the sides of the temple) a *cymatium* or gutter-molding. The moldings were decorated with patterns painted in brilliant colors; the metopes, or their backgrounds when they were filled with sculpture, were painted a dark red, and the triglyphs blue; and color was liberally used on all parts of the architecture, though the precise tints and shades employed are no longer known.

After the Persian wars the ascendancy of Athens and the prosperity of the Ionian cities of Greece and Asia Minor brought about the introduction of the *Ionic* style, characterized by its voluted capitals, slender columns deeply fluted, and rich bases; by the substitution of carved for painted ornament on the moldings; by the use of *dentils* in the cornice; by the absence of triglyphs; and by a general richness and elegance very different from the sober dignity of the Doric. It seems to have originated in Asia Minor, and to have been strongly affected by Persian and Lycian influences; but its precise history is as uncertain as that of the Doric. About the time of Alexander (333 B. C.) a modification of the Ionic came into use called the *Corinthian*, its chief innovation being in the capital, which was composed of two rows of richly carved acanthus leaves, and sixteen scrolls meeting in pairs under the four corners and four middle points of the abacus, the whole disposed around a tall bell-shaped core. This order it was reserved for the Romans to adopt and perfect, enriching greatly its base and cornice, as will be noticed later.

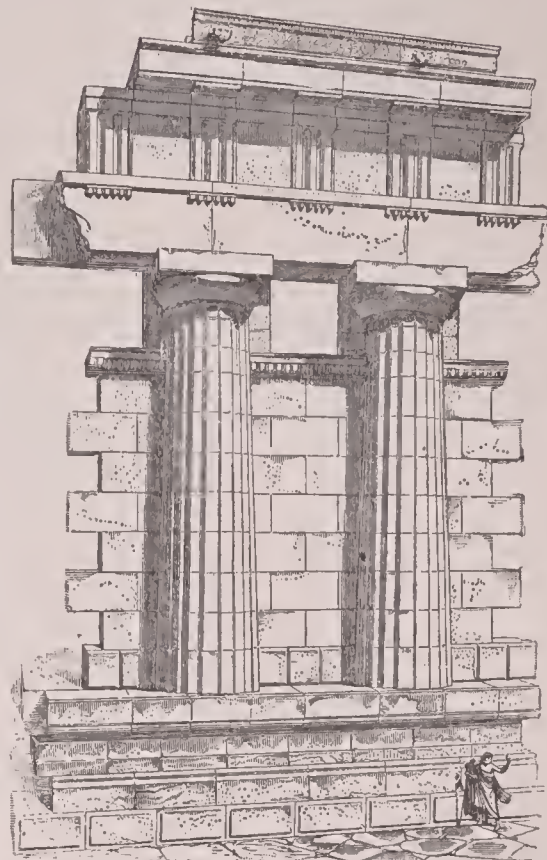


FIG. 14.—Great Temple of Agrigentum.

The Greeks out of these elements developed an architecture very unlike that of Egypt. They sought after perfection and a sunny grace rather than colossal size or gloomy solemnity; and the richest aspect of their buildings was

that which they presented externally to the public. Their carved ornament, and, above all, their decorative sculpture, was infinitely richer and more perfect than that of the Egyptians, while the execution of their masonry has never been equaled. They excelled in temple-building, but achieved also notable triumphs in the building of tombs, theaters, gates, and colonnades, all marked by the same spirit of refinement and simplicity, of dignity and grace.



FIG. 15.—The Erechtheion, Athens.

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It is impossible within our brief limits to mention more than a small number of these structures; for particulars one must consult the works of Stuart and Revett, Reber, Penrose, Durm, and the various publications of archæological societies in Europe and the U. S.

The earlier temples are mostly found in Southern Italy and Sicily, at Selinous, Agrigentum, Paestum, Segesta, Metapontium, and Syracuse. These for the most part have somewhat heavy columns and entablatures, and retain the primitive triglyph-frieze around the external wall of the cella. They date mostly from the sixth century B. C., and one of those at Selinous shows the uncouth beginning of decorative sculpture in the metopes. The finest is the temple of Poseidon (Neptune) at Paestum. The Basilica near by—probably an open hall for public assemblies—has no cella-walls, but has nine columns in the ends and a central row from end to end; while at Agrigentum is a very large *pseudo-peripteral* temple, whose massive columns were connected by a continuous wall. These are almost the only departures from the typical temple-plan. To the first half of the fifth century are ascribed the elegant temple at Ægina, whose striking pediment-groups enrich the museum at Munich; the clumsy provincial temple at Assos (explored by the American Archæological Institute); and the beautiful hexastyle temple of Theseus, so called, in Athens, the most perfectly preserved of all. As we advance toward the time of Pericles (440 B. C.), we find in these Doric temples an increasing refinement and delicacy in the moldings as well as in the proportions, more slender columns, and greater subtlety of design and execution, as in the temple of Zeus at Olympia.

The age of Pericles, made glorious by the names of Ictinus, Callicrates, and Phidias, marks the acme of Greek art, when, by her successful deliverance of Greece from the Persians. Athens had reached the headship of all Hellas, and grown rich to boot. Her wealth she expended upon her public and religious monuments, especially those in the Acropolis, which were rebuilt with a splendor and perfection impossible at any other period. The Propylæa, by Mnesicles; the Parthenon by Ictinus and Callicrates, adorned with the sculptures of Phidias; the triple temple of Erechtheus, and the tiny shrine of the Wingless Victory, with many altars, statues, and small shrines, formed on the Acropolis an unrivaled group of architectural triumphs. Among them all the Parthenon—the temple of Athena (Minerva) Parthenos—stood supreme, the master-work of Hellenic genius. Built of fine Pentelic marble, laid up without mortar, but so perfectly jointed that the blocks seem almost to have united into a monolithic whole, it stood a little to the S. of the general axis of the Acropolis, an octastyle peripteral temple, with 17 columns laterally and with 6 additional columns in the pronaos, and as many in the opisthodomus, or 58 in all. The temple measured 228 by 101 feet; the columns were about 6 feet in diameter and 36 high, supporting an architrave of mighty blocks of marble, above which were the triglyphs and metopes, the latter filled with groups in high relief, presumably by Phidias and his scholars, representing fights of centaurs and Lapiths; masterly works, though inferior to the magnificent groups in the gables. These two unrivaled compositions, representing the birth of Athena and her contest with Poseidon for the mastery of Athens, respectively, were composed of colossal figures standing free on the shelf of the horizontal cornice of the pediment, and are the grandest achievements of decorative sculpture in any age. Removed by Lord Elgin to London early in the nineteenth century, they are now the chief treasure of the British Museum, together with a large portion of the glorious frieze which once surrounded the cella just under the ceiling of the colonnade. This frieze represented the Panathenaic procession, and was treated in relatively low relief with masterly skill. All these sculptural adornments so fitted into the architectural framework of the temple that, without losing their intrinsic importance, they seemed rather a part of the temple itself

than independent sculptures added to adorn the fabric. Equally remarkable with this sculptural decoration were the refinements of the lines and execution of the temple. All the seemingly straight lines were slightly curved, to impart to them a fullness and strength of which their great length would otherwise have deprived them by a species of optical illusion; but these curves were so subtle as to remain



FIG. 16.—The Parthenon.

long undetected by archæologists. In like manner the seemingly vertical surfaces were all slightly inclined; the columns leaned imperceptibly inward, and those at the corner were less widely spaced than the rest. Only the most delicate æsthetic perceptions could have devised such refinements; the Parthenon, built as if by giants, seems finished like a jewel.

The entrance to the Acropolis was through the propylæa of Mnesicles, an imposing composition, showing, to one approaching it from the plain below, a noble hexastyle Doric colonnade surmounted by a pediment, and flanked by two projecting wings or chambers fronted by lesser colonnades of the same order. Behind the main façade two rows of Ionic columns supported the roof, and formed three aisles leading to five doors in the rear wall, behind which was another Doric portico looking upon the Acropolis. The whole was of the purest and most refined design and perfect construction, and shows us an early example of the Ionic order. The neighboring Erechtheion, however, displays this order in its most splendid form, having two Ionic porticoes to the north and east, besides a remarkable porch supported on



FIG. 17.—Caryatid porch of Erechtheion.

female figures, or Caryatides, the only example of the kind in Greek architecture, but fully worthy of the splendid age to which it belongs. Besides the singularity of this porch, this little temple is remarkable for the irregularity of its plan, which Greek genius knew how to reconcile with perfect dignity and monumental balance. Among other Ionic temples are the little shrine of the Wingless Victory on a bastion of the Acropolis; the temple on the Ilissus in Athens; the temple of Apollo at Phigalæa, Doric externally, but in-

ternally Ionic; and that of Athena at Priene. But the chief triumphs of this style were in the Ionian cities of Asia Minor; the Mausoleum (tomb of Mausolus) at Halicarnassus, and the great dipteral temples of Apollo at Miletus and of Artemis (Diana) at Ephesus.

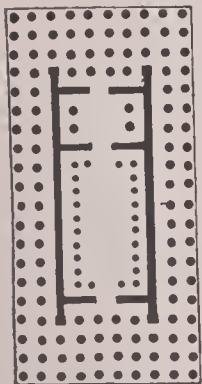


FIG. 18.—Plan of temple of Olympian Zeus.

But two distinctively Corinthian monuments are recognized in Greece; the first is the Choragic monument of Lysicrates at Athens. This is a charming circular structure on a square pedestal; six Corinthian columns support a slightly domical roof terminating in a magnificent finial, on which once stood the tripod won by Lysicrates in the choral contests. The whole is but 27 feet high. The second example is the great temple of the Olympian Zeus at Athens, whose gigantic ruins represent but a small fraction of the original structure. It was a decastyle dipteral temple, i. e. flanked by double lateral colonnades, and measured 354 by 170 feet, with 120 columns 60 feet high, and a little over 6 in diameter. Begun as a Doric temple in the time of Pisis-

tratus, continued by Cossutius, a Roman architect in the second century B. C., it was terminated only in the time of Hadrian, and should therefore rank as a Roman rather than Greek building, especially as its cornice was adorned with



FIG. 19.—Decorated Roman molding.

modillions, which were a distinctively Roman feature of the order.

We can not delay to describe other monuments of Greek architecture. It must suffice to observe that the theaters, excavated in the hillside and furnished with permanent stage-settings of marble or stone architecture; the *stoa* or porticoes for public assemblies and promenades; the propylæa or city gates; the arsenals, tombs, and sepulchral monuments erected by the Greeks, everywhere display the same high qualities of design, the same minute attention to details and striving after absolute purity and perfection of form. Of the houses of the Greeks we know little; their remains are scanty and trivial, and it is probable that domestic architecture received from them but little attention compared with that bestowed on it by the Romans. The Greek was essentially a public man and lived out of doors, and the public architecture of his cities was his chief concern.

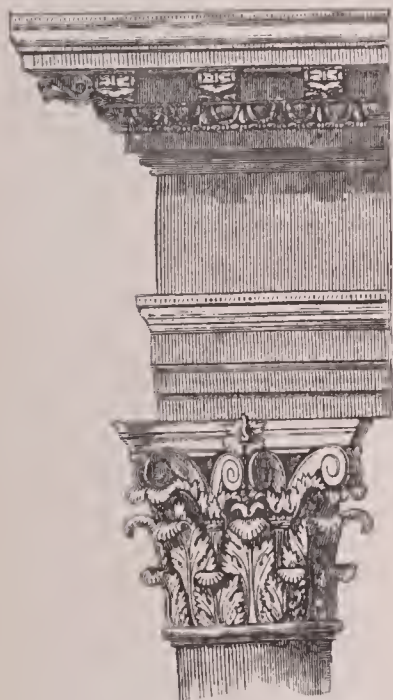


FIG. 20.—Corinthian order.

After the Macedonian conquest, Greek art began to decline in purity and dignity. Ostentation and triviality took the place of these qualities, and, in spite of the magnificence of some of the later temples in Asia Minor, it becomes evident that the age of Alexander was one of general decadence. Yet the spark of Greek genius was not extinguished; under Roman dominion it kindled the flame of art among the warlike Italians, and helped

create the triumphs of Roman architecture. Even in the fifth century A. D. it still burned, and under new conditions was able to originate still another architecture, the Byzantine, with whose passing away it finally vanished.

ROMAN.—Nothing could differ more widely from the Greek than the Roman taste and system of building. Masters of engineering, and of the art of planning the most complex and difficult structures, the Romans preferred to employ a massive system of vaults and arches, clothed with a merely decorative apparel of columns and entablatures, rather than to limit themselves, like the Greeks, to the simple system of the post and lintel. Their works are impressive by size, massiveness, and splendor rather than by those finer æsthetic qualities which we find in Hellenic work.

The Romans were consummate organizers, but indifferent artists; they knew, however, how to put to use the artistic abilities of conquered races, while by a quasi-formulation of architectural design they imparted a certain impressive unity of style to all their buildings, from the Pillars of Hercules to Palmyra, and from Britain to Alexandria; a unity which must have ministered strongly to the impression of an omnipresent Rome. And if the Romans distinguished, as none had done before them, between their construction and their decorative apparel of architectural forms, they were at least enabled thereby to utilize the unskilled hands of slaves and barbarians for the bulk of the work of construction, leaving to skilled artisans and artists only the finishing of the details and decoration. It should not, moreover, be forgotten that the vast number and mass of the buildings undertaken by the Romans would have made it absolutely impossible to bestow upon them all the minute exactitude and refinement of execution of Greek work. Considering all the circumstances, the Romans did wisely to substitute for such unattainable refinement (which, indeed, they were not likely to appreciate) a splendor and lavishness

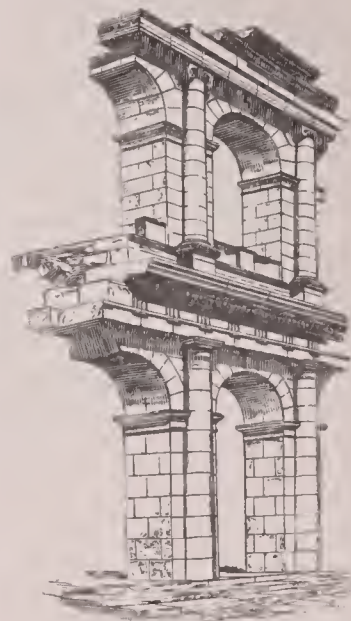


FIG. 21.—Section of exterior wall, theater of Marcellus.

they were at least enabled thereby to utilize the unskilled hands of slaves and barbarians for the bulk of the work of construction, leaving to skilled artisans and artists only the finishing of the details and decoration. It should not, moreover, be forgotten that the vast number and mass of the buildings undertaken by the Romans would have made it absolutely impossible to bestow upon them all the minute exactitude and refinement of execution of Greek work. Considering all the circumstances, the Romans did wisely to substitute for such unattainable refinement (which, indeed, they were not likely to appreciate) a splendor and lavishness

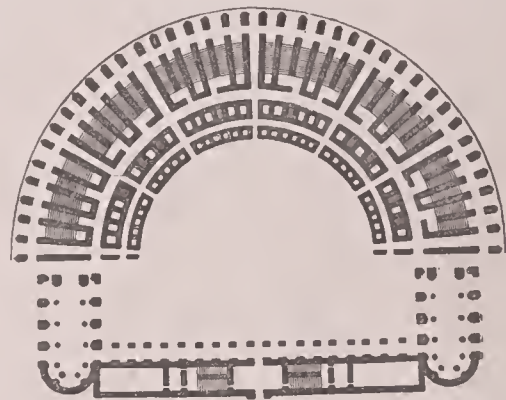


FIG. 22.—Plan of the theater of Marcellus.

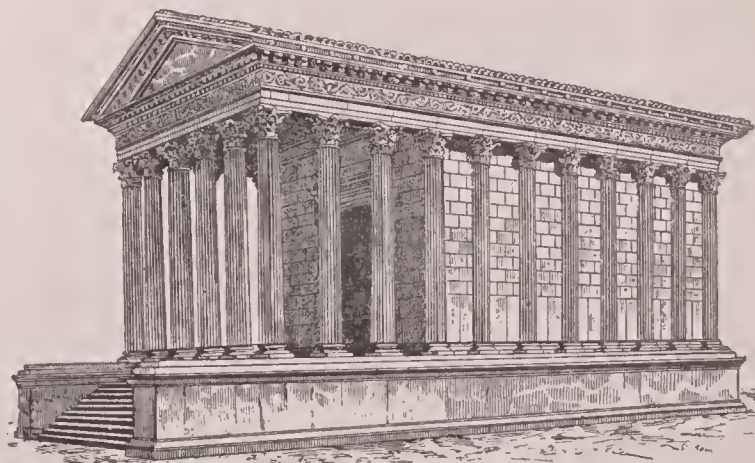


FIG. 23.—The "Maison Carrée" at Nîmes.

of ornament and material better suited to the character of their buildings.

From the foundation of Rome until the fall of Greece (146 B. C.) the Romans made almost exclusive use of the uncouth and undeveloped architecture of the Etruscans, to whom they

owed the arch and vault, which became as characteristic of their later architecture as the column and entablature were of the Greek. The conquest of Greece, however, with the consequent influx both of Greek artists and works of art, revolutionized Roman taste, and established Greek art as the fashion of the day. The craving for splendor and the

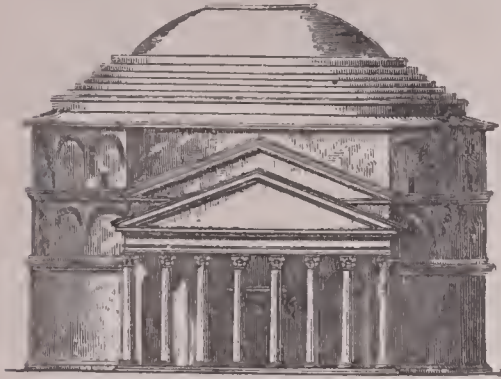


FIG. 24.—Elevation of Pantheon.

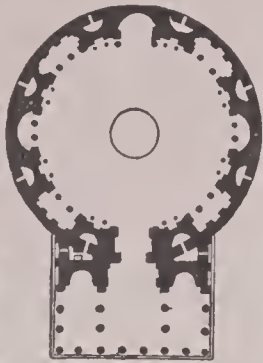


FIG. 25.—Plan of Pantheon.

accession of wealth which resulted from the Greek conquests combined to foster the development of a new architecture, in which the orders of the Greeks were married to the Roman arch; and to Greek artists are doubtless due the skill and success with which these Greek members were adapted to Roman plans and systems of construction. This adaptation involved radical changes in the details of the

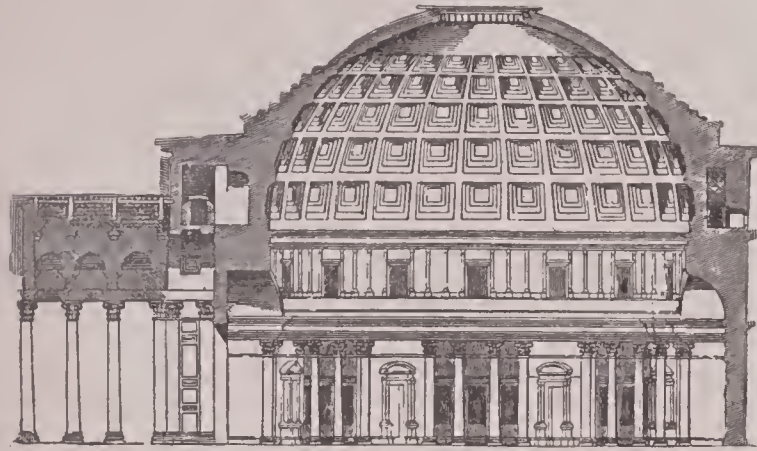


FIG. 26.—Section of Pantheon.

orders. The profiles of the moldings were modified, as well as their succession and proportions in the entablature. The Doric order received a base, and was often unfluted and crowned with a cornice much like the Ionic. The Tuscan order, a simplified form of the Doric, and the Composite, a modification of the Corinthian, were added to the three orders borrowed from Greece; and the Corinthian



FIG. 27.—Arch of Titus.

was elaborated and perfected, receiving a new base and a new cornice with modillions. Out of all these changes there was gradually developed a sort of canon of proportions for the various parts of the orders. Not that these rules

were established at once, or arbitrarily by the dictation of authority, or as absolute and unchangeable laws; but the systematic, organizing, mathematical turn of mind of the Romans gradually led them into practically uniform ways of doing each thing, and imposed these methods upon the Greeks who worked for them. In the same way, while they used the orders as did the Greeks for porches and colonnades, they also used them in the form of engaged columns and pilasters, to decorate their façades and triumphal arches, placing them between the arches, where they performed no really constructive function, but served to constitute a most imposing system of decorative form. Carved decoration was no longer confined to the moldings, but applied to every possible surface; and instead of the sculptured groups and processions of the Greek temples (which would have been an absurd extravagance on friezes like those of the Colosseum, for instance), they adorned their friezes with magnificent compositions of acanthus-leaved scrolls mingling with genii, griffins, garlands, and symbolic forms.

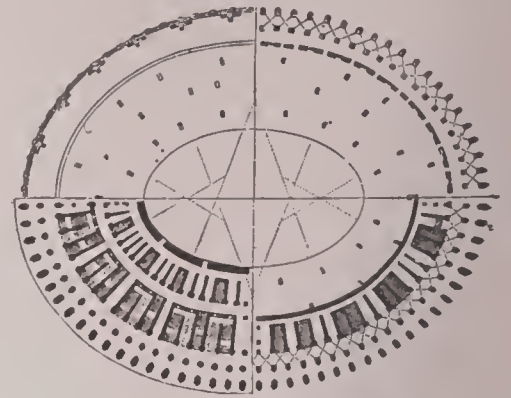


FIG. 28.—Half-plan of Colosseum.

The Romans were not pre-eminently temple-builders, though they produced several notable temples. These all retained Etruscan peculiarities of plans, in spite of their Grecian columns and pediments. They were usually *prostylar* instead of *peripteral*, having generally a nearly square cella prefaced by a deep porch (e. g. the temples of Antoninus and Faustina, of Vespasian, etc.). Sometimes the flanks of the cella were adorned with engaged columns, giving them the name of *pseudo-peripteral*, as in the case of the temple of Virile Fortune; and the temple of Venus and Rome near the Forum offers a singular example of two cellas placed back to back, and surrounded by a *pseudo-dipteral* colonnade, i. e. one in which the width of the lateral colonnade is equal to two intercolumniations of the front. They built also a considerable number of circular temples, a form exceptional in Greek work (e. g. the Philippeion at Olympia), but evidently a favorite with Etruscans and Romans. Some of these were surrounded by colonnades, as in the two so-called temples of Vesta, one in Rome, and the other at Tivoli, and the actual temple of Vesta at one end of the Forum; others, like the unrivaled Pantheon, had columnar porches over the entrance. But the Roman genius was much better exemplified in such complex and elaborate structures as the amphitheatres and *thermæ*, into whose construction engineering entered largely. Their enormous size and mass, the majesty of their arches and vaulting, the ingenuity and dignity of their plans, constitute the soundest title of the Romans to architectural fame. Roman love of splendor also found abundant scope in the monumental disposition and design of the *fora*, with their colonnades, statues, and altars; and in the erection of triumphal arches and memorial columns, with which they recorded throughout Europe and the Mediterranean lands their feats of conquest. They developed furthermore the architecture of the *basilica*, which was destined in later ages and in Christian hands to become the germ of nearly all church architecture, the cathedral included. In the basilicas and *thermæ* was moreover evolved that splendid system of internal decoration by paneled incrustations of marble in various colors, by elaborate marble pavements, by monolithic shafts of porphyry, verd antique,

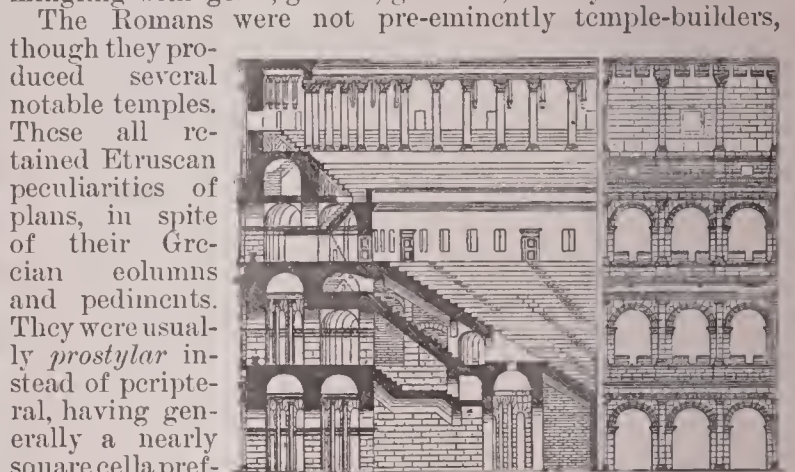


FIG. 29.—Section of Colosseum.

was elaborated and perfected, receiving a new base and a new cornice with modillions. Out of all these changes there was gradually developed a sort of canon of proportions for the various parts of the orders. Not that these rules

and other precious materials, and by mosaic and wall-painting, which the architects of Byzantium in after years made the basis of the decoration of their gorgeous church interiors.

Little remains to us of the architecture of the republic; the little temple of Virile Fortune and the temples of Vesta,

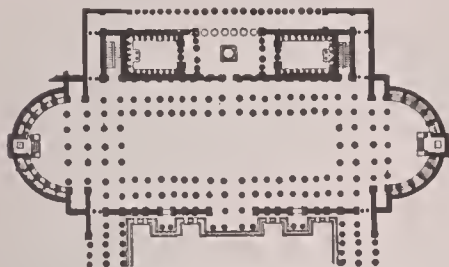


FIG. 30.—Plan of Ulpian Basilica.

so called, at Rome and at Tivoli are of Greek workmanship, though on Roman plans. The most important monument of this period is the great theater of Marcellus (13 B. C.), built of stone with engaged columns in superposed orders, the Ionic over the Doric, between the arches

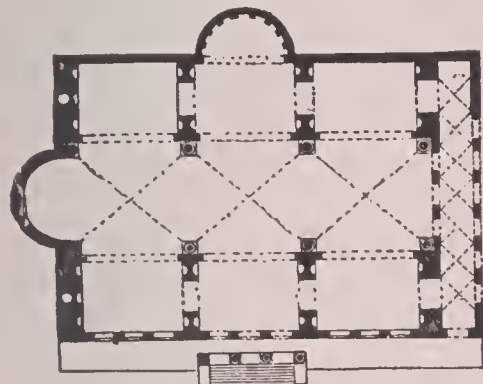


FIG. 31.—Plan of Basilica of Maxentius and Constantine.

of the exterior (see Fig. 19). The most noble of all Roman temples, the "Pantheon of Agrippa," so called from the inscription upon the portico, has until very recently been ascribed to this period, as the work of M. Vipsanius Agrippa (27 B. C.). Very recently, however (summer of 1892), a French architect, M. Chédanne, made the important discovery that while the portico and the temple to which it belonged were built by Agrippa, the circular domed hall is of

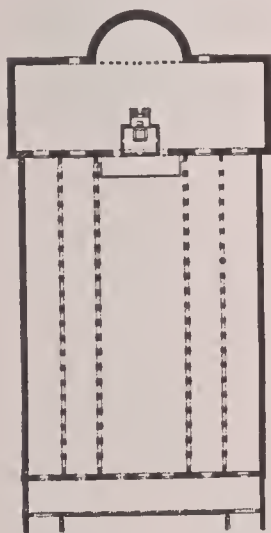


FIG. 32.—Plan, Basilica St. Paul beyond the Walls.

a later date, having been either constructed new or rebuilt from the foundation in the time of Hadrian. The portico, of twelve monolithic Corinthian columns, arranged in three aisles after the Etruscan fashion, admits to a vast circular structure, 140 feet in diameter, covered by a noble hemispherical dome, and lighted by a single circular opening in the summit of

the dome, 28 feet in diameter and 140 feet above the marble pavement. The circular wall, 20 feet thick, which supports the dome is lightened by eight alternately semicircular and rectangular niches, in one of which is the entrance-door; these niches are arched and decorated with columns. The whole interior was originally adorned with a splendid veneering of marble, with statues and with bronze enrichments, and the deeply coffered vault of the dome was also richly ornamented. A conjectural restoration of the original interior is shown in the fine model of the Pantheon in the Metropolitan Museum in New York. The Pantheon is now used as the Church of S. Maria della Rotonda; it has been internally altered by successive restorations, and the bronze ceiling of the portico was long ago removed; but even in its present condition it is one of the most majestic and impressive buildings in existence. The ruins of Agrippa's baths, of which it was once thought to have formed the *laconicum*, are still to be seen in the rear of the temple.

Of the architecture of Imperial Rome the ruins are almost countless. The Forum Romanum retains many of the columns of splendid temples, e. g. of Vespasian, Saturn, Antoninus and Faustina, and Castor and Pol-

lux ("Jupiter Stator," so called); and in or near it are the arches of Septimius Severus, Titus, and Constantine. That of Titus, in the Composite order, is the most elegant, though not the largest or richest of these; and other examples of this sort of monumental architecture are to be seen at Ancona, Benevento, Orange, Reims, and other Italian and provincial cities, some with one, some with three arches. Of somewhat similar character are the city gates, like the *Porta Maggiore* at Rome, and the gates at Verona, Athens ("Arch

of Hadrian"), Nîmes, Autun, etc. The column of Trajan, in the forum of that emperor at Rome, was erected both to mark the height of the hill removed to create an area for the forum and to commemorate the Dacian campaigns of Trajan. It is some 90 feet high, and enwrapped by a continuous spiral bas-relief picturing the victories of its builder, whose statue crowned its summit. The Antonine column of Marcus Aurelius is almost precisely similar; and Constantinople, Alexandria ("Pompey's Pillar"), and other cities were likewise adorned with columns of victory by the Roman conquerors or rulers.

In the building of amphitheaters the Romans excelled, and the Flavian amphitheater of Vespasian, commonly called the Colosseum, is not only the finest of these, but the greatest in size and bulk of all Roman structures. Its circuit-wall of travertine, pierced by 240 arches, rises in three stories of superposed Doric, Ionic, and Corinthian columns and entablatures, with a fourth range of pilasters, to a height of 150 feet, inclosing a vast ellipse, 606 feet long by 500 wide. The seats, rising in tiers around the arena, could accommodate over 80,000 spectators, and even in its present ruinous condition it is one of the most tremendous and impressive piles ever reared by man, its very size converting the monotony of its architecture into sublimity. Less in dimension, but still imposing, are the amphitheaters of Pompeii, Verona, Capua, Nîmes, and Arles. The Romans also built theaters of stone on the same general principle as their amphitheaters, but inclosing a little more than a semicircle, somewhat

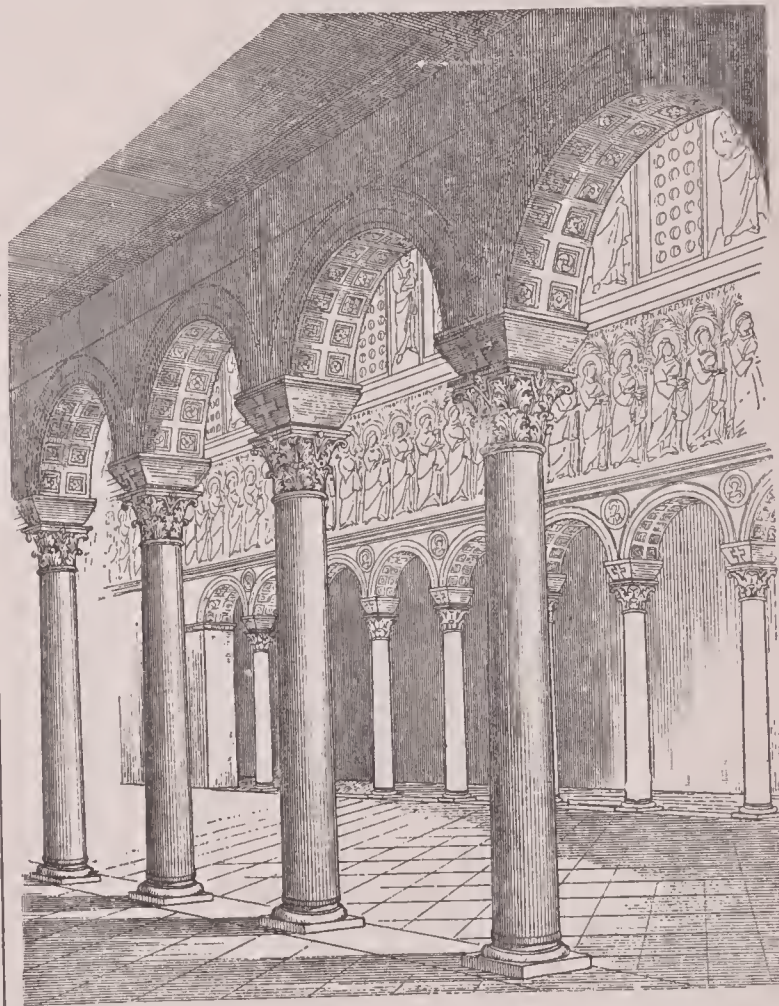


FIG. 33.—Interior view, San Apollinare Nuovo, Ravenna.

after the Greek fashion. The theaters of Marcellus (see *ante*), of Pompeii, Taormina, and Orange are among the finest examples extant. The Odeon of Herodes Atticus at Athens belongs to the same class.

Of the *thermæ* or baths, which share with the amphitheaters the glory of displaying the highest resources of Roman engineering skill and architectural genius, only shapeless ruins exist; but these are sufficient to show their plan and general design. In the center of a vast inclosure, surrounded by small bath-rooms, lecture-rooms, gymnasia, and exedrae, was situated the principal edifice, which contained, besides one or two open courts and various smaller chambers, a series of enormous halls of the greatest magnificence, planned with consummate skill, vaulted with simple but massive vaults, and decorated with the greatest possible splendor of marble incrustations and mosaic. One of these halls, the *tepidarium* of the baths of Diocletian (the largest of the *thermæ*, ac-

commodating 3,600 bathers at once), remains to-day almost intact, except for the alterations which were required to convert it into the Church of S. Maria degli Angeli. Of the baths of Caracalla imposing masses of brickwork still remain, from which it has been possible not only to restore quite completely the plan of the baths, but also to prove that the Romans were the first to use iron beams with brick or concrete for the construction of fire-proof floors.

The ruins of the Flavian palaces on the Palatine hill, the excavations at Pompeii and Herculaneum, the picturesque



FIG. 34.—Pillar, Church of St. John, Constantinople.

remains of Hadrian's villa at Tibur, and other similar vestiges on the Campagna and elsewhere, furnish us with a very clear notion of the Roman domestic architecture, private and imperial. The private houses and villas were less remarkable for their external architecture than for the beauty of their gardens and surroundings and the splendor of their interior decoration, in which wall-painting of the most brilliant and fanciful description, largely executed by Greek painters in encaustic, played an important part. The houses themselves had mostly but one or at most two stories, and presented little in the way of architectural embellishment to the street. The imperial palaces were, of course, far more splendid; the magnificence of Nero's "Golden House," as preserved in the narratives of contemporary writers, almost passes belief, and the palace of Diocletian at Spalatro preserved in its massive and imposing architecture the dispositions of the typical Roman camp.

This summary account of the building-art of the Romans must be brought to a close with a brief sketch of the basilicas. These were civic buildings, serving at once as auction-marts, exchanges, and palaces of justice, and comprised generally a great hall, sometimes open to the sky, as at Pompeii, more often roofed with wood, rarely vaulted, as in that of Maxentius and Constantine at Rome: two or more side aisles, lower than the nave or hall, from which they were separated by ranges of columns, and an *apsis* or tribune at the end opposite the entrance. In the *apsis* was the seat of the *quaestor*, with an altar in front of it, and sometimes a species of transept

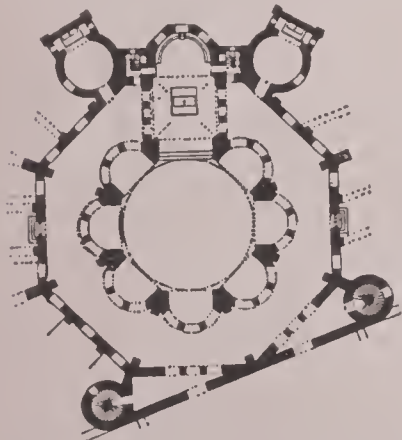


FIG. 35.—Plan of S. Vitale, Ravenna.

between it and the nave. The side aisles were sometimes two-storied, with galleries; above their roofs the walls of the nave, supported on the columns below, rose to form a clerestory, with windows to light the hall; and the whole structure was preceded in many cases by a *narthex* or porch across the front (Basilica Julia, Basilica Ulpia, Basilica of Fano, etc.). The last of the pagan basilicas was erected by Maxentius and Constantine (328 A. D.) after the model of the tepidaria of the baths, vaulted and fire-

proof. It was in the reign of this monarch that Christianity was first freely permitted to erect for itself suitable places of worship. The early Christians, disdaining to convert to their own use the temples of paganism polluted by heathen worship, and unfitted by their size and plan for Christian uses, saw in the basilicas precisely what they needed. When they built new churches they followed the same plan and arrangements, often using the materials—columns, architraves, etc.—of ruined or demolished Roman buildings, and adopted the same general scheme of decoration by marble incrustations and mosaic, using, however, the forms of Christian symbolism in place of the pagan representations in their prototypes. Thus arose Early Christian architecture on the ruins of Roman art, and for a thousand years continued to furnish Rome with churches of the same unchanging type. Meanwhile Western Europe was developing out of the same elements a totally new and sublime architecture, evolving from the Roman basilica the matchless fabric of the Gothic cathedral; and the architects of the East, out of prototypes furnished by the *thermae* and the basilica of Constantine, were at the same time developing the very different but still splendid domical forms of Byzantine architecture.

BYZANTINE.—As Rome declined, Constantinople advanced in splendor and importance to the first place in Christen-

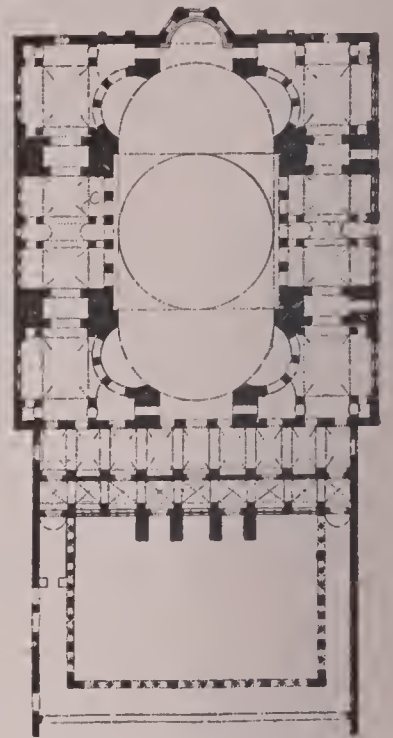


FIG. 36.—Plan of St. Sophia, Constantinople.

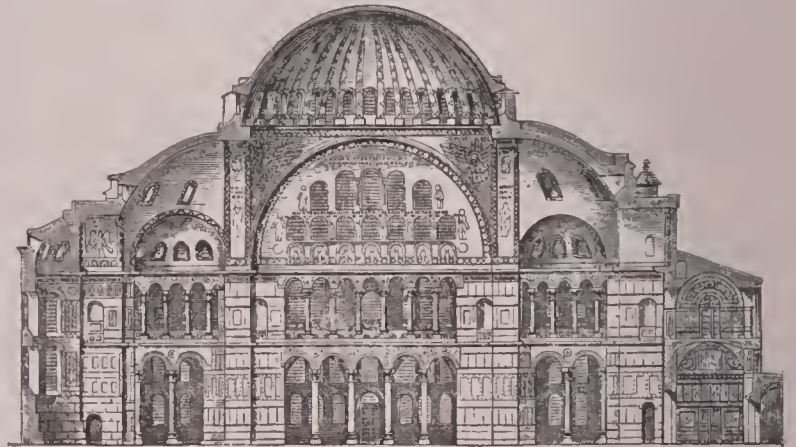


FIG. 37.—Section of St. Sophia.

dom. Inheriting the traditions and constructive methods of Roman architecture, the Byzantine Greeks blended with them many Oriental elements, due to their relations with Asia Minor, Syria, and the far East, and developed therefrom a new and distinctively Christian architecture. To the Roman systems of vaulting they added the dome, and developed out of the marble incrustations and mosaics of Roman art a complete system of gorgeous but harmonious color-decoration, the vaults and domes being made especially magnificent with glass-mosaic on a gold ground. The details of Roman architecture, already much modified in the basilicas and in provincial works, as in Dalmatia and Syria, underwent further alterations. Arches were supported on columns, capitals and profiles were changed, and for the Roman carving in strong relief was substituted a rich incised decoration of patterns which blended the acanthus leaf with Christian symbols and monograms. Byzantine architecture flourished from the fifth to the end of the twelfth century, and was the parent of several styles,

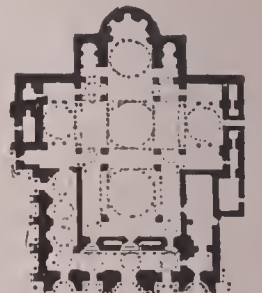


FIG. 38.—Plan of St. Mark's church, Venice.

including that of the modern Greek Church, many of the Mohammedan styles, and the earlier mediæval architecture of Venice. In France, along the highway of the Oriental commerce of the Middle Ages, the cities of Angoulême, Périgueux, and others betray in their churches of the eleventh



FIG. 39.—Interior, Cathedral of Speyer (Spire).

century the Byzantine influence. Ravenna was in the sixth century a part of the Byzantine empire, and is full of splendid monuments of the style, among which the domical Church of San Vitale is the most important. It was completed by Justinian, who during his long reign (527-565 A. D.) built an extraordinary number of magnificent churches in Constantinople and the provinces. But it was far surpassed by the great basilica which he dedicated in Constantinople in 537 to the Divine Wisdom (*ἡ Ἁγία Σοφία*, mis-called "Santa So-

phía"). and by many considered to be internally the most beautiful church ever erected. The magnificence of its decorations, together with the unrivaled majesty of its interior, elicited from the emperor the historic and perhaps justifiable boast: "Solomon, I have surpassed thee!" Its church, measuring 253 by 115 feet, is covered by a masterly combination of two half-domes with a central dome 107 feet in diameter and rising 180 feet into the air. This dome was the first pendentive dome ever attempted on a large scale, and for internal effect has never been surpassed. (The pendentive dome is supported on four arches by means of spherical triangles of masonry, called *pendentives*, which fit in between the adjacent halves of each pair of arches.) Side aisles, 60 feet wide, in ten stories forming galleries, are separated from the nave by magnificent arcades with polished columns of precious materials. Abundant light enters through clerestories above the gallery-roofs and through a great circle of windows at the base of the dome; and whether we regard the whole from the point of view of its engineering design or its decoration, it appears a masterpiece, unrivaled in its way, and marks an era in the history of architecture. It is now a Turkish mosque.

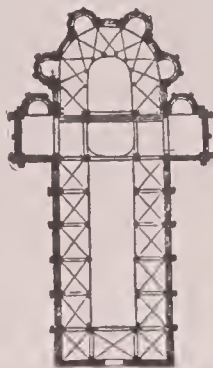


FIG. 41.—Plan, Notre Dame du Port, Clermont-Ferrand

A few of the other Byzantine churches in the Turkish empire have been spared by the Mohammedans, and of the Church of the Apostles, which ranked next to that of the Divine Wisdom in size and beauty, the almost exact counterpart exists in Venice, though the original was long ago demolished. This copy is the famous Church of St. Mark, erected by Byzantine architects in the latter part of the tenth century, though not completed till much later. It is a five-domed cruciform church, and though it lacks the majesty of Santa Sophia it is hardly less magnificent in the

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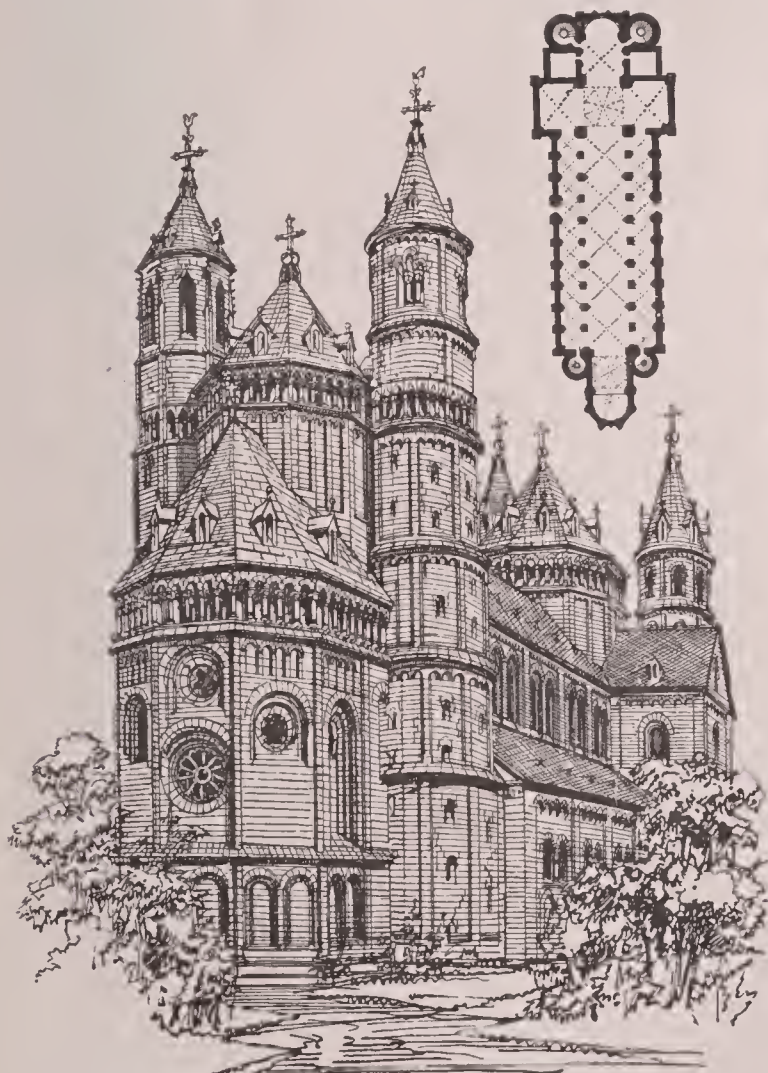


FIG. 40.—The Minster at Worms.

general plan seems to have been suggested to Anthemius and Isidorus, its architects, by the basilica of Maxentius at Rome, which, however, it greatly surpasses in scale; while, instead of its groined vaulting, the immense nave of this

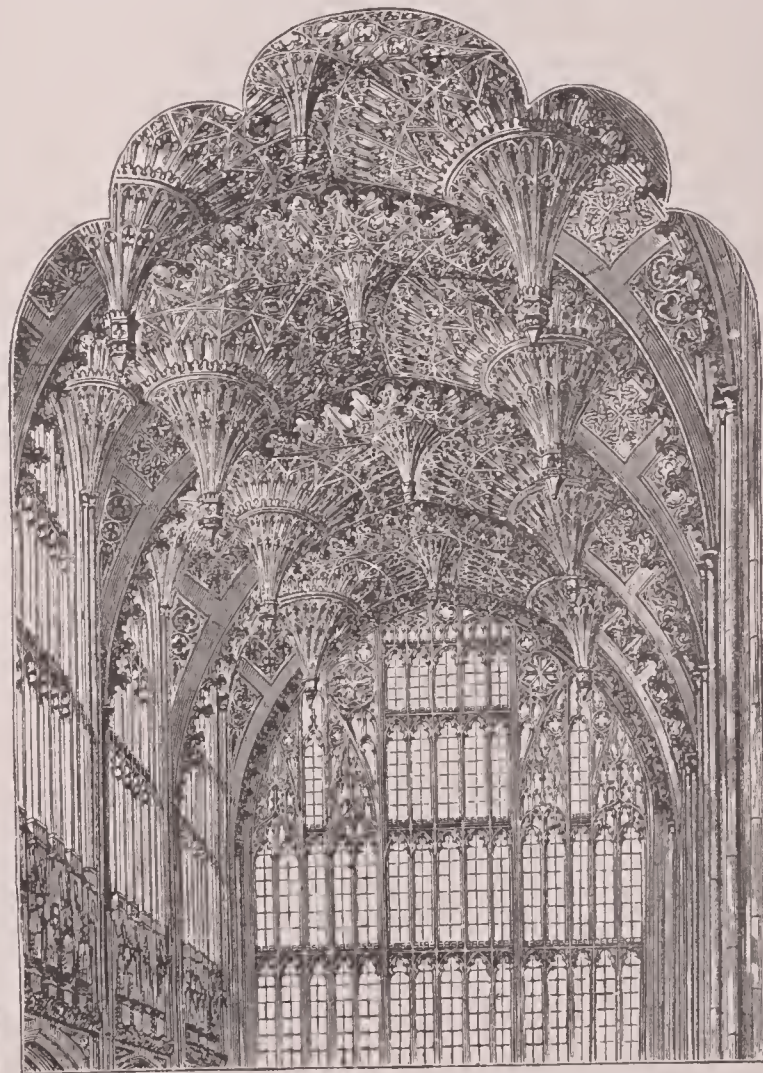


FIG. 42.—Fan vaulting, Henry VII. chapel, Westminster.

splendor of its internal color-decoration. In Athens are a number of small but interesting Byzantine churches, and in the monasteries of Mt. Athos the traditions of Byzantine art are still maintained. But the vitality of Byzantine architecture was exhausted with the decay of the Eastern empire, which never fully recovered from the Latin conquest in 1204.

ROMANESQUE.—Contemporaneously with the later phases of Byzantine art in the East the spread of Christianity through Western and Northern Europe was calling into existence a new architecture, varying in detail according

to locality, but marked everywhere by certain common characteristics, which have given it the name of *Romanesque*. While in Italy the early Middle Ages show a strange confusion of styles, with the Lombard in the northwest, the Byzantine in the northeast, the basilican in Rome, and Norman and Arab and Byzantine mingled picturesquely in Sicily and the south, all Western Europe was endeavoring to solve one and the same problem—the conversion of the three-aisled Roman basilica into a vaulted structure. This problem is the key to the whole history of mediæval architecture in Western Europe, of which the Romanesque styles are simply the first stages, the magnificent cathedrals of the thirteenth and fourteenth centuries the consummate achievement. Everywhere in Europe the three-aisled basilica, with its apse, transepts, and clerestory, was accepted as the type-plan for church architecture; and so long as classic traditions prevailed, or the columns and architraves of Roman ruins were accessible for use in church-building, the type underwent little modification. But with the lapse of time local and climatic influences asserted themselves in a progressive modification of this type, until it could hardly be recognized except in the main disposition of the plan. These changes were mainly motivated by two considerations: first, the difficulty of procuring or executing the fine classic columns of marble required by the typical basilica, and the rich marble revetments and mosaic pictures with which it was adorned; and, secondly, the desire to cover the wide nave as well as the aisles with a fire-proof vault of stone. As a combined result of both these considerations, heavy round or clustered piers were substituted for the columns, and



FIG. 43.—Buttness and flying arch.

space spaced much more widely apart; the clerestory wall was made extremely heavy and thick, and the nave reduced in width; while for the costly revetment of marble and mosaic was substituted the dignity of simple but harmonious architectural lines, with a limited amount of strong carving of moldings, capitals, and door porches. The Lombard churches of Northern Italy, like S. Ambrogio at Milan, S. Zeno at Verona, and S. Michele at Pavia; the magnificent abbeys of the Rhenish provinces, like Laach, Worms, Mayence, etc.; the French churches of the eleventh and twelfth centuries, as, for example, the great abbeys at Caen

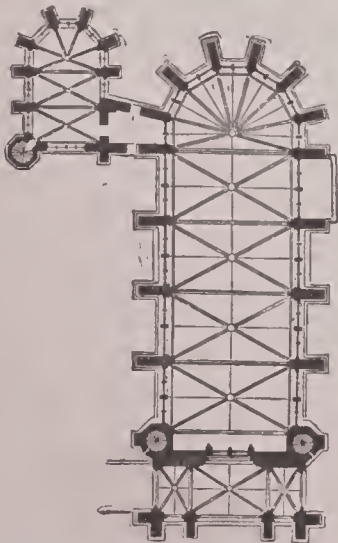


FIG. 44.—Plan of Sainte Chapelle, Paris.



FIG. 45.—Section of Sainte Chapelle, Paris.

and Vézelay; and the Norman churches of England, like Durham, St. Albans, Peterborough, Romsey, etc., are exam-

ples of the various national phases of Romanesque architecture. In all of these the heavy piers, the massive walls, the round arch strongly molded, the revival of Roman groined or quadripartite vaulting, and of the Roman system of buttressing the points of special thrust or strain, are characteristic features. Deeply recessed portals,



FIG. 46.—Lancet windows, Wimborne, Dorset.



FIG. 47.—Decorated tracery, Cologne Cathedral.

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FIG. 48.—Perpendicular tracery, St. Michael's, Oxford.

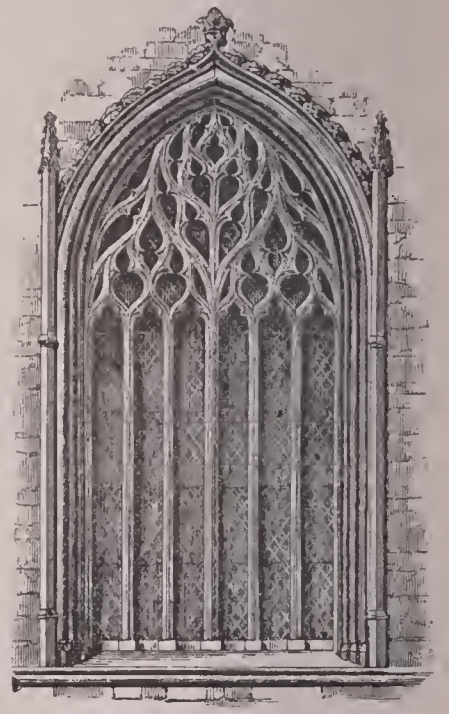


FIG. 49.—Flamboyant tracery, St. Saviour, Dinan.

capitals utterly unlike the Roman, and the zigzag, billet beak, and other characteristic molding-ornaments, are also found in nearly all Romanesque churches. Changes in the ritual, moreover, introduced changes in the plan; the head of the cross was lengthened to form a choir, and flanked by side aisles like the nave; chapels dedicated to various saints were added wherever convenient; and the use of bells made necessary detached campaniles (as in Italy) or towers, usually at the west end of the church, to which spires were added to give them loftiness and grace.

GOthic.—What is commonly called Gothic architecture is simply a continuation of the Romanesque, from which it can not be separated by any sharply defined line: for the pointed arch, which is usually considered its distinguishing mark, was no sudden innovation, and involved no abrupt breaking with the methods of Romanesque building, of which it was the outgrowth and result. Its form had been known from the earliest antiquity. The Assyrians, the Arabs, and the French Provençal architects had used it in successive ages; but its general adoption came about only when the exigencies of

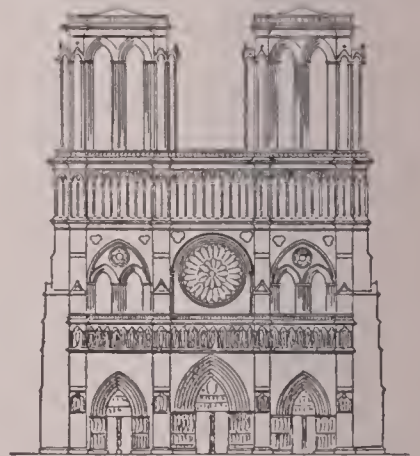


FIG. 50.—Façade of Notre Dame, Paris.

the problem of vaulting demanded its use, and this seems to have first occurred in France, perhaps (as Viollet-le-Duc

terms formed by the ribs, among the finest examples of which may be instanced the choir-vaults of Gloucester and Christ Church cathedrals, the retro-choir of Peterborough, and the vaults of Henry VII.'s chapel at Westminster and St. George's chapel at Windsor. The French never produced any vaults to compare with these in beauty, though French vaulting is superior from a scientific point of view. It was they, however, who developed the constructive fabric of the Gothic cathedral to its highest perfection. Their constant aim was to increase the height of the nave and clerestory and the size of the windows in order to secure better light, and to allow of a greater splendor of stained glass, which in the thirteenth century had become a decorative resource of great importance, and continued through the fourteenth century to stimulate the increase in the size of the windows. The use of lofty clerestories, together with the constant effort to lighten the massiveness of the

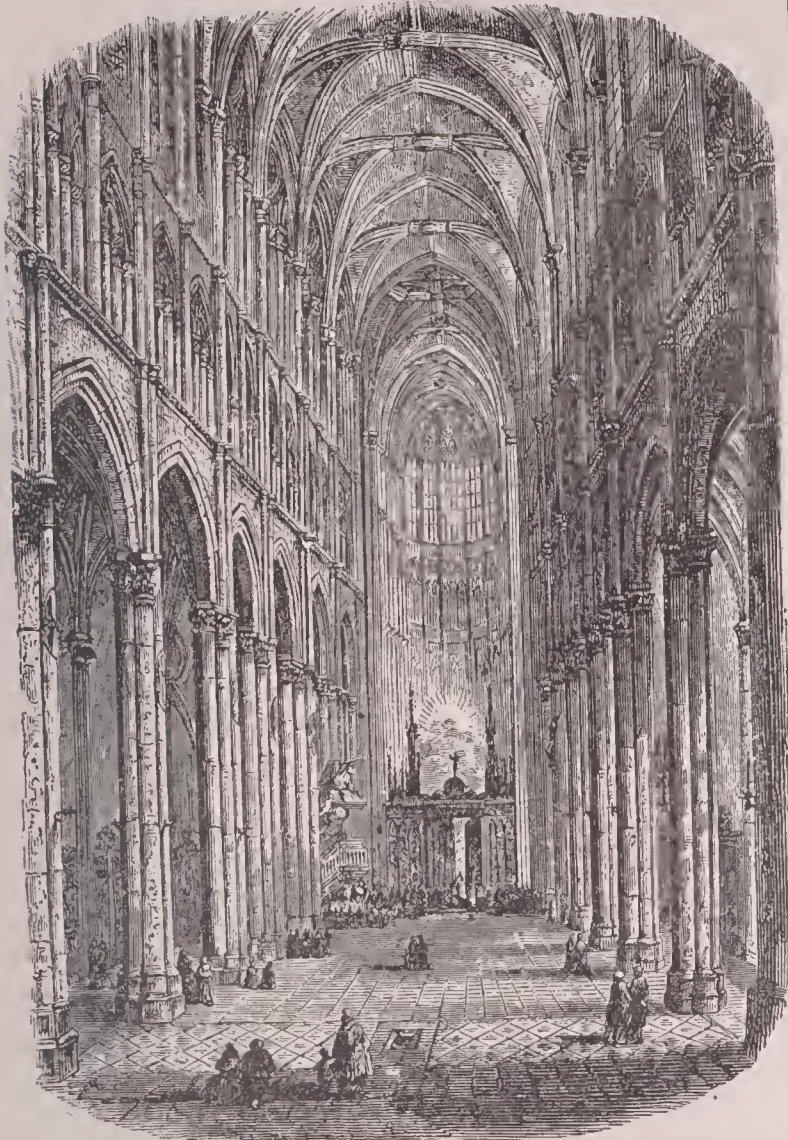


FIG. 51.—Interior of Amiens Cathedral.

suggests) in the great porch of Vézelay. It is impossible within the limits of this article to explain what were the difficulties encountered

in the effort to solve the problem of vaulting the nave, and how the pointed arch contributed to its solution (for such particulars, consult Moore's *Gothic Architecture* and the articles *Construction* and *Voûte* in the *Dictionnaire Raisonné* of Viollet-le-Duc). It must suffice to say that these difficulties were partly constructive, resulting from the intersection of vaulting surfaces of different spans, due to the discrepancy between the width of the nave and of the pier arches; and partly æsthetic, some of the possible solutions of the constructive problem being objectionable because of their ugly appearance. But the pointed arch, having been once adopted for the pier arches and vaulting-ribs, was almost of necessity made use of for all the openings and spans; so that while in transitional works of the close of the twelfth century and beginning of the thirteenth century we find the round and pointed forms occurring side by side, the

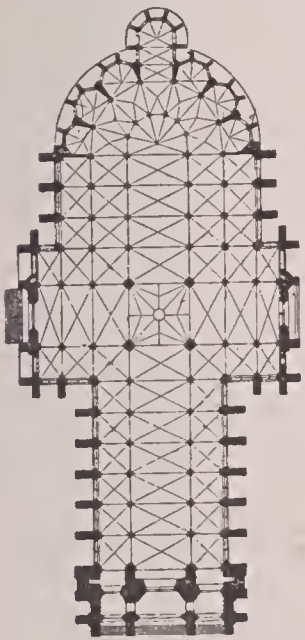


FIG. 52.—Plan of Amiens Cathedral.

former finally disappears after those dates except in a few isolated instances.

Very early in the course of these efforts to devise a suitable form for the vaulting, the church-builders began to use plain or molded ribs of stone as a sort of framework for the vaults. This feature the English architects developed into a decorative as well as constructive element of the greatest splendor. The different stages of this development are called *lierne*, *star*, and *fan* vaulting, according to the pat-

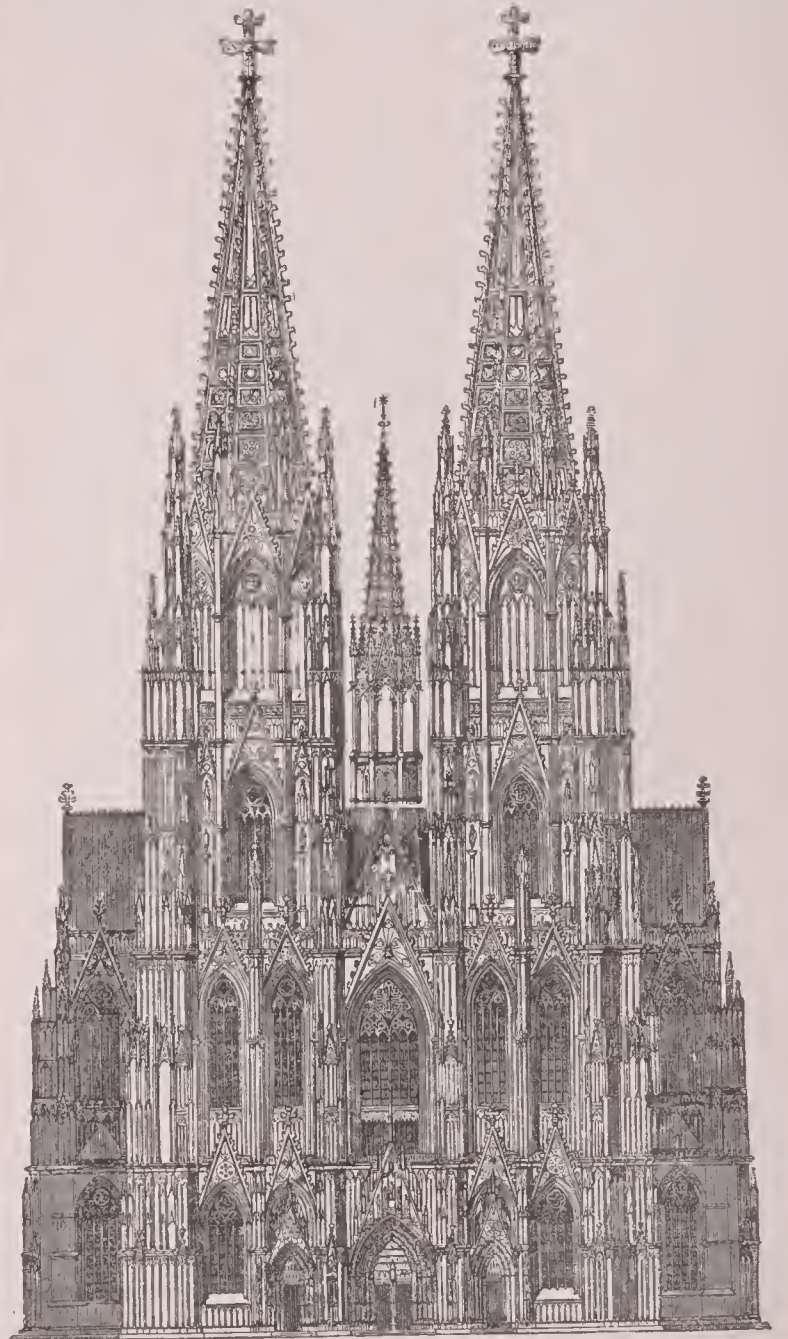


FIG. 53.—West front of Cologne Cathedral.

masonry, led to the adoption of flying buttresses, by which the enormous thrust of the vaults was conveyed outward and downward to buttresses of great transverse depth built against the external walls of the side aisles (see BUTTRESS). Where side aisles were omitted the flying arches became unnecessary, and the buttresses directly resisted the vault-thrust, as in the Sainte Chapelle in Paris. By these means, the germs of which may be found in Roman and Byzantine buildings, the side walls of the aisles and clerestory became of little importance, and were in large part replaced by immense windows of stained glass, furnishing a color-decoration even more gorgeous than that of the Byzantine mosaics. But such walls of leaded glass required multiple supports to stiffen them, and these were afforded by the graceful stone traceries with which the window opening was filled. The changes in the character of these traceries mark

the stages of development of Gothic architecture in France and England, and in measurably in Germany, and have given to them, as well as to the several periods in which they occur, the names of lancet, geometric, and perpendicular for the English styles, respectively, of the thirteenth, fourteenth, and fifteenth centuries; and of early pointed (or early French), rayonnant, and flamboyant to the corresponding phases of French architecture.

By these successive steps the Gothic cathedral was developed into a structural organism, each of whose parts fulfilled a definite constructive function. All the members of this framework of stone, piers, arches, ribs, etc., received forms originating not in caprice or mere æsthetic fancy, but in the demands of stability, lightness, and convenience; and every radical variation in their shapes and proportions may be traced to the effort to meet more perfectly the special requirements of each case. Especially is this true in France, where a sure and unerring logic seems to have guided the mediæval builders in every step they undertook. At the

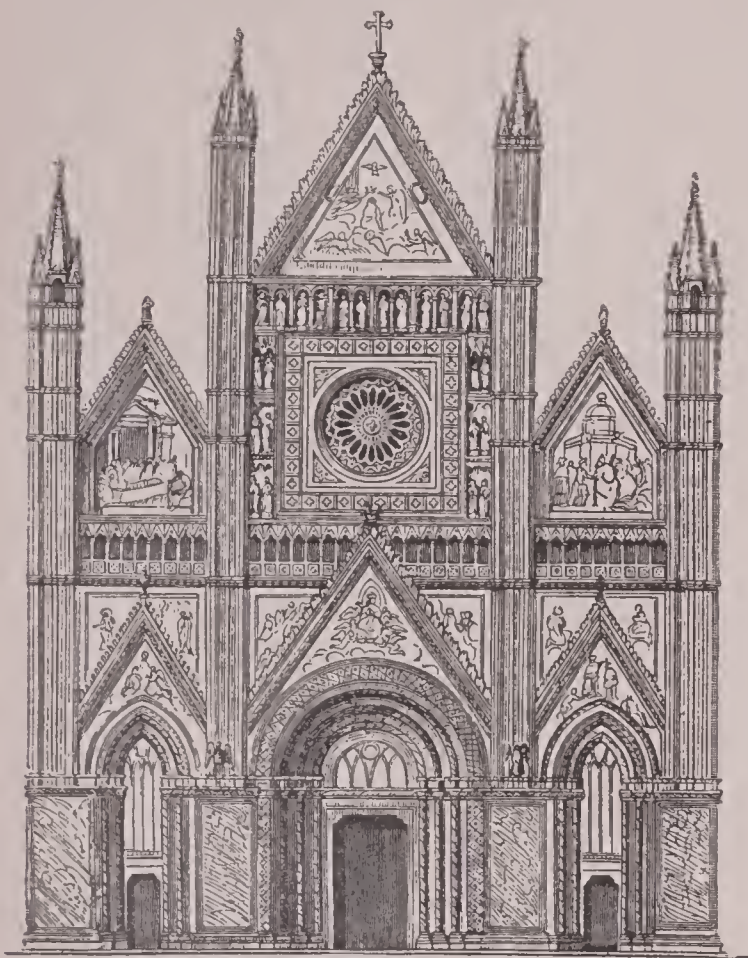


FIG. 54.—Orvieto Cathedral, west front.

same time they were ever controlled by an equally unerring artistic taste, so that the splendid engineering of their structures is clothed in forms of undying charm and ever-fresh beauty and loveliness. For their ornamental details they ranged the whole universe of vegetable and animal forms, and, under the influence of a fervid imagination, compounded therefrom a marvelous world of grotesque, symbolic, and conventionalized ornament, or, as in the later stages of their art, copied nature with realistic fidelity. Thus was the æsthetic marvelously blended with the constructive in extraordinary creations, whose vaults, like that of Amiens, soar 150 feet into the air, or stretch into long vistas extending, as in some of the English cathedrals, 500 feet from porch to apse. Never were the demands of use and beauty more perfectly reconciled and satisfied than in these structures, which unite the æsthetic charm which the Greeks strove after with the splendid engineering and impressive magnitude of Roman architecture, adding thereto a religious symbolism and a glory of carved and colored picturing, full of poetry and far more inspiring than Egypt ever produced.

Our limits will not permit of attempting to specialize upon the various national phases of this development except in the briefest manner. France was the birthplace of every important step in its advance, and created its most perfect examples. Conspicuous among many others are the cathedrals of Paris (Notre Dame); Chartres, with its unrivaled stained glass; Rouen; Amiens, the largest and internally

the richest of all; Reims, with its magnificent front and exterior; and Tours, Sens, Auxerre, and Orléans among the later examples, besides many splendid abbeys and parish churches. In England the cathedrals were less lofty, but longer, than in France, usually terminating in square east ends instead of the French *chevet*; Durham, Peterborough, Norwich, and Ely among the earlier built, Lincoln, Canterbury, Salisbury, and York among those of the thirteenth and fourteenth centuries may be mentioned.

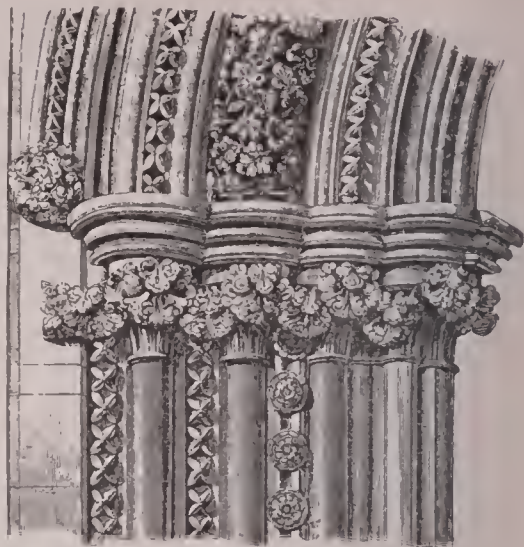


FIG. 55.—Florid Gothic carving.

In Germany the finest are the earliest works, like the minsters at Worms, Mayence, Limburg, Laach, etc., which exhibit the round arch in its glory. Strassburg, Freiburg, and Cologne (the largest of all) are of later date, splendid with elaborately minute tracery, especially in their magnificent open-work spires. Spain copied indiscriminately from other countries, and mingled with this copying many features of Moorish origin in most fanciful combinations (Seville, Burgos, Toledo, etc.). Italy never adopted the constructive principles of the West, and the pointed arch, introduced by French Cistercian monks and by German architects, was used without constructive meaning. Vaults were

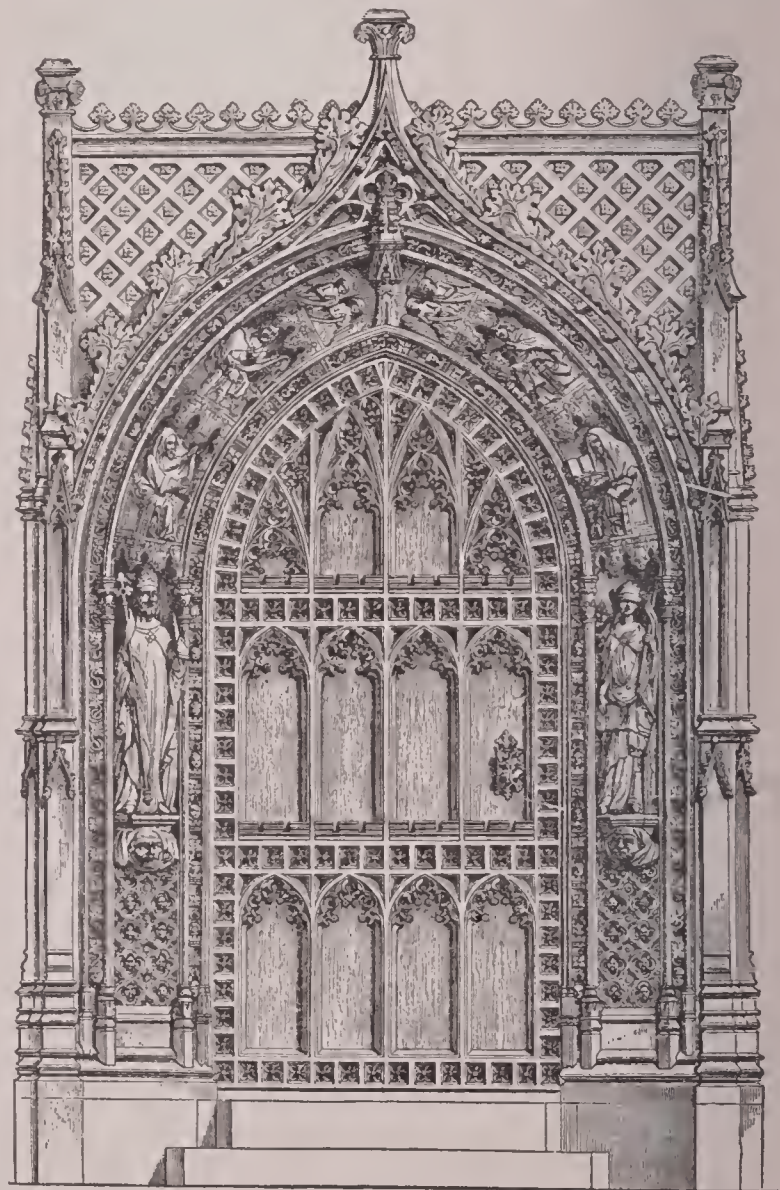


FIG. 56.—Florid Gothic doorway, Rochester Chapter-house.

tied by iron rods, buttresses omitted, and façades designed as mere decorative screens, though as such often singularly beautiful (Sienna, Orvieto, Ferrara, Milan, etc.).

Two chief causes led to the decay of Gothic architecture. In the first place the constructive development, which was its life, could not continue forever; the main problem of the vault once solved, it could only busy itself with proportions and details. The striving after height and lightness and ingenuity of construction became its chief concern and its bane. Decoration assumed an undue importance, and the elaborate naturalistic ornament of the fourteenth century preluded the extravagant but often dry and unmeaning carving and paneling of the fifteenth; while the somewhat stiff but noble figure-sculpture of the thirteenth century degenerated into an art of overcrowded and realistic carved pictures. In the second place, mankind was undergoing a religious and intellectual revolution, which was loosening the hold of that mediæval mysticism which so powerfully influenced the Gothic builders. Men were becoming practical, independent, lovers of splendor and luxury, and fashions changed in building as in all else. There was no longer need of new cathedrals, and civic architecture was replacing religious architecture in interest and importance, as in the town-halls of Flanders and Italy. In other words, the Renaissance was approaching, bringing in its train the revival of classic tastes and of classic forms, with palace-building and domes, with the individualism of great builders like Brunellesco and Bramante and Michel Angelo, in place of the consistent and ubiquitous advance of all architecture along the same general lines through the combined efforts of countless unknown designers. A new architecture arose, of courtiers and princes, of municipalities and guilds, of burghers and common citizens, of merchants and corporations, to be succeeded by the philistinism of the eighteenth century, and that again by the artistic revival of which we of the last decade of the nineteenth century are the witnesses. This revival, still chaotic and uncertain in its tendencies, is not marked by those lofty impulses and strong currents of feeling which we note in all the great epochs of architecture in the past, but by that more general diffusion of taste and knowledge which to-day in intellectual as in artistic matters produces perhaps fewer giants and great master-works, but infinitely more of general and common excellence of performance.

For the architecture of the East, see ARABIAN ARCHITECTURE, ASSYRIA, CHINA, INDIA, and MOHAMMEDAN ARCHITECTURE; and for its progress after the decay of Gothic art, see RENAISSANCE (*Architecture*). Other subdivisions of the subject are covered by special articles under the appropriate heads. The general reader is also referred to the handbooks of architectural history already cited, and to the volume on *The Fine Arts* in the history of *The Renaissance in Italy*, by J. A. Symonds.

A. D. F. HAMLIN.

Architecture of the American Aborigines: See INDIANS OF CENTRAL AMERICA, INDIANS OF NORTH AMERICA, and INDIANS OF SOUTH AMERICA.

Archon [Gr. ἄρχων, ruler, deriv. of ἄρχειν, be first]: the title of the highest magistrates or rulers of Athens. On the death of Codrus, King of Athens (1068 B. C.), the title of king was abolished, and Medon, the son of Codrus, became the first archon, with limited power. The office was at first hereditary and held for life, but in 752 B. C. the term of office was limited to ten years, and in 714 it ceased to be hereditary and became open to all patricians. In 683 the number of archons was increased to nine, who were elected annually. One of the nine was called archon *eponymus* (ἐπώνυμος), because his name was used to designate the year; the second, who was styled *king* (βασιλεύς), had charge of religious affairs; the third was called *potemarch* (commander-in-chief), and originally had the command of the army. The other six, who were styled *thesmothetæ* (θεσμοθέται), law-givers, conducted criminal trials, and had power to ratify treaties with foreign states. In the latter period of Athenian history all citizens were eligible to the office of archon. The word archon (translated *ruler*) occurs in the New Testament as the title of members of the SANHEDRIN (*q. v.*), among whom was Nicodemus (John iii. 1). Among the Gnostics the word is the designation of two beings who ruled the several heavens. A sect of Gnostics bore the title *Archontic*. It arose in the fourth century, rejected baptism and the Lord's Supper, and identified the God of the Old Testament with the devil.

Archytas (Ἀρχύτας): Greek philosopher, general, and mathematician; b. at Tarentum. He flourished about 400-350 B. C., was a Pythagorean in philosophy, and was an intimate friend of Plato, whose life he is said to have saved

when the tyrant Dionysius was about to put him to death. As general of Tarentum, to which office he was elected seven times, he commanded with success in several campaigns. He was also employed in important civil affairs, for which he displayed excellent capacity. His virtue was as conspicuous as his ability. He is reputed the first that applied geometry to practical mechanics, and the first to solve the problem of the doubling of the cube. He was drowned on the coast of Apulia. Only fragments of his works are extant. See Zeller's *Pre-Socratic Philosophy* and Mullach's *Frag. Philos. Græc.*

Arcis-sur-Anbe, ar'see'-sür-õb: a town of France; department of Anbe; on the river Anbe; 16 miles N. by E. of Troyes (see map of France, ref. 4-G). It has manufactures of cotton hosiery. On Mar. 20 and 21, 1814, an indecisive battle was fought here between Napoleon and Prince Schwartzburg, who commanded a portion of the allied army. Pop. about 3,000.

Arc-lamp: See ELECTRIC LIGHT.

Arco'la: a village of Northern Italy; on the Alpone, near its entrance into the Adige; 15 miles E. S. E. of Verona (see map of Italy, ref. 2-D). Here Napoleon gained an important victory over the Austrian general Alvinzy. The French commenced the battle on Nov. 14, 1796, by an attempt to cross a bridge over the Alpone, but were repulsed. The action was renewed on the 16th, and ended on the 17th, when Alvinzy retreated. Pop. 5,259.

Arcola: city on railroad; Douglas co., Ill. (for location of county, see map of Illinois, ref. 6-F); 158 miles S. of Chicago; has a high school, 8 churches, a city hall, electric lights, 2 newspapers, a broom-factory, and 2 tile-factories. Pop. (1880) 1,515; (1890) 1,733; (1900) 1,995.

Arcou, JEAN CLAUDE ELÉONORE LEMICEAU, d': French engineer; b. at Pontarlier, 1733; invented (1780) the celebrated floating batteries for attacking Gibraltar; directed successful operations against several fortresses in Holland; author of *Considérations Militaires et Politiques sur les Fortifications*. D. July 1, 1800.

Arcona: See ARKONA.

Ar'cos de la Fronte'ra: a town of Spain, in Andalusia, on the right bank of the Gaudalete, 30 miles N. E. of Cadiz (see map of Spain and Portugal, ref. 20-D). It is called Arcos, because it is built in the form of a bow. Its site is a high rock, which commands an extensive and beautiful prospect. Here are celebrated manufactures of tanned leather. This town was once strongly fortified. In 1519 Magelhaens started from here for the first circumnavigation of the globe. Pop. 16,280.

Arcot': two districts and a city of Madras presidency, British India; near the southern end of the peninsula, on the east side, just W. of Madras city and Pondicherry. *North Arcot* is between latitudes 12° and 14° N. It is flat and uninteresting in the eastern and southern parts, but the western extends to the foot of the Eastern Ghats, and is agreeably diversified. This part abounds in minerals, especially the ores of copper and iron. Four railways pass through the district. Grain, cotton, sugar-cane, and indigo are largely grown, and cotton-cloth is manufactured. Area, 7,256 sq. miles. Pop. about 2,000,000.

South Arcot lies immediately S. of the preceding, and is similar to it. Both districts are poorly watered, especially in the dry season. Area, 4,873 sq. miles. Pop. about 2,000,000.

Arcot City, also called *Arcuaty*, is the principal town of North Arcot; lat. 12° 54' N., lon. 79° 24' E. (see map of S. India, ref. 6-E). It is a railway station and military cantonment. Arcot was taken by Clive in the middle of the eighteenth century with an inconsiderable force of men. Its siege in 1751 by the natives was a memorable incident in the history of the Carnatic. It became British in 1801. Pop. 50,000.

MARK W. HARRINGTON.

Arctic [Lat. *arcticus*; Gr. ἀρκτικός, belonging to [the constellation of] the Bear (ἄρκτος), which is near the North Pole]: "northern," or, rather, "far to the north," "near the North Pole."

The ARCTIC CIRCLE is a circle drawn around the North Pole of the earth, 23° 27½' from the pole and 66° 32½' from the equator. It forms the boundary between the north temperate and the north frigid zones. Within this circle the sun does not set at the summer solstice nor rise at the win-

ter solstice. The ARCTIC CURRENT is supposed to originate in the ice of the Arctic seas, whence it runs along the eastern shore of Greenland, and round Cape Farewell to the western shore of Greenland, in N. lat. 66°, where it turns southward, forming the *Hudson's Bay Current*. Thence it passes near the Bank of Newfoundland, and, meeting the Gulf Stream, passes beneath it. Other portions follow the eastern coast of North America for various distances, cooling the land, and eventually pass beneath the Gulf Stream. Both at the surface and after descending, the Arctic is a return current, compensating in part for the northward transfer of water by the Gulf Stream.

Arctic Discovery: See POLAR RESEARCH.

Arctic Ocean: the ocean which surrounds the North Pole, washes the northern shores of Europe, Asia, and America, and is nearly coextensive with the Arctic Circle. It communicates with the Pacific by Bering's Strait, and with the Atlantic by a wide passage between Greenland and Norway. The navigation of this ocean is obstructed by perpetual congelation, but it has been supposed that a portion N. of 80° is an open polar sea. The Arctic Ocean incloses many large islands, and comprises large bays and gulfs, which deeply indent the adjacent continents, as Baffin's Bay, the White Sea, and the Gulf of Obi. The water of this ocean is extremely pure and clear, and the ice is remarkable for the beauty and variety of its tints. Those parts of this sea which have been explored are occupied by large fields of floating ice and icebergs in almost perpetual motion. Capt. Ross measured an iceberg which rose 325 feet above the water in which it floated. There are masses that present a front of 200 feet in height, and fields from 10 to 40 feet thick sometimes extend over 100 miles. Icebergs often have a violent rotation, and are dashed against each other with a tremendous force. Fogs, storms, and almost endless night add to the dangers which beset the explorer. Among the navigators who have explored it in search of a northwest passage are Parry, Ross, Sir John Franklin, and Kane. Dr. Hayes and Dr. Hall, and various Scandinavian and Dutch navigators, are among the recent explorers. Parry in 1827 reached lat. 82° 45' N., lon. 19° 25' E., and found there floes of ice, with open water between. In 1854 Kane penetrated to lat. 81° 22' in lon. 65° 35' W. He argued that there is an open sea, not frozen, around the pole. For further details, and for account of later explorations by Nares, Nordenskjöld, De Long, Greely, Peary, etc., see POLAR RESEARCH. There are valuable whale-fisheries in the Arctic Ocean.

Arcturus [from Gr. ἀρκτοῦρος; ἄρκτος, bear + οὔρος, keeper]: a fixed star of the first magnitude in the constellation Bootes. It is situated behind the Great Bear, and may readily be found by continuing the curve of the tail of the Bear. It is designated in catalogues as α Bootis.

Arcuation [Lat. *arcuatio*, from *arcuare*, curve like a bow (*arcus*)]: a mode of propagating trees; the shoots of the trees, cut off near the ground, are bent over and partly covered with earth, which causes them to take root. It is now generally called *inarching*.

Arcueil, ar'-küel': a village of France; 3 miles S. of Paris; on the railway from that capital to Sceaux; has a fine aqueduct constructed by Marie de Médicis; also the remains of a Roman aqueduct built by the Emperor Julian. It is a place of resort on holidays for the Parisians. Pop. (1896) 7,064.

Arcus senilis [Lat., bow of old age]: the hazy zone seen around the outer zone of the cornea with advancing years. It is rarely a complete circle, but may become so in extreme cases. When seen in persons at middle life it is an indication of premature decay or actual disease, being due to fatty degeneration from disease of the blood-vessels, and very probably associated with similar fatty change elsewhere, as in the heart.

WILLIAM PEPPER.

Arey, GROTTO OF: an ancient limestone quarry in France, in the department of Yonne, remarkable for its size and the beauty and extent of its stalactites and incrustations, which have almost completely obliterated all traces of the labor of man.

Ardavan: See ARTABANUS.

Ardebil', or **Ardabil'**: a town of Persia; province of Azerbaijan; on the Karasū; 40 miles from the Caspian; 90 miles E. by N. of Tabriz (see map of Persia, ref. 1-F). It is visited by the trading caravans from Tiflis, Derbend, and

Ispahan. Its salubrity is celebrated, and there are warm mineral springs in the vicinity. Pop. 10,000 to 15,000.

Ardèche, ar-dāsh: a river of France; rises among the mountains of Cévennes, flows southeastward through the most magnificent and romantic scenery, and enters the Rhône a mile from Pont Saint-Esprit, after a course of 45 miles. Near its mouth is a natural curiosity called the Bridge of Arc.

Ardèche: a mountainous department in the S. E. of France; bounded N. by the department of Loire, E. by Drôme, S. by Gard, and W. by Lozère and Haute-Loire, and drained by the Ardèche. Area, 2,136 sq. miles. The surface is diversified by extinct volcanic peaks, deep craters, ranges of basaltic columns, and romantic valleys, forming combinations of scenery which are highly magnificent and picturesque. The valleys near the Rhône produce good wine, olives, figs, almonds, and Spanish chestnuts, the annual crop of which latter is about 400,000 bushels. Mines of copper, iron, lead, antimony, and coal are worked in this department. It is subdivided into three arrondissements. Capital, Privas. Pop. (1896) 363,501.

Arden (commonly written ARDENNES, *q. v.*): a forest in which Shakspeare places the scene of his play called *As You Like It*. There was formerly a forest of this name on the western borders of Warwickshire, which is believed to have occupied a great part of the midland counties, and it is noteworthy as the maiden name of Shakspeare's mother.

Ardennes, or **Arden** (anc. *Arduenna Sylva*): a hilly and densely wooded tract which includes a part of Belgium and of France, and is situated on both sides of the river Meuse. The forest of Ardennes in Cæsar's time was more extensive, and occupied nearly all the space between the Sambre, Moselle, and Rhine. The highest points of the Ardennes are about 2,200 feet above the sea. The predominant rocks are clay-slate, grauwacke, and limestone. The channel of the Meuse presents rugged and precipitous rocks about 600 feet high. Many important military events have occurred among the Ardennes, at Rocroi, Sedan, Mézières, etc. Its chief wealth is in its minerals, wood, cattle, and sheep.

Ardennes: a department in the N. E. of France; bounded N. by Belgium, E. by the department of Meuse, S. by Marne, and W. by Aisne; was part of the old province of Champagne. Area, 2,020 sq. miles. It is intersected by the Meuse, which flows northward, and by the Aisne, which flows westward. The surface is partly hilly, and covered with the forest of Ardennes. The valley of the Aisne is fertile and produces much grain. Among the mineral resources of this department are iron, lead, marble, and slate. The canal of Ardennes, connecting the Meuse and the Aisne, affords facilities for trade. Here are manufactures of glass, metallic wares, woolen cloths, shawls, firearms, earthenware, etc. It is subdivided into five arrondissements. Capital, Mézières. Pop. (1896) 318,865.

Arditi, LUIGI, loo-ee-'jěe aar-dee'těe: musician and composer: b. at Crescentino, Piedmont, Italy, July 16, 1825. He received a musical education at the Milan Conservatory, where he remained six years. Soon after he made his first public appearance as a violinist and conductor in concerts and operatic performances at the small town of Vercelli; was engaged as conductor at the Teatro Re, Milan. In 1846 he went to Havana, and subsequently in company with an opera troupe visited the principal cities of the U. S. In 1856 Arditi returned to Europe and conducted Italian opera in Constantinople, producing Verdi's opera of *Traviata* in that city for the first time; settled in London in 1858 as conductor, first at Her Majesty's theater and afterward at Covent Garden, then managed by Gye and Mapleson. He has also conducted Italian opera in Russia and at Vienna. Arditi's name has been associated professionally with the most famous artists, such as Mario, Grisi, Piccolomini, and Patti. He is principally known as a composer by his opera *The Spy*, produced in New York in 1856, and *Il Bacio*, a waltz song. He frequently visits the U. S. to conduct operatic performances. B. B. VALLENTINE.

Ardmore: village; Montgomery co., Pa. (for location of county, see map of Pennsylvania, ref. 6-J); on Pa. R. R.; 7 miles N. W. of Philadelphia; has several yarn-factories. It has many beautiful private residences and fine roads. Pop. (1880) 519; (1890) 2,205; not returned separately in 1900.

Ardoch: a small village of Scotland, in the county of Perth, 8 miles S. S. W. of Crieff (see map of Scotland, ref.

10-G). Here is an ancient Roman camp, the most entire now in Britain. The intrenched works form a rectangle 500 by 430 feet, the north and east sides of which are protected by five ditches and six ramparts.

Ardovan: See ARTABANUS.

Ardshir', or **Ardsheer'**, BABEGAN: a King of Persia; founder of the dynasty of the Sassanides; a man of obscure origin who raised himself by his courage and energy. He revolted against Artabanus (or Ardovan), King of Persia, whom he defeated and killed. He extended the boundaries of Persia by conquests, and afterward reigned in peace for many years. He was celebrated as a sage and a legislator, and was the author of maxims which are still preserved by the Persians. The Greeks called him Artaxerxes. He died about 260 A. D., and was succeeded by his son Shapur (or Sapor).

Are [Fr., from Lat. *area*, space]: in the metric system of weights and measures, the unit of measure of surface. It is the square of 10 meters = 119·60332 sq. yards. The *are* is not practically employed, the hectare = 100 ares, or 2·47114 English acres, the deciare (one-tenth of an are), and the centiare (one-hundredth of an are), being the only agrarian measures practically used in this system.

A'rea [Lat., orig. an open space, a courtyard, a threshing-floor]: any plane surface. In geometry it means quantity of surface, the surface included within any given lines. The calculation of areas is one of the ultimate objects of geometry, and the measuring units employed are a square inch, a square foot, etc. The area of a rectangle is equal to the product of the length and breadth. That of a circle is found by multiplying the square of the diameter by the decimal ·7854.

Are'ca: a genus of palm-trees having pinnate leaves and double spathes; a fruit which is a one-seeded drupe, or nut, with an outer fibrous husk. The *Areca catechu*, called pinang-palm or betel-nut palm, is a native of the East Indies, and grows to the height of 40 or 50 feet. It bears a fruit called areca-nut or betel-nut, which is astringent and tonic, and is extensively used in the East as a masticatory. (See BETEL.) It also yields a part of the catechu of commerce.

Areci'bo: a port of Porto Rico, Spanish West Indies; on the north side of the island; 45 miles W. of San Juan (see map of the West Indies, ref. 5-J). It is at the mouth of the Rio Arecibo, but is a poor port, being shallow and exposed to the north winds. It is the capital of a province of the same name. Pop. about 11,000.

Are Frode, THORGILSSON: the father of Icelandic (that is, of Scandinavian) history; b. in Iceland in 1067; d. in 1148. Snorri Sturlason, in his *Heimskringla*, says of him that "he was the first man in the north who wrote down in the Norse language narratives of events both old and new"; that "he wrote principally about the first settlements in Iceland, the laws and government, and next of the lawmen, and how long each had administered the law"; and that "he added many other subjects, such as the lives and times of kings of Norway and Denmark, and also of England." Are Frode is the Herodotus of Scandinavian history-writing. See ICELAND.

R. B. ANDERSON.

A'remberg', or **Arenberg**: the name of a noble family of Germany, which adhered to the Roman Catholic Church and to Philip II. of Spain. They own large estates in Hanover and Prussia.

Arenberg, LEOPOLD PHILIPP KARL JOSEPH VON LIGNE, Duke of: b. at Mons, Belgium, in 1690; became a field-marshal in the Austrian army and commander-in-chief in Flanders in 1737; distinguished himself at the battle of Malplaquet in 1709, and at that of Belgrade in 1717. D. in 1754.

Are'na: a Latin word signifying sand; was anciently applied to an open space of ground strewed with sand on which athletes and pugilists contended for mastery, and to the open central part of the amphitheater where gladiators and wild beasts fought. This was usually covered with sand. In modern language *arena* signifies any scene of contest or field of intellectual exertion; any public place in which men display their talents or contend in debate.

Ar'endal: a city of Norway; 41 miles N. E. of Christiansand; on the Cattegat; in lat. 58° 23' N., lon. 8° 53' E. (see map of Norway and Sweden, ref. 12-B). It is partly built on the mainland and partly on islands, giving it the

name of "Little Venice," and has considerable trade in iron and timber. Pop. 5,800.

Arends, LEOPOLD ALEXANDER FRIEDRICH: founder of a famous German system of stenography; b. Dec. 1, 1817, near Milma; removed to Berlin, 1844; d. Dec. 22, 1882. Author of *Introduction to Rational Shorthand* (17th ed. 1888).

Arenicola [literally, sand-dweller; from Lat. *arena*, sand + *colere*, dwell]: a genus of annelids containing the lug-worms. See LUGWORM.

Arens, FRANZ XAVIER: See the Appendix.

Arensberg: See ARNSBERG.

Arensky, ANTON STEPANOVITCH: See the Appendix.

Arenswalde: See ARNSWALDE.

Arent'zen, CHRISTIAN AUGUST EMIL: Danish poet and literary historian; b. at Copenhagen, Nov. 10, 1823. His most important work is *Baggesen og Oehlenschläger: Litteratur-historisk Studie* (8 vols., 1870-78). See his *Recollections (Fra yngre og ældre Dage: Livs-Erindringer)*, 1886.

Areoi: See ARREOY.

Areom'eter, or **Aræometer** [From Gr. *ἀραιός*, thin + *μέτρον*, measure]: an instrument used to measure the specific gravity of fluids and ascertain the strength of spirituous liquors, usually called HYDROMETER (*q. v.*).

Areop'agus (in Gr. *Ἄρειος πάγος*, i. e. hill of Mars): a hill in Athens W. of the Acropolis; also a celebrated court of justice which held its sessions on the same spot in ancient times. This court or council was remarkable for its high character and great antiquity, having been organized before the first Messenian war, the date of which was 740 B. C. It was merely a criminal tribunal before the time of Solon, who made important changes in its constitution, and extended its jurisdiction to political and moral affairs. He ordained that this court should be composed of those archons who had performed their official duties faithfully, and who had passed with credit the scrutiny to which all archons were subjected at the expiration of their term of office. Its influence was conservative, and tended to restrain the excesses or the progress of democracy. The political power of this court was much reduced by Pericles about 458 B. C., but it maintained a high reputation long after that date. The name of the Areopagus occurs in the history of the apostle Paul, who uttered a memorable discourse on Mars Hill. See Acts xvii. 22-31.

Arequipa, a-rä-kee'pa: a department of Peru; bordering on the Pacific Ocean; bounded N. by Ayacucho and Cuzco, E. by Cuzco and Puno, S. by Moquega, and W. by the ocean. Area, estimated at 27,744 sq. miles. The eastern part is mountainous. The soil is fertile, and produces chiefly wine. Gold, silver, zinc, lead, and coal are found here. Capital, Arequipa. Pop. 160,282.

Arequipa: a city of Peru; capital of department of same name: finely situated about 40 miles from the Pacific Ocean, on the river Chili and on the plain of Quilca, 7,850 feet above the level of the sea; lat 16° 24' 28" S., lon. 71° 37' 30" W. (see map of South America, ref. 5-C). It is reputed one of the best built and most beautiful towns of South America. It is the seat of a bishop, and has a cathedral, a college, and several convents. The public edifices and private houses are built of stone, one or two stories high. It has been ruined by earthquakes several times. It has an active trade, facilitated by a railroad which extends from Puno on Lake Titicaca to Mollendo on the Pacific. Gold and silver are found in the vicinity. The adjacent country is fertile. Here occurred a great earthquake, Aug. 13 and 14, 1868, destroying property worth more than \$12,000,000, and said to have caused the death of more than 500 persons. Harvard College observatory has established a station at an elevation of over 8,000 feet near this place, which is exceptionally favorable for astronomical observations. Pop. 35,000.

Arequipa, VOLCANO OF: a volcanic peak of the Peruvian Andes; about 14 miles E. of the city of Arequipa. It rises to the height of 20,300 feet above the level of the sea, and has the form of a regular truncated cone, with a deep crater, from which ashes and vapor continually issue.

A'res (Gr. *Ἄρης*): the god of war in the Greek mythology, corresponding to the Roman MARS (*q. v.*).

Aretæ'us (in Gr. *Ἀρεταῖος*): an able Greek medical writer of Cappadocia; supposed to have lived between 50 and 150 A. D. The events of his life are not known, but he is considered by some persons to rank next to Hippocrates. He wrote a work in eight books on the causes, symptoms, and

cure of acute and chronic diseases, which is still extant and is highly esteemed. The style is singularly elegant and concise. The Greek text has often been printed, and has been translated into English by T. F. Reynolds (1837); Greek with English translation by Dr. F. Adams (1856).

Arethusa (in Gr. Ἀρέθουσα): in classic mythology, one of the Nereids, of whom Alpheus was enamored. Also the name of a fountain situated near Syracuse, into which it is said she was transformed. (See ALPHEUS.) Arethusa was invoked by Vergil as a source of inspiration in his tenth eclogue.

Arethusa: the name of two ancient cities, one on the river Orontes, in Syria, and the other in Macedonia. The Syrian city (now called *Restan*) was rebuilt by Seleucus Nicator, the first King of Syria. Its inhabitants persecuted Marcus, a Christian bishop, who is now honored as a martyr by the Greek Church. The Macedonian city was the site of the tomb of the Greek poet Euripides.

Arethinian Syllables: the syllables *ut, re, mi, fa, sol, la*, which Guido d'Arezzo used to designate his notes in his musical system of hexachords.

Aretno, PIETRO, pee-ā'trō āā-rā-tee'nō: satirical and licentious Italian writer; b. at Arezzo, Apr. 20, 1492. He was the son of a cobbler, and was not liberally educated. He became a resident of Venice in 1527, and found several powerful patrons, among whom were the Emperor Charles V. and Francis I. Among his numerous works were comedies, dialogues, sonnets, and letters (6 vols., 1538-57). He gained by his writings great applause and large sums of money. His satires, which were personal and bitter, procured for him the surname of THE SCOURGE OF PRINCES. His habits were extremely licentious. D. in Venice, Oct. 21, 1556. See P. Chasles, *L'Arélin, sa vie et ses écrits* (1879); Sinigaglia, *Saggio di un studio su P. A.* (1882); Samosch, *Pietro Aretno* (Berlin, 1881).

Aretno, SPINELLO: See SPINELLO DI LUCA SPINELLI.

Aretnus, LÉONARDO BRUNI: b. in Arezzo, the birthplace of Petrarch, of low parentage, in 1369; orphaned at an early age, the precocious boy was educated by the famous Salutato, and the two remained in close companionship until 1405, when Bruni secured the position of apostolic secretary to Pope Innocent VII. In 1410 he was elected chancellor of Florence, with very limited powers, which caused him to resign and to return to the papal court. In 1427 he was again appointed chancellor of Florence with the same prerogatives that Salutato had possessed, and he remained in this office, universally esteemed and admired, until his death on Mar. 9, 1444. He is remembered chiefly for his elegant and justly famous translations of Greek writers into Latin, to which he was inspired by Chrysoloras. Among the best of these may be mentioned the speeches of Demosthenes and Aeschines, the biographies of Plutarch, Plato's *Phædo*, *Gorgias*, *Kriton*, *Apology*, *Phædrus*, and some of the works of Aristotle. See G. Voigt, *Wiederbeleb. des class Alterth.* (i. 309-314; ii. 165-174); J. A. Symonds, *Renaissance in Italy* (ii. 182-186). ALFRED GUDEMAN.

Arezzo, a-ret'sō: a province of Tuscany, Central Italy; bounded on the N. by Florence, on the E. and S. by Perugia, and on the W. by Sienna. Area, 1,279 sq. miles. The country is chiefly mountainous, and is traversed by the rivers Arno and Chiana. The chief town is Arezzo. Pop. (1881) 238,707; (1890) 242,506.

Arezzo (anc. *Arretium*): a city of Italy; capital of the province of same name; on the Chiana; 55 miles by rail S. E. of Florence. It is a very ancient town, having been founded by the Etruscans several centuries before the Christian era. It has two colleges, a seminary, a lyceum, a school of technology, an academy of sciences and arts, and many silk, cloth, iron, and other factories. Among the public edifices are a cathedral, several churches rich in works of art, a museum, and the famous *Loggie* of Vasari. Arezzo is remarkable for the great number of eminent men who were born in it—namely, Mæcenas, Petrarch, Vasari, Pietro Aretno, Guy d'Arezzo, Redi the physiologist, and Cesalpino. Pop. 39,447 (commune). Ancient Arretium was celebrated for the manufacture of terra-cotta vases. The cathedral contains rich sculptures by Giovanni Pisano, and some of the finest glass windows in Italy.

Argæus, Monnt (in Turk. *Arjish-Dagh*): the highest mountain in Asia Minor; in the pashalic of Karamania, about 12 miles S. of Kaisariyeh, and connected with a branch of Mt. Taurus. Its height is 13,100 feet.

Argali (*Ovis ammon*): the large wild sheep of Central Asia and Siberia. A closely related species is the bighorn of the Rocky Mountains (*Ovis montana*).



Argali.

Argand Lamp: a lamp (patented in 1787) invented in 1782 by A. Argand (a Swiss chemist who lived in England; b. 1755, d. 1803), and intended for burning oil. His invention consisted, first, in using a wick in the form of a hollow cylinder, through which a current of air ascends, so that the supply of oxygen is increased, preventing the waste of carbon (which in the old lamps escaped in the form of smoke), thus greatly increasing the amount of light; and, second, in adding the glass chimney, by which a draft is created and the flame is rendered more steady.

Argelan'der, FRIEDRICH WILHELM AUGUST: German astronomer; b. at Memel, Mar. 22, 1799; was a pupil of Bessel. He became in 1823 director of the observatory at Åbo, in Finland, where he made observations for a well-known catalogue of stars. In 1832 he became professor at Helsingfors. In 1837 he was appointed Professor of Astronomy at Bonn. Published a celestial atlas entitled *Uranometria Nova* (1843), and was one of the first to raise the study of variable stars to the rank of a science. His greatest work was a catalogue of all the stars north of the equator, from the first to the ninth magnitude inclusive, the number exceeding 300,000. D. at Bonn, Feb. 17, 1875.

Revised by S. NEWCOMB.

Argemo'ne [through Lat. from Gr. ἀργεμόνη, a kind of poppy]: a genus of plants of the family *Papaveraceæ*. The *Argemone mexicana* is an annual herbaceous plant, with yellow flowers and sinuated spiny leaves, a native of Mexico and the U. S., now naturalized in India, Africa, South America, etc. It has seeds which are emetic and purgative, and have been used as a substitute for ipecacuanha.

Argens, dar'zhan, JEAN BAPTISTE DE BOYER, Marquis d': French writer; b. at Aix, in Provence, June 24, 1704. He served in the army in his youth, and gained distinction by his *Jewish Letters* (*Lettres Juives*, 6 vols., 1738-42), and *Chinese Letters* (6 vols., 1739-42). These procured for him the favor of the Crown Prince of Prussia, afterward Frederick the Great. He went to Berlin, and became an associate of that prince, who after his ascension appointed him director of the Academy of Fine Arts. Among his works is *Histoire de l'Esprit Humain* (14 vols., 1765-68). D. at Toulon, Jan. 11, 1771.

Argenso'la, BARTOLOMÉ LEONARDO, de: Spanish poet; b. at Barbastro, in Aragon, Aug. 26, 1562. Having entered the Church he became a canon of Saragossa, and historiographer of Aragon. He published a number of poems and a *History of the Conquest of the Moluccas* (1609). He and his brother (see below) were called the Horaces of Spain. D. at Saragossa, Feb. 26, 1631.

Argensola, LUPERCIO LEONARDO, de: popular poet; b. at Barbastro, Dec. 14, 1559; was a brother of the preceding. He was appointed historiographer of Aragon by Philip III., and Secretary of State by the viceroy of Naples in 1610. He produced tragedies, entitled *Filis*, *Isabela*, and *Alejandra*; also lyric poems which were very successful. The poems of these two brothers display much similarity. D. in Naples, March, 1613. Bouterwek commends his true poetic feeling, and recognizes in his works an imagination more plastic than creative. See Ticknor's *History of Spanish Literature*; N. Antonio's *Bibliotheca Hispana Nova*.

Argenson, d', dar'zhan-soi': a French family which has produced many men eminent in letters and in public affairs.—MARC RENÉ DE VOYER D'ARGENSON (1652-1721) was a prominent academician and public officer.—His son RENÉ LOUIS, Marquis d'Argenson (1694-1757), was a foreign minister and an author of distinction.—MARC PIERRE, Count d'Argenson (1696-1764), a brother of the foregoing, was an able statesman and a patron of letters.—MARC ANTOINE RENÉ DE PAULMY D'ARGENSON (1722-87), a son of the Marquis René Louis, was an academician and the collector of a famous library.—MARC RENÉ, b. in Paris, Sept. 10, 1771, served as the adjutant of Gen. La Fayette, and fought afterward for the republic. Throughout his life he was a prominent leader of the ultra-republicans. D. in Paris, Aug. 2, 1842.

Argenson, Pierre de Voyer, Viscount d': b. in France in 1626; was governor of Canada in 1657-61, and made some discoveries near Lake Superior and Hudson's Bay. He was of noble ancestry, served honorably at the siege of Bordeaux and the battle of Sens, and was afterward reeve of Touraine. D. in France about 1709.

Argentan: a town in the N. W. of France; department of Orne; on a railway which connects Alençon with Caen; 16½ miles by rail N. N. W. of the former (see map of France, ref. 3-D). It is well built, and has a fine Gothic church and a college; also manufactures of linen, and lace called *point d'Argentan*. Pop. 6,300.

Argenteuil, ar-zhan-tü: a town of France; department of Seine-et-Oise; on the Seine; 11½ miles by rail S. W. of Paris (see map of France, ref. 3-F). Here was a convent to which the celebrated Héloïse retired about 1120. It is now in ruins. Pop. (1896) 15,116.

Argen'teus Co'dex: an old uncial manuscript of fragments of the Four Gospels, written in the Mæso-Gothic dialect on vellum; is so called because the letters are in silver, except the initials. It is supposed that it was written in the sixth century. It is a copy of the translation made by Ulfphilas, Bishop of the Mæso-Goths, was found in the abbey of Werden, Westphalia, in 1597, and is now preserved as the most precious treasure of the University of Upsala, Sweden.

Argentina, aar-gen-tee'nää: the ARGENTINE REPUBLIC.

Argentine [from Lat. *argen'tum*, silver]: a variety of carbonate of lime, having a silvery-white luster.

Argentine: city; Wyandotte co., Kan. (for location of county, see map of Kansas, ref. 6-K); incorporated in 1880, and made a city of the second class in 1890; 4 miles from the mouth of Kansas river, on a level plot of bottom-land, almost surrounded with hills; the main terminal of the Santa Fé system of railroads. The "Argentine smelter" smelts gold, silver, copper, and lead, and employs about 1,000 men. Argentine has street-car lines extending to Kansas City, Mo., and Kansas City, Kan. (4 miles distant), electric lights, fine water-works, and two large grain elevators. Pop. (1890) 4,732; (1900) 5,878. EDITOR OF "REPUBLIC."

Argentine Literature: See SPANISH-AMERICAN LITERATURE.

Argentine Republic [Sp. *La República Argentina*, named from the *Río de la Plata*, i. e. the river of silver, *argentum*]: a South American federal republic; bounded N. by Bolivia and Paraguay, E. by Brazil, Paraguay, Uruguay, and the Atlantic Ocean, S. by the Atlantic Ocean, and W. by the Andes, which separate it from Chile. It extends from lat. 22° to 56° S., and lon. 53° 30' to 72° W. The area, including additions, in 1881, of most of Patagonia and a small part of Tierra del Fuego, is about 1,125,086 sq. miles. The population, including additions from Patagonia, etc., and including the "Federal District," which is practically the city of Buenos Ayres, according to the census of May 10, 1895, is 3,973,626, of whom over 2,000,000 are natives, 280,000 Italians, 100,000 Spaniards, 150,000 French, 40,000 British, 20,000 Germans, besides Uruguayans, Chilians, Swiss, Bolivians, Paraguayans, Portuguese, Asiatics, Africans, Oceanians, etc., in numbers of from 18,300 to about 2,000 each. The area and population of the 14 provinces and 9 territories into which the republic is divided are, according to the latest official reports, as follows:

PROVINCES AND TERRITORIES.	Area in sq. miles.	Pop. in 1895.	Capitals of provinces.
Coast.....	Buenos Ayres... ..	63,000	La Plata.
	Santa Fé.....	18,000	Santa Fé.
	Entre Rios.....	45,000	Paraná.
	Corrientes.....	54,000	Corrientes.
Andes.....	Rioja.....	31,500	Rioja.
	Catamarca.....	31,500	Catamarca.
	San Juan.....	29,700	San Juan.
	Mendoza.....	54,000	Mendoza.
Central....	Cordoba.....	54,000	Cordoba.
	San Luis.....	18,000	San Luis.
	Santiago.....	31,500	Santiago.
	Tucuman.....	13,500	Tucuman.
Northern..	Salta.....	45,000	Salta.
	Jujuy.....	27,000	Jujuy.
Territories.	Misiones.....	23,932	
	Formosa.....	125,612	
	Chaco.....	191,842	
	Pampa.....		
	Río Negro.....		100,000
	Neuquen.....		
Chubut.....	268,000		
Santa Cruz.....			
Tierra del Fuego.			

The chief cities with populations in 1895 are: Buenos Ayres (665,243), Rosario (124,305), La Plata (60,982), Cordoba (54,400), Santa Fé (35,288), Mendoza (28,709), Tucuman (25,000), Salta (20,000), Paraná (18,000), Corrientes (14,000), San Luis (17,827).

Physical Geography.—The country is divided into four regions, viz.: 1, the regions of the Andes, the western boundary; 2, "the Argentine Mesopotamia," situated between the Uruguay and the Parana; 3, the pampas or southern plains; 4, the northern or interior plains which extend far into Bolivia. The characteristic feature of the country, excepting the region of the Andes, is the plain. The true pampas are situated between the Rio Negro and the Rio Salado. About the mouth of the Rio Negro, beyond Buenos Ayres and some distance up the Parana, the ground consists of a fine deposit of sand and clay, which have been washed down from the mountains in the course of time. For hundreds of miles S. and W. of Buenos Ayres not a stone is to be found. In the pampas the principal vegetation consists of grasses, which serve as food for the numerous herds of cattle. In the interior cacti and thorny mimosæ are frequent. Timber trees are not met with. Toward the N. the vegetation becomes extremely varied; along the rivers it becomes luxuriant; the trees, however, are not extraordinarily high. Land capable of being cultivated is found only along the rivers. The strip of country between the eastern branches of the Andes and the Parana is more or less sterile and deserted, and even the western states are partly separated from each other by deserts. Large tracts in the interior are covered by volcanic ashes and pumice-stone. The southern plains are broken by several ranges of hills, some of which stretch 150 miles to the S. and S. W. of Buenos Ayres, and run from S. E. to N. W. Their elevation above the plain never exceeds 300 feet. Parallel to these are the Ventana Mountains, whose highest point is 3,500 feet above the level of the plain. These ranges mostly consist of granite, which in some parts is covered by quartz. In the lower diluvian strata many fossil remains of marine animals occur, which are also found occasionally in the mountains at a height of 14,000 feet. The next higher stratum to the one last mentioned is rich in fossil remains of extinct mammals of an enormous size, which have a striking resemblance to the present mammals of South America and Africa (e. g. the large armadillo, the giant sloth, the mastodon, fossil horses). The mountains, especially the Aconquija Cordilleras, which separate Tucuman from Catamarca, are rich in valuable metals, especially in gold, silver, and copper. In the Famatina range, in the province of Rioja, much iron ore is found. In the Gran Chaco it was ascertained by the expedition of Porter Cornelius Bliss in 1863 that the ground is covered for miles around with iron, which contains about 10 per cent. of nickel. A piece of this, weighing about 1,400 lb., was taken to the British Museum. Up to the present time, however, the republic imports the iron it uses from Europe. In the southwestern provinces extensive coal-fields have been discovered, while sulphur, alum, etc., are found in large quantities in the Andes.

Rivers, Lakes, and Swamps.—Almost all the rivers which come down from the Andes, the southern slope of the central Brazilian ranges, and the heights forming the watershed of Buenos Ayres, unite to form the Rio de la Plata, which has a wider mouth than any other river on the globe. Between the capes San Antonio and St. Mary it has a width of 170 miles; 50 miles farther up stream, at Montevideo, it has narrowed down to 75 miles, and the water becomes fresh. At Buenos Ayres, 150 miles farther up, the low shores can not be seen from the middle of the river. The current can be noticed as far as 100 to 200 miles out in the ocean, although the depth of the river is not very great. Above Montevideo, which is the only good port on it, its navigable channels are so obstructed by sand-banks that vessels of light draught, which go to Buenos Ayres, are compelled to anchor from 6 to 9 miles from the city. Even small boats have such difficulty in getting ashore that the passengers are generally landed by means of wagons with very high wheels. The chief branches of which the La Plata is formed are the Parana (with its affluent, the Paraguay) and Uruguay, which are respectively navigable for steamers for 1,000 and 250 miles. Many of the eastern tributaries, especially the Rio Vermejo and the Rio Salado, are navigable for smaller vessels for 400 to 500 miles. The smaller tributaries coming from the E. are generally unsuited to navigation by reason of their strong currents. Those coming from the Andes, however, slowly wend their

way through the endless plains, and are of the greatest importance for commerce. The rivers of the interior which do not belong to the system of the La Plata are mostly unimportant, as they are lost in swamps or temporary lakes, or entirely dry up in summer. These temporary lakes, lagoons, and swamps are found in great number, and are sometimes of considerable extent. Those to the E. of the Parana and Parana generally contain fresh water, while those W. of these rivers are brackish, almost without exception. Among the former the lake of Ybera in the province of Corrientes is the most important. Those to the W. of the great rivers usually dry up at the end of the rainy season, and leave the ground covered with a crust of saline matter several inches in thickness. The salts are of different kinds. In the plain around Fort Melincue, W. S. W. of Buenos Ayres, sulphates of magnesia are found which yield a profitable article of commerce. Good cooking-salt is found in large quantities S. of Buenos Ayres and in the neighborhood of San Luis.

Climate.—The most prominent characteristic of the climate of the Argentine Republic is extreme dryness. Although the territory W. of the Parana has plenty of rain, still the plains in the interior suffer extremely from drought, because the S. W. winds, being stopped by the Andes, discharge their rain in Chili, and the eastern equatorial winds have already exhausted their rain at the tropic. Buenos Ayres and the country immediately surrounding are often exposed to warm N. winds, which come down the valley of the Parana loaded with vapor. The mean temperature of Buenos Ayres is 64° F.; the mean for the summer 72°, for the winter 52°. In many places a warm and a cool season can be distinguished, the former lasting from October to May, the latter from May to September. The time of the change from one to the other is the chief rainy season. The heavy thunder-storms, sometimes accompanied by hail-storms, often produce very sudden changes of temperature. Nevertheless, the climate is very healthy. This is partly due to the pampero, a strong S. W. wind coming from the Andes. Also the nights, which are cool throughout the year, and which tend to make the heat of the day less felt, contribute much toward this end. In the plains of the interior the hot zonda, the strong and lasting N. wind, is very much dreaded. The republic has a well-organized meteorological service, and its climate has been studied with more care than that of any other South American country.

Animal and Plant Life—Products.—With very few exceptions, the animals of the present day have the same characteristics as the gigantic fossils found in the country, except that they are considerably smaller. The animal peculiar to the plains is the llama. The vicuña, related to the llama, is hunted in the W. Of other wild animals are found the puma, the tapir, the capibara, and the ounce. Among the birds the birds of prey, as the condor and the Caracara vulture, are especially numerous. The American ostrich and different kinds of humming-birds and parrots are also often met with. The vegetation of the plains of the La Plata is poor. Even in Entre Rios the lack of wood is often seriously felt. To the S. clumps of willows are found here and there. But the shores of the Parana are covered with beautiful forests, and both toward the tropics and the Cordilleras the vegetation becomes varied and luxuriant. The most characteristic plants of the Gran Chaco, as well as of the pampas, are mimosas and cacti, and not until the foot of the Cordilleras in Salta and Mendoza is reached are palms and the other ornaments of tropical forests met with. The native plants and animals of these regions are, however, mostly superseded by naturalized species. The apple-tree, which at the present day forms large woods in the S. of Chili and toward the sources of the Rio Negro, has been transplanted by the Indians farther N. on the eastern slopes of the Cordilleras. The peach-tree is largely cultivated on the islands at the mouth of the Parana. A wild species of artichoke and impenetrable thickets of thistles cover the ground for miles to the W. and N. W. of Buenos Ayres. Wine is extensively grown in Mendoza and La Rioja.

Agriculture, Industry, Trade.—It is only in late years that agriculture has been generally introduced, especially in the coast provinces. In the region of the Andes, where the ground is more easily irrigated, considerable wheat, wine, and fruits of all kinds have been produced for a long time. At present wheat, corn, oats, and other grain and vegetables are cultivated on a large scale. Sugar-cane, tobacco (especially in Corrientes and Tucuman, but also in Salta and Catamarca), cotton, peanuts, and flax are also cultivated,

but many of these plants are of comparatively recent introduction. Less than 1 per cent. of the total area is under cultivation. Cattle and sheep breeding, the old national occupation, is much more important than agriculture. The natives had at the time of the discovery no other domestic animal than the llama or guanaco. Mendoza introduced the horse in 1536; in 1550 goats and sheep were brought from Peru; in 1553 the ox was brought from the coast of Brazil. From these importations have descended the millions of cattle which now roam over the plains of the republic. The breeds are almost all good. The sheep have been greatly improved. In recent times the breeders of cattle have suffered considerable losses, as, in consequence of the high tariff of the U. S., they have no market for their products. Wild cattle are no longer to be found. All are inclosed, though often in very large ranges. The large *estancias* of former times are becoming things of the past, and they are cut up more and more into smaller estates. While the price of land has risen considerably (in some places it has doubled within twenty years), the increase of the cattle has been so large that the supply exceeds the demand largely, and manure is made of the unsold meat. About 3,000,000 hides of cattle are exported annually, and in the large slaughter-houses (*saladeros*) 310,700 cattle were killed in 1899. The herds of horses seem to diminish gradually, but are still so large that 250,000 horse-hides are annually exported. The pampa horse is small and of coarse build, but excels in fleetness and endurance. It roams about in herds of 6,000 or 8,000, and is caught by the gauchos with the lasso or the bolas. Mules are raised in large numbers, and are exported to Peru and other places. General industry and manufactures are unimportant in the La Plata states. The manufacture and export of "Liebig's extract of meat" is extensive. Besides this, tanning and the soap manufacture are carried on on a large scale. Valuable embroidered cloths, wearing apparel, gorgeous blankets, and ponchos are made of the finest wool. The Indian women of the S. also make wonderfully fine quilted ponchos, belts, horse-blankets, and harness. A laborer is paid from \$1 to \$3 in gold per day.

The commerce with the interior is unimportant: that with Chili and Bolivia is of more consequence. To these countries oxen, mules, and asses are exported in large numbers. The commerce by sea is about twenty times as large as that by land. It is limited almost entirely to Buenos Ayres and Rosario. The river-ports, Santa Fé, Parana, Corrientes, Gualeguay, Concepcion, and Concordia, supply themselves from Buenos Ayres. The inland trade is to a great extent carried on by caravans of thirty or forty wagons. The articles of export are, besides those obtained from the herds of cattle, horses, and sheep, chiefly ostrich feathers, Patagonian and artificial guano, furs, honey, copper, gold and silver bars. The development, however, of the vast resources of the country can as yet hardly be said to have commenced. Its greatest wealth is still represented by the herds of cattle and sheep which graze upon its plains. The manufactures and luxuries imported into the country are paid for with the proceeds from the flocks. The total exports amounted in 1899 to \$185,000,000, and the imports to \$117,000,000, both in gold dollars. The number of vessels entered in 1898 was 10,198, of 6,555,128 tons, of which 6,866, of 5,928,765 tons, were steamers, and 3,332, of 626,363 tons, sailing vessels. Of the exports 48 per cent. were animals or their products, 23 per cent. agricultural produce, 9 per cent. manufactures, and only $\frac{1}{10}$ of 1 per cent. mineral products.

In 1897 the post-office carried 110,217,576 letters and 80,289,287 newspapers and other packets. The length of railway in 1898 was 9,885 miles, carrying 16,044,389 passengers and 9,001,559 tons of freight. In 1898 there were 25,345 miles of Government telegraph line. A submarine telegraph from Buenos Ayres to Montevideo has been in operation since 1866. Buenos Ayres has now complete communication with Europe by telegraph.

Inhabitants.—The native tribes are divided into three different groups: 1, the Araneanians, who are found as far N. as the Rio Salado; 2, the Quichnas, who were formerly subject to the Incas of Peru, and spread E. of the Cordilleras as far as Santiago; 3, the Guaranis, who formerly ruled the Rio de la Plata region. These races were among the most civilized of the aborigines when first found, and have blended somewhat (the Guaranis especially) with the Spaniards, this mixed race constituting the larger part of the indigenous population of the republic. The number of the foreign-born population is very large. The number of im-

migrants amounted in 1888 to 155,632; in 1889, 289,014; in 1890, 138,407; in 1898, 95,190. Most of the immigrants are from Spain, France, and Italy.

Manners and Customs.—In Buenos Ayres, where the foreign population gains the ascendancy more and more, European dress and manners have been rapidly naturalized. The lower classes, which are chiefly mestizoes and half-breeds, combine the inclination of the higher classes for gaming and a dissolute life with the plain and rough mode of living of the gaucho of the pampas. The gaucho wears a jacket of coarse cloth or sheepskin, and pantaloons of the same stuff, which are open from the knee down. His poncho is a square piece of cloth with an opening in the middle for the head. His ornaments consist of spurs with large silver rowels, and a large knife, with the handle inlaid with silver, which is carried in the belt. The women are dressed almost exactly like the men, only they have the neck and arms bare. The rancho or hut of the gaucho consists of a trellis-work of brushwood, which is covered with mud. The roof is covered with straw or cow-hides, and in the place of a door is a horse-hide. The food of the gaucho consists almost entirely of meat and water. From 1850 to 1860 there was 1 marriage for every 140 inhabitants, 1 birth for every 22, 1 death for every 44, and 5 children for every family; one-fifth of all the children are illegitimate. The mean length of life in the country and the smaller cities is 40 years. Since 1780 the population has almost quadrupled itself. The predominating religion is the Roman Catholic; Protestants are only found among the immigrants. Under the Archbishop of Buenos Ayres are the Bishops of the Littoral (with his seat in Parana), of Cordova, of Cuyo (San Juan), and of Salta. There are very few monasteries, but a large number of nunneries. Since the accession of President Sarmiento much has been done to improve the education of the people. In 1887 there were 3,028 elementary schools with 6,241 teachers and 227,450 pupils; there were in 1885 15 lycées with 369 professors and 3,189 pupils; also 2 universities, a school of mines, 2 colleges of agriculture, a naval and a military school, 15 normal schools for females and 6 for males, a national observatory, a national museum, and a meteorological bureau. In 1886 the general Government and the 14 provinces contributed \$3,467,240 to the support of elementary education. In 1869 Congress passed a law that the new civil code (*codigo civil*) compiled by Dr. Sarsfield, at that time Minister of the Interior, was to be introduced throughout the whole republic on Jan. 1, 1871.

Constitution.—The constitution was adopted May 11, 1853, and was revised in 1860 and 1862. This is now nearly identical with that of the U. S. At the head of the republic is a President, elected for a term of 6 years by representatives of the 14 provinces. Congress consists of a House of Deputies with 86 members, and a Senate with two members for each province and the capital. In 1862 Congress transferred the seat of government to Buenos Ayres, and introduced several clauses into the constitution with regard to the relations of the city to the Confederation. The province of Buenos Ayres elects its own governor, but the city is under the direct jurisdiction of the President and Congress. The judiciary is entirely independent. There are a supreme court and tribunals in every state. The freedom of the press, of association, of education, and free disposition of property, as well as equality before the law, is guaranteed to everybody. The "provinces" are really states. The Roman Catholic religion is recognized in the constitution as that of the state, but all creeds are tolerated.

Army, Navy, and Finances.—The army consisted in 1891 of 1,129 officers with 789 artillery, 2,227 horse, and 2,331 foot. The militia comprises 236,000 men, besides 68,000 reserves. The navy includes several modern-built and ironclad vessels, and has 1,530 officers and men. In 1899 the financial position was as follows: Debt, \$449,680,000; revenue, \$107,096,000; expenditure, \$134,123,671. The paper dollar, which forms a large part of the currency, was worth 27½ cents in gold. A law of national banks similar to the banking law of the U. S. was published Nov. 3, 1887.

Weights and Measures.—The metric system is established by law, but the old Spanish weights and measures are still in use.

History.—The La Plata was discovered by Juan Diaz de Solis in 1516, who took possession of the country for the crown of Spain. Buenos Ayres was founded by Don Pedro de Mendoza, who became governor in 1535. The city was not, however, firmly established against the attacks of the

Indians until after its third rebuilding in 1580, and after Santa Fé, Mendoza, and other cities in the interior had been founded. The government of the countries of the La Plata was subject to the Viceroy of Peru until 1778, in which year a vicerealty was formed of the provinces of Rio de la Plata, Paraguay, Uruguay, and Bolivia, with Buenos Ayres as its capital. After 1806–07 Buenos Ayres and Montevideo were for a short time in the hands of the British, who, however, were not able to hold them. Soon after liberal ideas began to gain ground. The viceroy was expelled, and on May 25, 1810, a *junta gubernativa* was installed. Cordova, Paraguay, and Uruguay, however, did not recognize this junta, and a long succession of civil wars ensued. Soon after the districts in the interior also joined the Confederation. In 1813 a constituent assembly met in Buenos Ayres, the Spanish flag was given up, and the republic issued its own coin. In the previous year Montevideo, which had remained longest connected with Spain, had been taken. In 1816 the representatives of all the provinces assembled in congress at Tucuman, declared the La Plata states independent, and appointed Gen. Pueyrredon dictator of the republic. The Spanish troops were severely defeated at Chacabuco in 1817, and at Maypu in 1818. The last and decisive victory was gained in 1821. In the meanwhile the republic was the scene of serious encounters between several ambitious leaders. In 1825 the "Unitarians" (who favored a strong central government) succeeded in restoring unity and established a new constitution. But Rivadiva was their only President. Juan Manuel de Rosas, the leader of the gauchos, in connection with other malcontents, forced him to resign, and caused Dorrego to be elected governor of Buenos Ayres. After a counter-revolution under Lavalle, which was for a time successful, Rosas was elected governor in 1826, in which position he remained for six years. In 1835 he declined a re-election, but accepted the position of dictator of the republic with unlimited powers, which he held until 1852. During this entire period Congress did not assemble. The civil wars nevertheless continued uninterruptedly. The independence of Uruguay, which had assumed the title of "República Oriental del Uruguay," had been recognized in 1828. But Rosas did not relinquish his plans. He assisted Governor Oribe, while France took sides with his rival, Rivera. Peace was concluded in 1840, but in 1845 new difficulties arose, which led to an armed intervention of France and England. They blockaded Buenos Ayres and occupied the island of Martin Garcia, but were compelled to recall their fleets the next year. The provinces of Corrientes and Entre Rios seceded from Rosas soon after, and on Feb. 3, 1852, he was defeated by the united forces of Brazil, Uruguay, Paraguay, and Urquiza, the head of the opposition, in the battle of Monte Caseros, in consequence of which he was compelled to fly to England. After a short administration of Vincente Lopez, Urquiza declared himself President, and recognized on June 23, 1852, the independence of Paraguay. In September another revolution took place, and Buenos Ayres resolved to secede from the Confederation. In the meanwhile Congress had adopted a new constitution (May, 1853), and Urquiza was elected President. Buenos Ayres remained independent, but consented to the conclusion of two treaties in Dec., 1854, and Jan., 1855. The attempts at a reunion were not suspended, but several difficulties caused the suspension of the treaties. A war followed, and Buenos Ayres was defeated. Urquiza gained a victory at Cepeda on Oct. 23, 1859, and by the treaty of peace of San José de Flores of Nov. 10, 1859, and the union of Parana, Buenos Ayres again entered the Confederation. In 1861 new difficulties arose on account of taxation, and Gen. Mitre completely defeated the federal troops on the Pavon (a small tributary of the Parana) on Sept. 17, 1861. The President, Santiago Derqui, resigned in consequence of this, and Gen. Mitre was appointed President *pro tem.*, with the direction to call a Congress on May 25, 1862, at Buenos Ayres. Mitre was elected President of the reunited Confederation on Dec. 14 of the same year. In 1866 great dissatisfaction arose in several provinces in consequence of the war with PARAGUAY (*q. v.*). In several places, as Mendoza and Catamarca, serious disturbances arose, which were secretly encouraged by Peru, Chili, and Bolivia. In 1867 the disturbance, under the command of Videla, began to assume serious proportions in Mendoza, and even extended to La Rioja and San Juan. Gen. Pannero, although not till Mitre had joined him with 4,000 men, completely defeated the insurgents, and triumphantly entered Mendoza on May 14. Both houses of Congress passed a resolution to transfer the seat of government to Rosario, which was, how-

ever, vetoed by the President. In 1868 Sarmiento was elected President for a term of six years. Since that time the country has been rapidly increasing in prosperity. In 1870 a rebellion broke out in Entre Rios, at the head of which was Gen. Lopez Jordan, a son-in-law of Urquiza. This old patriot was murdered by the rebels in his palace at San José. The rebellion, although rapidly gaining, was opposed by almost all the other states. On Sept. 23 Jordan was completely routed at Santa Rosa, and lost all his infantry and artillery. In April, 1871, he was again completely defeated, and the rebellion was suppressed. In Mar. and Apr., 1871, the city of Buenos Ayres was visited by the yellow fever, and suffered terribly from its ravages. The citizens and the Government did their utmost to prevent its spread, but still the total of its victims was found to be 13,403—a figure which, although large, was still considerably below the estimate made by the press. In Feb., 1872, a revolution broke out in Corrientes, which, however, was soon ended. In Entre Rios, Lopez still continued to agitate in secret, but without success. On Jan. 1, 1872, a band of gauchos, under a Bolivian fanatic calling himself a *Dios medico* (God physician), entered the town of Tandil, and crying "Death to the Masons and Gringos!" massacred thirty-five persons. They were afterward captured; fourteen were put to death, fifteen imprisoned, and the *Dios medico* was shot by the populace.

In April, 1872, Gail Jordan was reported to be on the frontier of Brazil, at the head of 2,000, intending to revive the dream of Artigas and Urquiza concerning the establishment of an independent republic, to consist of the Argentine provinces of Corrientes and Entre Rios and the republic of Uruguay. At the beginning of the year the border provinces had to suffer from a new invasion of the Araucanian Indians under their chief Calfucura. In May, 1873, the province of Entre Rios was once more invaded by Lopez Jordan. Dr. Avellaneda became President in 1874, and served six years; in Sept., 1880, Gen. Roca was elected President, after another rebellion; Dr. Miguel Juarez Celman was elected President for six years, June 13, 1886. By treaty with Chili in 1881, all the country E. of the eastern crest of the Andes, including most of Patagonia and a small part of Terra del Fuego, was conceded to the Argentine Republic.

The enormous issues of paper money, and the improvidence and mismanagement of the administration of President Celman, caused a revolution, which began July 26, 1890. It began among the troops, was favored by the Unión Civica, a party opposed to financial excesses, and was soon joined by the navy. The fighting lasted several days, and President Celman remained master of the field, but public opinion forced him to resign on Aug. 5, 1890. Gen. Pelligrini, the Vice-President, became President on Aug. 9, and public confidence was restored. In Oct., 1891, the old National Bank was placed in liquidation, and a new bank was created with a capital of \$50,000,000. The financial crisis involved among other disastrous consequences the failure of the celebrated banking-house of Baring Brothers, London. Dr. Saenz Peña succeeded President Pelligrini in April, 1892. His administration was marked by several serious revolutions, and on Jan. 22, 1895, he was forced to resign, and was succeeded by Z. S. Uriburu. Gen. Julio A. Roca was inaugurated President, Oct. 12, 1898. The western boundary is a source of constant dispute with Chili, and in 1893, 1896, and 1898 almost led to war between these countries. By mutual agreement, Sept. 22, 1898, the question was submitted to the arbitration of the British Government.

LITERATURE.—Compare, besides the works of Nuñez, King, Mansfield, and Page, André's *Buenos Ayres und die Argentinischen Provinzen* (1856); Mannequin's *Les provinces argentines et Buenos Ayres* (1856); De Moussy's *Description géographique et statistique de la Confédération Argentine* (1861 and 1864); Burmeister's *Reise durch die La Plata Staaten* (1861); Ford's *La République Argentine* (1867); Trelles's *Registro Estadístico* (1867); L. Beck Bernhard's *Le Rio Parana, etc.* (1865); Mouchez's *Nouveau Manuel de la navigation dans le Rio de la Plata, etc.* (1865); Schnepf's *Mission Scientifique dans l'Amérique du Sud* (1864); the *Annales del Museo público de Buenos Ayres*, published yearly by Burmeister since 1864; Dominguez's *History of the Argentine Republic*, translated by G. Williams (1866); M. G. and E. T. Mulhall's *Handbook of the River Platte* (1869); Wappäus's *Argentinische Republik*, in Stein and Hörchelmann's *Handbuch der Geographie und Statistik* (7th ed. 1863-70); Hudson, *The Naturalist in La*

Plata (London, 1892); Turner, *Argentina and the Argentines* (1892); and Brackebusch's map (1891). Also, reference can profitably be made to the Argentine official publications, which are numerous and valuable; to the numerous Consular Reports; and to the *Handbook of the Bureau of American Republics* (2d ed. Feb., 1891). See also the article SPANISH-AMERICAN LITERATURE.

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Ar'ges: a genus of small fishes of the family *Siluridae*, said to be thrown out sometimes from some South American volcanoes (16,000 feet or more above the sea-level) with hot, muddy water. One species, now called *Arges cyclopus*, has been described by Humboldt.

Argillite: See SLATE.

Ar'gives, or Argi'vi: the inhabitants of Argos and of Argolis, a state of ancient Greece. The name was also used by Homer and other ancient authors as a generic appellation for all the Greeks.

Ar'go: an extensive southern constellation named after the ship of the ARGONAUTÆ (*q. v.*). It is usually divided into four: Argo, Argo in Carina (in the keel), Argo in Puppi (in the stern), and Argo in Velis (in the sails). Canopus belongs to this constellation, part of which is invisible in our latitude.

Ar'gol: crude tartar; a salt which is deposited by wine in crystalline crusts on the interior of vats, barrels, and bottles. Being less soluble in alcohol than in water, the increasing proportion of alcohol during fermentation causes it to separate. It consists chiefly of potassic bitartrate, $\text{KHC}_4\text{H}_4\text{O}_6$, but contains also variable quantities of calcic tartrate, coloring, and mucilaginous matter. It is purified by solution in hot water, clarification by the addition of clay, and recrystallization. By repeating the process it becomes white, and is then sold under the name of *cream of tartar*, and extensively used in connection with sodic bicarbonate for raising bread. Cream of tartar is shamefully adulterated with gypsum, flour, etc., many samples containing two-thirds or more of such fraudulent admixtures. Argol is used for the preparation of tartaric acid, Rochelle salt, and potassic carbonate, or *salt of tartar*.

Ar'golis (Gr. Ἀργολίς): a state of ancient Greece, in the N. E. part of the Peloponnesus (Morea), bordering on the sea. It consists partly of a peninsula between the *Saronicus Sinus* (Gulf of Ægina) and the *Argolicus Sinus* (Gulf of Nauplia). It was bounded on the S. by Laconia and on the W. by Arcadia. The surface is diversified by mountains, which are about 5,000 feet high. Near the sea is the large plain of Argos, which is rendered unhealthy by marshes. Argolis was one of the most famous and powerful states of ancient Greece, and was the scene of many memorable events or myths in the heroic ages. Here Hercules was born, and the descendants of Pelops reigned. The inhabitants were called ARGIVES (*q. v.*). The chief towns were Argos, Mycenæ, Epidaurus, Hermione, Sicyon, and Trœzene, each of which was a separate kingdom. ARGOLIS AND CORINTH is the name of a nomarchy of modern Greece. Area, 1,447 sq. miles. Pop. (1889), 144,836. Capital, Nauplia.

Argon: a gas, somewhat heavier than nitrogen, found in the air in 1894 to the extent of less than one per cent. by Lord Rayleigh (see STRUTT) and Prof. Ramsay. It can be obtained (1) by passing air over heated copper, which combines with the oxygen, and then over heated magnesium, which combines with the nitrogen, leaving the argon; (2) by mixing air with oxygen, and passing electric sparks through the mixture contained in a vessel over an alkali. Its most marked property is its inactivity, to which it owes its name. It is not known whether it is an element or not. I. R.

Argonaut: a mollusk of the genus *Argonauta* and class *Cephalopoda*; commonly called "paper nautilus." The latter name is derived from the fragile nature of the boat-like shell in which the argonaut floats on the surface of tranquil seas. The shell is not chambered like that of the true nautilus, but has one spiral cavity, into which the animal can retire and be completely hidden. There is no organic connection between the body of the animal and its shell; the latter being formed as a secretion from the two broadly expanded dorsal arms, and thus not comparable to the shell of other mollusks. The shell is formed in the female only, and is for the purpose of protecting the eggs. Several species of *Argonauta* are known. They have eight arms, two of which are expanded into broad membranes. The latter were formerly believed to be sails, and the other arms were regarded as oars; but, though the fable is perpetuated

by the poets, it has long been known that the animal really propels itself by ejecting water from its funnel. It is a



Argonaut within its shell.

pelagic form, coming to the surface during the breeding season, at other times living on the bottom.

Revised by DAVID S. JORDAN.

Argonau'tæ (Gr. Ἀργοναῦται, i. e. the sailors of the Argo), in English **Ar'gonauts**: the famous Greek heroes who, according to tradition, lived before the Trojan war, and acquired celebrity by an adventurous navigation of unknown seas. This is the most ancient voyage of discovery mentioned by classic poets or historians. They derived their name from the ship Argo, in which, under the command of Jason, they performed the expedition to Colchis, on the Euxine, in order to recover the Golden Fleece, which was guarded by a sleepless dragon. Among the Argonauts were Hercules, Theseus, Castor, Pollux, and Orpheus. In the course of the voyage they landed at several points and passed through many perilous adventures. Among the obstacles which they encountered were the enmity and treachery of Æetes, King of Colchis, but they were aided by his daughter Medea, a powerful sorceress, and finally carried off the Golden Fleece.

Ar'gos: an important city of ancient Greece; situated in Argolis; about 3 miles from the *Argolicus Sinus*, or Gulf of Nauplia. It was considered the oldest city of Greece, and was supposed to have been founded by Inachus, the father of Io, about 1500 B. C. It was a famous city in the heroic age, and at the time of Trojan was the capital of Diomedes. Argos was the head of a league of Doric cities before Sparta acquired the supremacy in the Peloponnesus. Its site is occupied by a small modern town of the same name, 6 miles N. N. W. of Nauplia. Here are remains of ancient cyclopean structures, among them those of the theater and an extensive aqueduct.

Argos: town; Marshall co., Ind. (for location of county, see map of Indiana, ref. 2-E); situated at junction of Erie and Western and N. Y. C. and St. L. R. Rs.; 8 miles from Plymouth. Furniture, flour, and lumber are here manufactured. Pop. (1880) 622; (1890) 1,101; (1900) 1,307.

Argot, ar'gō: a word of uncertain derivation, applied in France to a peculiar language or gibberish invented for purposes of concealment by those whose pursuits make them dread the arm of the law. In all the countries of Europe a language of this kind prevails, and has prevailed perhaps to some extent from immemorial time. In England it is called "thieves' Latin," "St. Giles's Greek," "peddler's French," "flash," and other names; in Italian, "zergo" (or "gergo") and "furbesco" (from *furbo*, a rogue); in Spanish, "Germania"; in Germany, "Rothwelsch" or "Rothwälsch." An able French writer, M. Nodier, remarks that "argot, a language invented by thieves, often sparkles with imagination and wit." The following examples may serve to illustrate the truth of the foregoing remark: *Apôtre* ("apostle") applied to the fingers, because they are "sent forth." *Sans feuille* ("without leaf"), the "leafless" tree—that is, the "gallows." *Epouser la veuve* (to "marry the widow"), to "be hanged"; implying that those who had previously been joined in the same marriage were deceased. *Aspic*, (an "asp," or poisonous serpent), a "slanderer." *Sancho Panza*, "justice of the

peace," in allusion to Sancho Panza having been under Don Quixote magistrate of the isle of Barataria. *Sanglier* (a "boar," an animal having long teeth), applied to priests, in allusion to their frequent fasting; the phrase "having long teeth" was equivalent to "being very hungry." Sometimes the principle on which the word (in argot) is formed is a mere resemblance of sound: thus *arsenic* is used for "arsenal." In a somewhat similar manner *solir* is used for *ventre* ("belly"), because *sollir*, "to sell," in argot signifies the same as *vendre*, which resembles *ventre* in sound. Considerable attention has of late years been paid to the study of argot. Francisque Michel has written a large volume on argot (Paris, 1856), which is said to be by far the most complete work on the subject. Several distinguished novelists, including Bulwer, Dickens, and Victor Hugo, have introduced frequent specimens of this language into their works; it may suffice to refer the reader to *Pelham*, *Paul Clifford*, *Oliver Twist*, and *Les Misérables*.

Argout, ANTOINE MAURICE APOLLINAIRE, Count d' (an-twan mō-rēs' a-pol-in-âr dar-goo'): b. at Veissilien (Isère), Sept. 27, 1782. He became prefect of Gard in 1817, and a peer of France in 1819. In July, 1830, during the revolution, he negotiated between the popular party and the king, from whom he obtained concessions, but it was then too late. He was appointed Minister of Commerce in 1831, Minister of the Interior in 1833, and governor of the Bank of France in 1834. He retained that office many years. D. in Paris, Jan. 15, 1858.

Arguelles, ar-gwel'yēs, AUGUSTIN: a liberal Spanish statesman; b. at Ribadesella in the Asturias, Aug. 28, 1776. He was elected to the Cortes, and was a member of the committee which produced the liberal constitution of 1812. He gained distinction as an orator, and became very popular with the liberal party. On the restoration of Ferdinand VII., in 1814, he was imprisoned for several years, but was released by the revolution of 1820. He was Minister of the Interior for several months in that year, and was an exile from 1823 to 1832. After that date he was a leader of the moderate party in the Cortes, and in 1841 was appointed tutor to the young Queen Isabel. D. in Madrid, Mar. 23, 1844. See Evaristo San Miguel, *Vida de D. A. Arguelles* (1850).

Ar'gument: a reason offered for or against a proposition, opinion, etc.; a series of reasonings; a debate or disputation. In logic, an expression in which, from something laid down as granted (i. e. the premises), something else (i. e. the conclusion) is to be deduced. "Socrates," says Addison, "introduced a catechetical method of arguing. He would ask his adversary question upon question, until he had convinced him out of his own mouth that his opinions were wrong. . . . Aristotle changed this method of attack, and invented a great variety of little weapons called syllogisms. As in the Socratic way of dispute you agree to everything which your opponent advances, in the Aristotelic you are still denying and contradicting some part or other of what he says. Socrates conquers you by stratagem, Aristotle by force. . . . When our universities found there was no end of wrangling this way, they invented a kind of argument which is not reducible to any mode or figure in Aristotle. It was called the *argumentum basilinum* (others write it *bacilinum* or *baculinum*), which is pretty well expressed in our English word *club-law*. When they were not able to confute their antagonist, they knocked him down." (*Spectator*, No. 239.) In the tables used in the exact sciences, the term *argument* signifies the leading numbers, or quantities, arranged in order at the top or sides to guide to the tabular number sought.

Argumen'tum ad Hom'inem (i. e. an argument [applied] to [the particular] man [one is addressing]): an argument derived from the principles or conduct of an antagonist, or an appeal to the prepossessions or prejudices of a person to whom the argument is addressed.

Ar'gus (in Gr. Ἄργος): a fabulous personage who, according to an ancient Greek legend, had a hundred eyes, some of which were always awake. Having been employed by Juno to guard the heifer into which Io was transformed, he was killed by Hermes. Juno is said to have transferred his eyes to the tail of her favorite bird, the peacock. Another mythical Argus was King of Argos, and a son of Jupiter and Niobe.

Argus (named in allusion to the Argus of the Greek mythology, having a hundred eyes): a genus of gallinaceous birds remarkable for rich and brilliant plumage. The best

known species is the *Argus argus*, commonly called argus-pheasant. It is a native of Sumatra and other parts of the



Argus pheasant.

East Indies, and is about equal in size to a common barn-door fowl. Two of the tail-feathers of the male are about 4 feet long. The name argus is given in reference to the beautiful circular eye-like markings which adorn the plumage of the male, especially on the secondaries of the wings.

Argyle, or Argyll, DUKES OF: Marquesses of Lorne and Kintyre, Earls of Campbell and Cowal, Viscounts of Lochow and Glenilla, Barons of Inverary, Mull, Morven, and Tiry (1701), Earls of Argyll (1457), Barons Campbell (1445), Barons of Lorne (1470, in Scotland), Lords Sundridge and Hamilton (1766, in Great Britain).

Argyle, ARCHIBALD CAMPBELL, Marquis of: Scottish peer; b. in 1598; son of the seventh Earl of Argyle. In the civil war he fought against Charles I., and was a leader of the Scottish Covenanters. He was defeated in battle by Montrose in 1644. An adherent of Charles II., he took arms for him against Cromwell in 1651. After the restoration of 1660 he was convicted of submission to the usurpation of Cromwell, and was beheaded in Edinburgh, May 27, 1661.

Argyle, ARCHIBALD CAMPBELL, ninth Earl of: eldest son of the preceding; noted for his loyalty to the royal family, notwithstanding the fact that his father was a leader of the Covenanters. He fought for Charles II. at Dunbar in 1650, and when the Commonwealth was established he was imprisoned and was carefully watched till the Restoration. The estate of his father was restored to him, with the title of earl in 1663. When he took the test-oath, which was exacted in 1681, he added the phrase: "So far as consistent with the Protestant faith." For this offense he was imprisoned, tried for high treason, and condemned to death. The execution of the sentence being suspended, he escaped from prison, and, after remaining concealed for a while in London, fled to Holland, where he remained until the close of the reign of Charles II. He returned with a small body of armed men to Scotland on the accession of James II., to aid in the rising of the Duke of Monmouth, and was captured, and beheaded in Edinburgh, June 30, 1685.

Argyle, or Argyll, GEORGE DOUGLAS CAMPBELL, eighth Duke of: b. in Ardeneaple Castle, Dumbartonshire, Apr. 30, 1823; succeeded his father, the seventh duke, in 1847, before

which he was styled the Marquis of Lorne. He published in 1848 *Presbytery Examined*, in which he defends the Presbyterian system against prelacy. Having entered the House of Lords, he supported the Liberal party, and distinguished himself by his oratorical ability and soundness of judgment. He became Lord Privy Seal in 1852, and Postmaster-General in 1855. When the Tories obtained power in 1858 he resigned office, but he was reappointed Postmaster-General and Lord Privy Seal in 1860. In 1866 he published a philosophical work called *The Reign of Law*, one of the ablest of recent works advocating a theistic view of creation. He resigned with his colleagues in June, 1866, but was Secretary for India 1868-74; again was appointed Lord Privy Seal under Gladstone 1880, but resigned 1881 because of his differences with his colleagues on the Irish Bill. He married Elizabeth Gower, daughter of the Duke of Sutherland (d. 1878); married in 1881 the widow of Col. A. H. A. Anson. D. Apr. 24, 1900. His eldest son, the Marquis of Lorne, married H. R. H. the Princess Louise, daughter of Queen Victoria (1871), and was Governor-General of Canada 1879-83.

Argyle, JOHN CAMPBELL, second Duke of: b. Oct. 10, 1678; fought under Marlborough in 1706 in Flanders; defeated the Jacobites at Dumblane, Scotland, 1715; made an English peer 1718, with the title Duke of Greenwich. D. Oct. 4, 1743.

Argyle'shire, or Argyll (Gaelic, country of the Gael): a large county of Scotland; bordering on the Atlantic Ocean. It is bounded on the N. by Inverness-shire, E. by Perthshire and Dumbarton, S. and W. by the sea. It includes the islands of Mull, Islay, Jura, Tiree, Coll, Iona, Lismore, Colonsay, etc. Area, 3,270 sq. miles. The surface is rugged and mountainous, and presents some of the grandest and most picturesque scenery in Scotland. The highest peaks are Bidean nam Bian, 3,760 feet, and Ben Cruachan, 3,668 feet. The rocks which predominate here are granite, mica-slate, trap, limestone, and quartz. Long arms of the sea, called Loch Linnhe and Loch Fyne, extend into this county, which also contains Loch Awe, a fresh-water lake. The chief occupation of the farmers is the raising of cattle and sheep. The land is owned by a few proprietors, among whom are the Duke of Argyle and the Marquis of Breadalbane. Inverary and Campbellton are chief towns. Pop. (1901) 73,166. The United Diocese of Argyle and the Isles (Scottish Episcopal Church) comprises the counties of Argyle, Bute, part of Inverness, and the Hebrides. The see of Argyle was founded A. D. 1115, that of the Isles A. D. 1838.

Ar'gyro-Cas'tro (in modern Gr. *Arguron-Kastron*; Turk. *Ergree-Kastree*): a town of Albania, on the river Deropuli, 50 miles N. W. of Yánina (see map of Turkey, ref. 4-B). It is built on the steep declivity of a mountain. The best Turkish snuff is manufactured here. Pop. 11,000.

Argyrop'ulos, JOHANNES: b. in Constantinople in 1416; went early to Italy, where he contributed much to the revival of letters. He taught the Greek language and literature and Aristotelian philosophy at Padua 1434-56, Florence 1456-71, and Rome, where he died in 1473. Palla Strozzi, Politianus, and Reuchlin were among his disciples. He became a master of the Latin language, and translated several of the works of Aristotle directly from the Greek, thus finally displacing the mediæval translations which had come through the Arabic. Revised by A. R. MARSH.

Ari the Wise (Old Norse, *Ari Fróði*): "the father of Icelandic history"; b. in Iceland in 1067. He was a "goði" (chief), and was also in holy orders. Three works of his are mentioned: *The Book of Kings* (Konungabók), the *Book of Settlements* (Landnámabók), and the *Book of the Icelanders* (Íslendingabók). No one of these has come down to us in its original shape, and the *Book of Kings* is by many thought to be altogether lost, though Vigfússon holds that parts of it are preserved in the writings of Snorri Sturlason. The *Landnámabók*, which gives a record of the settlers of Iceland and of their descendants, is, in its present condition, the work of several hands; but the essential part of it is the work of Ari. It is a remarkable monument of genealogical labor. The *Book of the Icelanders* is preserved only in the form of an abstract. The *Kristni Saga*, a history of the conversion of Iceland, has also been ascribed to Ari. Ari is remarkable for his acumen and his power of historical criticism in an inaccurate and altogether uncritical age. His style served as a model for later Icelandic prose-writers. D. 1148. G. L. KITTEDGE.

A'ria [Ital. air < from Lat. **arius* for *aerius*, deriv. of *aër*, air]: in music, a rhythmical song, a tune, a measured lyrical piece for one or several voices; commonly applied to a song introduced into a cantata, opera, or oratorio, and intended for one voice supported by instruments.

Ariad'ne (in Gr. 'Αριάδνη): a daughter of Minos, King of Crete; became the lover of Theseus when he visited Crete. She gave him a clew of thread by which he was enabled to find his way out of the Cretan labyrinth. Her mythus is not uniform, but, according to one account, she was abandoned by Theseus at Naxos, and subsequently became the wife of Bacchus. Others say that Diana slew her at Naxos with her arrows. She bore twin sons to Theseus. Her name is given to the forty-third asteroid. See THESEUS.

Arial'dus: a deacon of the Church of Milan, noted for his zeal against the marriage of priests; was born in Lombardy. His preaching led to a schism in the Church, attended with violent tumults. Arialdus was killed June 28, 1066. See Muratori, *Annali d'Italia*.

Aria'na: the ancient name of a region in the west central part of Asia, inhabited by the Aryan or Arian race. It probably comprised ancient Persia and Bactriana.

A'rianism: the doctrines of the ARIANS (*q. v.*), who held that the Son was begotten of the Father, and therefore not eternal nor consubstantial with him, but created by and subordinate to the Father, though possessing a similar nature. See ARIUS.

Aria'no: a town of Italy, in Avellino, among the Apennines; 23 miles N. E. of Avellino, on a steep hill, 2,500 feet above sea-level (see map of Italy, ref. 6-F). It was founded by the Greeks, and was an important military post for many centuries. The district is volcanic, and the town suffered severely from earthquakes in 1456 and 1732. It is the seat of a bishop. It has a mountain-fortress, a fine cathedral, several churches, a gymnasium, a normal school, and considerable manufacture of silk. Wine and butter are exported. Pop. about 15,000.

Arians: friends and followers of Arius, and those who have from time to time held his or similar opinions (see ARIUS). After the death of Arius in 336, the strife between the Arians and Athanasians went on for nearly half a century in the Church, and after the councils of Constantinople and Chalcedon the Arians were a heretical sect till far into the seventh century. Eusebius of Casarea and Eusebius of Nicomedia, both Arians who had signed the Nicene Creed, were the principal opponents of Athanasius. The Emperor Constantius, who succeeded to the imperial throne in 337, inherited his father's sympathies with the Arian party, who would say that the Son was of the "same substance" with the Father, meaning of "like substance." In 360 the latter phrase was actually substituted for the former at the Council of Rimini, after which the controversy raged hotter than before, but complicated with other points of doctrine. The Arian doctrine had a great attraction for the Northern people pressing down upon the Roman empire. The Ostrogoths were unanimous in their adoption of it, and the Visigoths also, withholding their assent from the Nicene symbol until 589, when they declared for it at the Council of Toledo. The Vandals, the Suevi, and the Burgundians were all largely Arian, and the Lombards were the last to become orthodox. From the middle of the seventh until the middle of the sixteenth century there was no Arian party, and the individual Arians were unconscious of their lapse. The "adoption" heresy, by which certain Spanish teachers at the close of the eighth century endeavored to make their doctrine palatable to the Mohammedans, was more akin to the heresy of Nestorius than to that of Arius. Even when the Reformation period produced departures from the orthodox doctrine, they were not on Arian lines. Servetus certainly was not an Arian, for he wrote that Arius was "incapable of appreciating the glory of Christ"; "gloriæ Christi incapaximus." The Socini, Laelius, and Faustus were humanitarians in their Christology. Opinions of an Arian stamp were developed among the German Anabaptists, and passed over into England. The charge of Arianism was common in the seventeenth century, but investigation often shows that Socinianism is meant, as in the case of Bartholomew Legate, the Unitarian, who perished at the stake in 1611, and was the last person burned for heresy in England. Milton, and Locke, and Cudworth, and Sir Isaac Newton, and Isaac Watts were Arians with more or less decision. While the English Unitarianism of the eigh-

teenth century was generally Socinian (Richard Price, the friend of Franklin, against whom Burke wrote his *Reflections on the French Revolution*, was an exception), American Unitarianism in its earlier growth was generally Arian, though it may be doubted whether Channing or many of his coreligionists could have used the terms of Arius without qualification. But Christ was for them a unique being, of whose pre-existence they made cordial affirmation. Few if any Unitarians are now Arians, and there is a growing preference among them for the thought of Athanasius as compared with that of Arius, because the former insisted on the humanity of Christ, while the latter destroyed it altogether, making of Christ a being neither God nor man. But the modern Unitarian would make the particular of Athanasius a universal, declaring that all men are at once human and divine.

JOHN W. CHADWICK.

A'rias Monta'nus, BENEDICTUS: Spanish biblical scholar and Orientalist; b. in Estremadura in 1527. He was a member of the Council of Trent in 1562, and under the auspices of Philip II. edited a Polyglot Bible, which was published at Antwerp (1568-72, 8 vols. fol.), and is highly commended. He wrote, besides other works, *Jewish Antiquities* (1593). D. at Seville in 1598. See Lounmyer, *Vie de B. A. Montano* (1842); N. Antonio, *Bibliotheca Hispana Nova*.

Ari'ca: a maritime town of Chili; department of Tacna (see map of South America, ref. 6-C). It was formerly the principal port of Bolivia, and is yet the principal point of imports and exports for that country, Bolivia having the right of transporting goods across this strip of Chili in bond. A railroad extends to the town of Tacna. Pop., formerly put at 7,000, is now only 3,000 or 4,000.

M. W. II.

Arichat, ar-i-shat': a seaport; capital of Richmond co., Nova Scotia; on the south coast of Madame island, near the Gut of Canso, and on a small bay or inlet of the Atlantic; lat. 45° 28' N., lon. 61° W. (see map of Quebec, ref. 2-D). It owes its importance to fisheries. It is the seat of a Roman Catholic bishop. Pop., including West Arichat, about 2,500.

Aric'ia: an ancient and celebrated city of Latium, on the Appian Way, at the foot of Mons Albanus, 16 miles S. E. of Rome. It was an important town in the reign of Tarquin the Proud. The Aricians took part in a war of the Latins against Rome, which ended in their defeat at Lake Regillus, 498 B. C. Cicero speaks of it as in his time a wealthy and flourishing *municipium*. Here was a celebrated temple of Diana, and here is a beautiful lake called Lago di Nemi. The modern town, *La Riccia*, is on or near the site of the ancient Aricia.

Arid Region: that part of the U. S. in which the land is not sufficiently watered by rain for the successful cultivation of crops. It is approximately limited by the line of 20 inches mean annual rainfall, but in districts where the principal precipitation occurs during the agricultural season a less rainfall determines the limit. Between the arid region and the humid region—where rainfall meets the needs of agriculture—lies the sub-humid region, a belt of country in which ordinary farming is successful in relatively moist years, but fails in other years. The arid region includes the States and Territories of Montana, Wyoming, Colorado, Utah, Nevada, Arizona, and New Mexico, together with those parts of North and South Dakota, Nebraska, Kansas, and Northern Texas lying west of the 100th meridian, a belt of Southern Texas extending 100 miles from the Rio Grande, all of California south of the 37th parallel, the eastern half of Northern California, the eastern two-thirds of Oregon, the southeastern third of Washington, and nearly the whole of Idaho; a total area of about 1,340,000 sq. miles. In 1889 the irrigated portion of this amounted to about half of one per cent.

In this region are a few spots rendered fertile by perennial supplies of moisture from below, but in general agriculture is absolutely dependent on artificial irrigation. Fortunately, the face of the country is diversified by mountains, and the loftier of these receive in winter a supply of snow which does not melt until spring, and then nourishes streams which can be diverted to farms or neighboring lowlands (see IRRIGATION). Associated with the small rainfall is a dryness of the air, which causes rapid evaporation not only from bodies of water but from the leaves of plants. This is advantageous to irrigated plants, giving them a vigorous growth, but unfavorable to plants not supplied with water at the roots. The native vegetation is consequently scant. The lowlands

are destitute of trees, and but sparsely clothed with bushes and grass. See *Lands of the Arid Region*, by J. W. Powell (1878); 11th Ann. Rep., U. S. Geological Survey (part 2, Irrigation, 1891); 12th Ann. Rep., U. S. G. S. (part 2, Irrigation, 1892). See also articles DESERT and GREAT BASIN.

G. K. GILBERT.

Ariége, a'ri-āzh: a river of France; rises in the Pyrenees, flows nearly northward through the department of its own name, passing by Foix and Pamiers, and enters the Garonne a few miles south of Toulouse. Length about 90 miles.

Ariége: a department in the S. of France; bounded N. and W. by Haute-Garonne, E. by Aude and Busillon, and S. by Spain, from which it is separated by the Pyrenees. Area, 1,889 sq. miles (see map of France, ref. 9-E). The surface is mostly mountainous, the highest mountains being in the southern part. Among the highest summits are Montcalm, about 10,600 feet, and Serrère, 9,592 feet high. It is drained by the rivers Ariége and Salat. The soil of the lower lands is fertile. Here are rich iron mines, which furnish the chief article of export. It is subdivided into three arrondissements. Capital, Foix. Pop. (1881) 240,601; (1891) 227,491; (1896) 219,641.

Ariel: a word signifying lion of God, or altar of God; was sometimes applied to the city of Jerusalem (Is. xxix. 1). Among the Jews of a more recent date the name was given to a water-spirit.—ARIEL is also the name of one of the principal characters in Shakspeare's drama of *The Tempest*, where he is represented as a spirit of air.

Ariel Gazelle (*Gazella dorcas* or *arabica*): the gazelle of Western Asia, the true gazelle belonging to Northern Africa. The ariel gazelle is one of the most beautiful of antelopes, is 21 inches high at the shoulder, of a dark-fawn color, the belly white, with a black or brown band running along the flanks. It is a variety of the species to which the African gazelle belongs. It is hunted both for sport (by falconry) and for its flesh and skin, both highly prized. Gazelles are often hunted in *battue*, for they can not be successfully followed in the chase, their speed excelling that of the greyhound. They are great favorites in the East when tamed, and the beauty of their eyes is proverbial.

Aries [Lat., ram]: a sign of the Zodiac; the first thirty degrees of the Zodiac measured from the point at which the equator intersects the ecliptic—i. e. the vernal equinox. The sun enters this sign about Mar. 21. Aries is also the name of a constellation of the Zodiac which once coincided with that sign, but which now occupies the same place as the sign Taurus. Among the ancient Romans, *aries* was the name of a battering-ram—a machine with an iron head used to batter down the walls of besieged towns or forts.

Arikara: See CADDOAN INDIANS.

Ar'il: a membrane or peculiar covering of some seeds, formed by an expansion of the *funiculus* or of the placenta. Mace, for example, is the *aril* of the nutmeg. The aril never appears until after the seed is fertilized.

Arimaspi: a mythological one-eyed Scythian race which lived in continual warfare with treasure-guarding griffins.

Ari'on (in Gr. Ἀρίων): Greek musician and poet, who first gave the dithyramb (*q. v.*) an artistic form; was a native of Lesbos, and flourished about 625 B. C. Herodotus has preserved a curious legend, according to which he was returning from Lower Italy to Corinth by sea with much treasure, to get which the mariners resolved to kill him. Having obtained permission to play one tune, he threw himself into the sea, and was received on the back of a dolphin, which had been charmed by the music, and carried him to land. This dolphin is supposed to be the same as that which figures among the stars.

Arios'to, ΛΟΔΟΒΙ'CO: Italian poet; b. at Reggio, near Modena, Sept. 8, 1474. He was educated at the College of Ferrara, and afterward, in compliance with the wish of his father, studied law, which he disliked and soon abandoned. After the death of his father, who left many children younger than Lodovico, he devoted much time to the support and education of his brothers and sisters. His early lyrical poems procured for him the patronage of Cardinal Ippolito d'Este, whose service he entered in 1503. He was employed by this cardinal, and his brother, the Duke of Ferrara, in embassies to several Italian courts. In the intervals of his busy life he meditated and matured his great romantic poem, *Orlando Furioso*, which was published in 1516 and soon acquired universal popularity. In 1517 he entered the serv-

ice of Alfonso, Duke of Ferrara, in whom he found a liberal patron. He is said to have been a favorite associate of that prince, and to have enjoyed some ecclesiastical revenues. In 1521 he was appointed governor or commissary of Garfagnana, where he was required to enforce order among a turbulent and rude population addicted to brigandage and violence. In the latter part of his life he married privately a widow named Alessandra Benucci. He had continued to polish and revise his *Orlando Furioso*, of which he published an enlarged edition in 1532 in forty-six cantos. It was at once seen how fortunate the poet had been both in subject and in manner. The subject was the romantic history of Charlemagne and his peers, especially of Roland—a history which had first been elaborated in mediæval France and treated in a whole cycle of poems, some finely serious, like the *Chanson de Roland*, others trivial and tedious. From France the story had come to Northern Italy in the thirteenth century, and been enormously popular there, leading to the production of numerous works in verse and prose—some of them, like the famous *Reali di Francia*, long eagerly read by the lower classes. In the end of the fifteenth century the tradition had been taken up by two considerable poets—Pulci, in his *Morgante Maggiore*, and Boiardo in his *Orlando Innamorato*—who had treated it, the one grotesquely, the other satirically. Ariosto, who perhaps had never seen Pulci's work, frankly used Boiardo's as the basis of his own, continuing the story from the point where Boiardo stopped. He used a different manner, however; and though his irony continues the satiric strain of his predecessor, he manages to give his poem, as a whole, a certain loveliness of style which makes what is most fantastic in character or action yet plausible and interesting. He also produced, in Italian, five comedies in verse, seven satires formed on the Horatian model, a number of sonnets, and some Latin poems. "Ariosto," says Hallam, "has been, after Homer, the favorite poet of Europe. His grace and facility, his clear and rapid stream of language, his variety and beauty of invention, his very transitions of subject, so frequently censured by critics, but artfully devised to spare the tediousness that hangs on a protracted story, left him no rival in general popularity." D. at Ferrara, June 6, 1533. See Barrotti, *Vita di L. Ariosto* (4 vols., 1766); Carl L. Fernow, *Lebenslauf L. Ariosto's des Göttlichen* (1809); Bolza, *Manuale Ariostesco* (1866); Ferrazzi, *Bibliografia Ariostesca* (1881); Crescini, *Orlando nella Chanson de Roland e nei poemi del Boiardo e dell' Ariosto* (1880); P. Rajna, *Le Fonti dell' Orlando Furioso* (1876); A. Panizzi, *Boiardo, Orlando Innamorato; Ariosto, Orlando Furioso*: edited, with an essay *On the Romantic Narrative Poetry of the Italians* (London, Pickering, 1830); G. Carducci, *Delle Poesie latine edite e inedite di L. Ariosto* (1875). Revised by A. R. MARSH.

Ariovis'tus: a chief of the ancient Suevi or Marcomanni; was a German. Solicited by the Sequani to aid them in a war against the Ædui, he marched (72 B. C.) with an army into Gaul, and took possession of that part which was afterward Burgundy. The Gauls then applied to the Romans to liberate them from their new master. Ariovistus was defeated by Cæsar near Vesontium (modern city of Besançon, France) in 58 B. C., and fled across the Rhine.

Aris'ta, MARIANO: Mexican general; b. in the state of San Luis Potosi, July 26, 1802; entered the army in his youth. Having served in several civil wars, he was made general of brigade in 1833, and was banished in that year by Santa Anna. He returned in 1835, became a general of division in 1841, and commanded the army which was defeated by Gen. Taylor at Palo Alto in May, 1846. In June, 1848, he was appointed Minister of War, and in 1850 was elected President of Mexico. Under his administration Mexico was disturbed by the usual chronic revolts and anarchy, and Arista was driven from power by Santa Anna early in 1853. He died on the way from Lisbon to France, Aug. 7, 1855.

Aristae'netus (in Gr. Ἀριστάνετος): a Greek epistolary writer of the fifth or sixth century; a poor imitator of Alciphron and Achilles Tatius, who composed two books of love stories in the form of letters, prose transcripts of Alexandrian elegies. Ed. by Boissonade (1822).

Aristæ'us (in Gr. Ἀριστᾶϊος): a personage of classic mythology, represented as a son of Apollo and Cyrene. He married Autoonē, a daughter of Cadmus; was the father of Actæon, and a lover of Eurydice. He was worshiped as a divinity who presided over flocks and herds, and taught men the art of raising or managing bees. See Vergil, *Georgics*, book iv.

Aristæus of Alexandria: a fictitious person represented as a Jew who enjoyed the favor of Ptolemy Philadelphus (cir. 280 B. C.). His alleged letter to Philocrates, giving an account of the origin of the Septuagint, has been proved by Humphrey Hody and others to be spurious. See SEPTUAGINT.

C. H. TOY.

Aristar'chus (in Gr. Ἀρίσταρχος): Greek grammarian and critic; 222–150 B. C.; a native of Samothrace; pupil and successor of Aristophanes of Byzantium. He taught at Alexandria, where he educated the son of Ptolemy Philometor. In consequence of a difficulty in the royal household he withdrew to Rhodes, where he died at the age of seventy-two. His especial excellence lay in textual criticism, in which he showed great acumen, rare powers of divination, and soundness of method. His leading principle of exegesis was the explanation of the author out of himself. He was an inspiring teacher, and did much to insure the prevalence of the analogical school of grammar in opposition to the Pergamene school of anomaly. He published a large number of corrected texts, with critical signs; and the restoration of Aristarchus's text of Homer is still the ideal of a school of editors. The Homeric scholia derive much of their value from the preservation of the criticisms of Aristarchus. See Lehrs, *De Aristarchi Studiis Homericis* (3d ed. 1882); Ludwich, *Aristarchs Homerische Textkritik*. B. L. GILDERSLEEVE.

Aristarchus of Samos: Greek astronomer; supposed to have flourished about 275 B. C. The events of his life are unknown. Archimedes in one of his works states that "Aristarchus of Samos supposes that the earth revolves about the sun in the circumference of a circle." All of his writings are lost except a short treatise *On the Magnitudes and Distances of the Sun and Moon*. He calculated that the sun is twenty times farther than the moon from the earth. See Fortia d'Urban's *Histoire d'Aristarque de Samos* (1810).

Aristi'des, or Aristei'des (surnamed THE JUST): eminent Athenian statesman; son of Lysimachus; b. in Alopeke, a demos of Attica. His political tendencies were conservative or aristocratic. He was one of the ten generals who had the command of the army when the Persians invaded Greece in 490 B. C. Each general had a right to the chief command for one day, but Aristides persuaded his colleagues to resign or waive their claims, so that Miltiades commanded at Marathon when it was not his turn. Aristides became chief archon in 489, and a political adversary of Themistocles, the leader of the democracy. On the pretext that his influence was dangerous to the public interest, he was ostracized in 483 B. C. On this occasion a citizen who was personally a stranger to him, and who could not write, requested him to write *Aristides* on a shell to be used in voting. He asked this voter if Aristides had injured him. "No," replied the citizen, "but I am tired of hearing him always called Aristides the Just." When Xerxes, King of Persia, invaded Greece with a mighty army in 480 B. C., Aristides sought an interview with Themistocles, took a prominent part in the battle of Salamis, and recovered his popularity. He commanded the Athenian troops, which, aided by other Greeks, defeated the Persians at Plataea in 479. Aristides and Cimon were appointed in 477 B. C. commanders of the Athenian forces which co-operated with other Greek armies against the Persians. Pausanias the Spartan had the chief command of the allied army, but he offended the allies by his arrogance, while Aristides by mildness and prudence gained general favor, and promoted the supremacy or predominance of Athens among the states of Greece. He died poor in 467 B. C., leaving a son and two daughters, who received dowries from the public treasury. Few statesmen have left so pure and honorable a reputation as Aristides. See Plutarch, *Life of Aristides*; Cornelius Nepos, *Life of Aristides*. WILLIAM JACOBS.

Aristides, ÆLIUS: a Greek sophist and rhetorician; b. in Bithynia about 117 A. D.; was a pupil of Polemon and Herodes Atticus. He acquired an undue reputation for eloquence, and produced many orations and panegyrics. His emulation of Demosthenes had the unhappy effect of making his style labored and obscure. He resided at Smyrna when that city was ruined by an earthquake in 178 A. D., and persuaded the Emperor Marcus Aurelius to rebuild it. D. in 185 A. D. Principal edition by Dindorf in 3 vols., 1829. See Baumgart, *Ælius Aristides* (1874); Schmid, *Atticismus* (vol. ii.). B. L. G.

Aristides Quintilianus: a Greek grammarian (of the third century A. D. ?); author of an important work on music,

in which he holds fast to the great principles of Aristoxenus, though beclouded by Neo-Platonic mysticism. Ed. by Albert Jahn (1882).

Aristides of Thebes: an eminent Greek painter who lived about 350 B. C., and was a contemporary of Apelles. He had a brother, Nicomaehus, who was a skillful painter. According to Pliny, Aristides was the first who expressed on the countenance the passions and movements of the soul. He painted a battle between the Greeks and Persians, which the Roman consul seized among the spoils of war and took to Rome.

Aristip'pus (in Gr. Ἀριστιππος): Greek philosopher; founder of the Cyrenaic school; b. at Cyrene, in Africa, about 435 B. C. He was a pupil of Socrates, but did not adopt his principles or imitate his mode of life. He traveled extensively, indulged freely in sensual pleasure, was intimate with the courtesan Lais at Corinth, and flourished as a courtier and philosophic voluptuary at Syracuse in the reign of Dionysius the Elder. Though he recognized pleasure as a proper subject of pursuit, he appears to have observed some moderation in that pursuit, and to have been remarkable for self-control and equanimity as well as versatility, and a faculty of adapting himself to the vicissitudes of fortune. Plato is reported to have said that "Aristippus was the only man he knew who could wear with equal grace fine clothes and rags." He was celebrated for his witty sayings and repartees, some of which are recorded by Diogenes Laertius. His works, if he wrote any, have not come down to us. He despised or neglected mathematics and physical sciences. He died after 366 B. C., and left a daughter, Arete, who was distinguished as a philosopher. Wieland wrote in German a romance of *Aristippus and his Contemporaries* (4 vols., 1800–02). See G. H. Lewes, *Biographical History of Philosophy*; F. Mentz, *Aristippus Philosophus Socraticus, sive de ejus Vita* (1719); and Zeller's *Socratic Schools*.

Revised by W. T. HARRIS.

Aris'to, or Aris'ton, of Chios (surnamed THE SIREN): Stoic philosopher who lived about 275 B. C.; a disciple of Zeno. He taught at Athens, and confined his attention to moral philosophy. He maintained that the chief good consists in indifference to everything except virtue and vice.

Aristobu'lus (Gr. Ἀριστόβουλος): a Greek historian who accompanied Alexander the Great in his expedition against Persia, about 332 B. C., and wrote a history of the same, which is not extant. It was highly praised by Arrian for its trustworthiness.

Aristobulus: a Jew and philosopher who lived at Alexandria about 175–150 B. C. He was the reputed author of a Commentary on the Books of Moses, the aim of which was to show that the ancient Greek writers had borrowed much from the sacred books of the Hebrews.

Aristobulus I.: high priest of the Jews; son of Joannes Hyrcanus. He assumed the title of king in 107 B. C., and died in 105, when he was succeeded by his brother, Alexander Jannæus.

Aristobulus II.: nephew of Aristobulus I., and a son of Alexander Jannæus; became King of the Jews about 70 B. C. Jerusalem was taken in 63 by Pompey, who gave the throne to Hyrcanus, a brother of Aristobulus, and carried the latter as a captive to Rome. D. about 48 B. C.

Aristoc'raey [from Gr. ἀριστοκρατία: ἄριστος, best + κρατία (in comp.), rule; cf. κράτος, power]: signifies ideally a form of government controlled and administered by the best or noblest citizens. It is enumerated by Aristotle among the principal forms of government. Aristocracy is of very ancient origin, and in some countries of ancient times it prevailed as subsidiary to monarchy. The word may be defined as a government controlled by the nobility or privileged class, or a government in which a minority of adult males constitutes the ruling class. Such was the republic of Venice. The aristocratic element also predominated originally in the republic of ancient Rome, which was governed by patricians, whose power was hereditary. The feudal system of the Middle Ages favored the formation of powerful aristocracies. Among modern nations Great Britain is perhaps that in which the aristocracy is most influential and respectable. A title of nobility is the great prize for which British statesmen and soldiers compete, and the ranks of the ancient noble families are often reinforced by men of genius, who are raised to the peerage. There is probably no country where rank is more highly prized and ardently coveted. In modern language, this word is used to denote

nobility, or the higher class of society, without reference to government. See DEMOCRACY.

Aristogi'ton, or **Aristogeiton** (Gr. Ἀριστογείτων): an Athenian conspirator, an accomplice of Harmodius in the assassination of Hipparchus. He was put to death by Hippias in 514 B. C. He was regarded as a patriot by the Athenians, who erected statues to him and to HARMODIUS (*q. v.*).

Aristolo'chia [from, Gr. ἀριστολόχεια, an herb promoting childbirth; ἄριστος, best + λόχεια, childbed]: a genus of plants of the family *Aristolochiaceae*; are mostly natives of tropical countries, and have twining stems. The genus is characterized by a tubular oblique perianth, and by stamens adherent to the style. Some of the species climb to the tops of high trees and have handsome flowers. The *Aristolochia serpentaria*, or Virginian snakeroot, is a native of the U. S., possesses stimulant and tonic properties, and was once supposed to be a remedy for the bite of serpents. Similar virtues are ascribed to various species in different parts of the world. The root of this plant is exported from the U. S. to Europe, and is highly esteemed as a remedy in certain fevers. The *Aristolochia clematitis* (birthwort) is a native of Europe, a perennial plant, with cordate leaves, erect stem, and grows in waste places, hedges, and among rubbish. The roots of these and many other species, which possess powerfully stimulating properties, have been used in medicine.

Revised by CHARLES E. BESSEY.

Aristolo'chia'ceæ: a family of exogenous plants, of which *Aristolochia* (*q. v.*) is the type.

Aristom'enes (in Gr. Ἀριστομένης): a famous Messenian general who commanded the army of his state in the second Messenian war. He was renowned for personal valor and daring enterprises. Having been finally defeated in 668 B. C., he went with his daughter and son-in-law to Rhodes. See Jourdan, *Histoire d'Aristomène* (1749).

Aristoph'anes (in Gr. Ἀριστοφάνης): greatest of Attic comic poets; b. about 450, d. about 385 B. C. His birthplace is variously given; that he was a full-blood Athenian has been denied, but in character, endowment, and art he was an Athenian of the Athenians: his language is the norm of Atticism, his genius has the flavor of Attic soil and the light of Attic sky. An aristocrat by party allegiance, he was from the beginning in opposition to "democracy" and "progress," to "elevation of the masses," to "the career open to talent," to "free thought," to "finer art," to "art for art's" sake, to every form of sophistic phrase-making and humanitarian claptrap. Hence Aristophanes is to this day a powerful ally of conservative souls. He began early. His first two pieces, *Banqueters* (427) and *Babylonians* (426) are lost. Eleven out of about forty are left. *Acharnians* (425), a burlesque plea for peace; *Knights* (424), an attack on Cleon; *Clouds* (423), in ridicule of Socrates as the head sophist; *Wasps* (422), a caricature of the Athenian jury system; *Peace* (421), a frolic in anticipation of the close of the Ten Years war; *Birds* (414), in which the poet builds an airy cloud-cuckoo-town as a home for all manner of fancies. Then the shadow of the Four Hundred (see GREECE, HISTORY OF) falls over the poet. The *Lysistrata* and the *Thesmophoriazusæ* were acted in the same year (411). Both of them have to do with women and women's ways. In the *Lysistrata* the women seize the helm of state; in the *Thesmophoriazusæ* they band together against Euripides, the woman-hater. The truceless war against Euripides culminates in a formal siege in the *Frogs* (405). The *Ecclesiazusæ* (389 or 392) is a farce at the expense of women's rights and communism. The *Plutus* (388) is a manner of allegory and marks a transition to Middle Comedy (see GREEK LITERATURE). In wit, in humor, in inventiveness, in command of all the resources of language and rhythmical art, Aristophanes is one of the foremost masters of all time. Critical editions of all the plays by Bekker (*cum notis variorum*), Dindorf, Meineke, Bergk, Blaydes, Von Velsen (not yet complete). Annotated editions of single plays too numerous to mention. Famous translations by J. Hookham Frere. Noteworthy renderings by Mitchell, Rogers, Tyrrell, Kennedy. Droysen's German translation is a classic. See also Browning, *Aristophanes's Apology*.

B. L. GILDERSLEEVE.

Aristophanes of Byzantium: Greek grammarian; b. about 262 B. C.; studied at Alexandria, and succeeded Apollonius Rhodius as librarian. D. about 185. He did important service in connection with the Alexandrian canon; published valuable critical editions of Homer, Hesiod, the lyric poets, especially Alcæus and Pindar; wrote introduc-

tions to the plays of the tragic and comic poets, especially Aristophanes and Menander; made lexicographical collections; invented a series of critical signs; and developed the notation of prosody, including accent, breathing, and quantity. See Nauck's *Aristophanis Byzantii Fragmenta* (1848); Wilamowitz-Moellendorff, *Euripides Herakles*, vol. i. pp. 137-153.

B. L. GILDERSLEEVE.

Ar'istotle: Greek philosopher; b. at Stagira, a city of Thrace, but a Grecian colony, in the first year of the 99th Olympiad, or 384 B. C. His father was Nicomachus, a physician and friend of Amyntas, King of Macedon and father of Philip. The family of Aristotle was distinguished by the hereditary profession of medicine, and was wont to trace its origin to Machaon, son of Æsculapius. Left an orphan at an early age, he was brought up by Proxenus of Atarneus, in Mysia, to whose guardianship he seems to have been intrusted by his father, and whose memory Aristotle held so dear in after life that he erected a statue to him, and both instructed his son Nicanor in the liberal arts and adopted him as his heir. In his seventeenth year he went to Athens, and became a pupil of Plato, with whom he continued twenty years, and by whom he was called the reader and the intellect of the school, and likened, in his ardor and restiveness, to a colt which needed the bit more than the spur. Upon the death of Plato (348 B. C.) he accepted an invitation of Hermias, tyrant of Atarneus, his former fellow-pupil in the school of Plato, to take up his residence with him. Here Aristotle spent the three following years of his life, when Hermias, conquered by a Persian invader, was sent a prisoner to Persia, where he was put to death by Artaxerxes. To avoid a like fate, Aristotle fled to Mitylene, taking with him Pythias, whom he married, and who is variously described as the mistress, the sister, and the niece of Hermias. After her death he married his concubine Herpyllis, the mother of his son Nieomachus.

When Alexander of Macedon was born, Philip, his father, is said to have sent this letter to Aristotle: "Be it known unto you that I have a son, and that I am thankful to the gods, not so much for his birth as that he was born in your time. For if you will but take the charge of his education, I assure myself that he will become worthy of his father and of his future kingdom." The philosopher accepted the commission of the king, and there is evidence that he gave early directions respecting the care and culture of the infant prince. When Alexander was fifteen, Aristotle assumed the personal oversight of his instruction, taking up his residence at the court, and continuing there during the lifetime of Philip and for two years after his pupil had ascended the throne. When the conquest of the East was undertaken, Aristotle returned to Athens, and taught philosophy in the Lyceum, a temple dedicated to the Lycian Apollo, with walks ornamented by trees, fountains, and colonnades. From these shady walks (περίπατοι) his school received the name of Peripatetic. He here abode and taught thirteen years, when, after the death of Alexander, he was accused by the Athenians of impiety, and fled to Chalceis in Eubœa, the present Negropont, in order to escape the fate of Socrates, or, as he said, that Athens might not have the opportunity to sin against philosophy again. Here he died (B. C. 322) in his sixty-third year.

His Character.—Aristotle's was one of the most highly gifted intellects of all the ages. All agree that his wealth of scientific knowledge, his unbiased judgment, his constructive power, and his depth and breadth of speculative insight are unsurpassed in ancient or modern times. But the verdict is not so unanimous respecting his moral traits. By some of the ancients he is extolled for his patriotism, his reverence, his modesty, his moderation, his love of truth, and his attachment to his friends, while others hold him up as selfish, ungrateful, sordid, gluttonous, and impious. It must be owned, however, that few of the stories told in proof of either of these sides will bear a sharp look. They rest on frail grounds. But while we have little direct showing that can be trusted respecting the personal character of Aristotle, some points seem clear. The regard in which he ever held the memory of Proxenus, and the beautiful hymn to virtue which he composed in honor of Hermias, and which we still have, show that he was not incapable of gratitude or of love to his friends. The charge often made that he was jealous of Plato does not hang with the fact of Aristotle's continued intimacy with Xenocrates, Plato's devoted disciple and successor, nor with an elegy, some verses of which have come down to us, in which Aristotle calls Plato one whom the bad

might not even praise, and who first taught the world how a man could be at the same time good and happy. In his will he shows not only a judicious care, but an affectionate solicitude, for his family, while in his writings a lofty moral tone appears and a winning frankness and sincerity seem to shine.

His Writings.—These were very numerous, though only a small part, perhaps a fourth, remains, all of which probably differ more or less from the state in which Aristotle left them. Incompetent editors and ignorant transcribers have made almost as much mischief as the mold and mildew by which some of the original manuscripts are said to have been sadly injured, and some destroyed. But while the fragmentary and skeleton-like form which many of the so-called Aristotelian writings possess, joined to the evident omissions and the repetitions and contradictions which they contain, show the work of some other hands than those of the great master, there remains a solid nucleus of considerable size, whose purity of style and depth of speculative content bring us into the unmistakable presence of Aristotle himself. In 1890 one of the most interesting discoveries of the century was made. The constitution of Athens, one of the 250 constitutional histories that Aristotle wrote by way of preparation for his great work on Politics, was discovered and transcribed in the British Museum from Papyrus cxxxi.

His Philosophy.—Aristotle's method is exactly the reverse of Plato's, which he does not tire of making manifest. The attention which Plato had given to the unity of all being, Aristotle directs to the manifoldness of the phenomenal world. He is as analytic and discursive as Plato is synthetic and intuitive. While Plato finds in the universal the only light in which the particular can be seen, Aristotle sees the particular to be necessary in order that we may have any knowledge of the universal. So he gathers particulars from all quarters. History, the human mind, and all departments of nature furnish him contributions. He has no rival in the variety and extent of the facts which he has collected, and has never been surpassed in the patient industry of his investigations. But it is a great mistake, though one easily and often made, to judge thereby that Aristotle sought for nothing beyond experience, or that he and Plato represented only the opposite extremes of empiricism and idealism. The idea was as truly the object of Aristotle's search as it was of Plato's. Both Plato and Aristotle also agreed that the reality or the essence of individual things was in the idea. Aristotle also held as strongly as Plato to the objective existence of the idea. The doctrine of the Nominalists in the Middle Ages, that the idea or the universal is only a subjective product in which objects are represented, and by which they are named, though often ascribed to Aristotle, is but little less foreign to him than to Plato. But while to Plato the idea had an objective existence independent of the individual object which participated in it, to Aristotle the idea was immanent in the individual, and had no being separate from it. This accounts for the prodigious attention which Aristotle gave to individual facts. He collected these in such vast measure, not because they had any interest in themselves, and not because their collection and classification could give a satisfying science, but only for the sake of the idea which was immanent in them, and which was the only proper object in scientific inquiry, since it was the only object which could be truly known.

This immanence of the idea in the individual shows what was the most essential difference between Plato and Aristotle, and also what was the most characteristic and important doctrine in the Aristotelian philosophy. Aristotle criticises Plato because the Platonic ideas, being separate from and independent of phenomena, could not explain the existence of the phenomenal world. They are, in the Aristotelian view of Plato's doctrine, only potential, not actual, sources of individual things. But to the idea as universal Aristotle ascribes an activity which individualizes, but this individualization is not a change to anything without, nor because of anything without, but is wholly within the universal itself; it is a change thus into a difference which is at the same time an identity, a determining which is a self-determining, wherein the universal or the idea realizes or actualizes itself. This self-realizing of the idea is a conformity to an end which is at the same time a self-end, a true Final Cause, wherein is the living principle and rational explanation of individual things. This doctrine of the final cause, or sufficient reason, which it is the immeasurable merit of Aristotle to have introduced into philosophy, carries us back to a principle deeper than that of efficient causation, and

brings us from the world of necessity to that of freedom. Our modern physicists would gain a profounder view of nature and a more successful pursuit of science if they could know this principle as Aristotle taught it. They would find him, as the ancients called him, "the father of those who know." See Zeller, *Aristoteles und die Alten Peripatetiker*, and especially E. Wallace, *Aristotle's Psychology in Greek and English*; Stahr, *Aristotelia*; Lewes, *Aristotle*; Grant, *Ethics of Aristotle*; Trendelenburg, *Comm. ad "De Anima"*; Hegel, *Geschichte der Philosophie*; Thomas Davidson, *Aristotle and the Ancient Educational Ideals*; also Ritter, Ueberweg, Schwegler, Erdmann, etc.; also PHILOSOPHY, ITS HISTORY. Revised by W. T. HARRIS.

Aristotle's-lantern; the jaws of the sea-urchin, which are large in proportion to the size of the animal, and composed of five pieces, which form a lantern-shaped structure.

Aristoxenus of Tarentum: Greek philosopher; a pupil of Aristotle; lived about 350–320 B. C. He wrote numerous works which are lost, and a treatise on music (*Elements of Harmony*), which is extant and is accounted valuable. It was published by Meursius in 1616. He founded a school of musicians, who rejected the system of Pythagoras, and judged of the notes in the diatonic scale by the ear exclusively. See Zeller, *Aristoteles und die Alten Peripatetiker*.

Arith'metic [deriv. of Gr. ἡ ἀριθμητική (sc. τέχνη, art), art of counting, from ἀριθμεῖν, count]: the science which treats of numbers or the art of computation, is a branch of mathematics. In the ordinary use of the term it is the art of expressing numbers by symbols, combining these symbols, and applying to them rules of the greatest practical utility. Among the ancient Greeks, Pythagoras, Archimedes, and others cultivated the science of numbers, but they labored under the disadvantage of a clumsy mode of notation, and had no sign for zero or naught. The Roman numerals, I, V, X, L, C, etc., continued to be commonly used in Europe until the fifteenth century. The invention of the symbols called Arabian numerals, now in use, is attributed to the Hindus. The use of the cipher (0) gives the modern arithmetic a great advantage over the ancient.

Arithmetical Mean: See MEAN.

Arithmetical Progression: See PROGRESSION.

Arius, aa'ri-us (properly aā-rī'us): the founder of Arianism; an Alexandrian presbyter, theologian, and controversialist; one of the two principal figures in the first great controversy of the early Church; b. in Libya, in Africa, 256. He went as a layman to Alexandria, and there sided with Peter, Bishop of Alexandria, in the Meletian Schism; was ordained deacon by him, but subsequently excommunicated in consequence of his joining the schismatics. He repented, was restored, advanced to the priesthood and given sole charge of a church. He was so popular that when Peter's successor, Achilles, died, he came very near being elected to fill the vacant archiepiscopal throne. Alexander was, however, chosen. In 318 Arius first came into wide public notice. He was then an old man. He was probably trained in Antioch, imbibing there the doctrine of the Son's subordination to the Father which he afterward taught. While the historian Socrates represents him as assailed by his bishop, Alexander of Alexandria, as a Sabellian—i. e. as representing the Son to be a manifestation of the Father, as light is of the sun—the historian Sozomen relates that he had been for some time regarded as a heretic before Alexander, impelled by others, called him to account. His heresy—for as such his opinions were at last condemned—consisted in his denial that Jesus Christ was an unoriginated being. He would not say "there was a time when he was not," but only "there was when he was not," admitting that he was created before time. But he insisted that he was created, because a Son must be younger than his Father. This literalism appears in all the authentic records of his life, and notably in two of his letters that have come down to us. They deny that Christ was "unoriginate, or part of the Unoriginate, or made of any previously existing substance." They affirm that he was begotten before time, that he was perfect God (πλήρης Θεός), by whom all worlds were made. The controversy between Arius and Alexander widened till it included Egypt, Libya, and Palestine in its extent. A synod of Egyptian and Libyan bishops excommunicated Arius, but his followers steadily increased. He was a rigorous ascetic, a persuasive advocate, an ardent propagandist. Tall, gloomy, fanatical, with downcast eyes and tangled hair, he went about singing his doctrines, which he had set to the music of the theaters.

Before long they were being sung by priests, boatmen, bakers, and all sorts of people. Constantine, who had become sole emperor in 323 A. D., was ashamed to find the religion which he had just embraced rent by such a fierce dispute, and in 325 called the Council of Nicæa to settle it, with other matters affecting the peace and honor of the Church. It was the first œcumenical council, the first attempt to bring together all the bishops of the Church. There is abundant evidence that both parties were seeking the same end by different means—to steer clear of Ditheism, the doctrine of two Gods. To call the Son unoriginate, or eternally created, seemed to Arius to make him a second God. No, said his opponents, if one with God he can not be another. But a being created before time, the creator of all things but himself, was sure to be another God soon or late. Arius insisted that his “createdness” and his “moment when he was not” nullified the danger, but his opponents did not wish to be convinced. Their object was to fix upon a term that Arius and his party could not accept. It was furnished them by one of the Arian party, Eusebius of Nicomedia, who declared, in a letter that was produced in the council, that “to assert the Son to be uncreated would be to say that he was *homoïousian*, that is, consubstantial, of one substance, with the Father. Around this word the battle waged. The Arians would say that Christ was *homoïousian*, of like substance with the Father, but they would say no more. A creed offered by Arius was torn in pieces, and that he might not share its fate he was removed from the assembly. A second creed, which the emperor had approved beforehand, fared as ill. Then the creed since known as the Nicene was offered by the opponents of Arius, and prevailed. A young deacon of Alexandria, Athanasius, was its principal protagonist, and in the long controversy that ensued he was ever the most brilliant and picturesque and noble figure on the scene. Constantine, who cared much for unanimity and little for the diphthong, threw all his weight in favor of the creed, privately confessing to Eusebius that he understood *homoïousian* to mean *homoïousian*. The Arian bishops generally availed themselves of this understanding. Arius and two bishops who would not sign the creed were banished to Illyria, and Eusebius of Nicomedia, who, while accepting it, objected to its anathemas, was sent to Gaul. The Bishop Alexander went back to his see in triumph, and when he died, soon after, Athanasius succeeded to his throne. It was not in the nature of Arius to be easily suppressed. He gained the ear of Constantia, the sister of the emperor, and she persuaded her brother to recall him to the court. There he renewed the strife, but when Athanasius was ordered to reinstate him at Alexandria he stubbornly refused. In 336 Athanasius was banished and Arius went back to take his old place, but the popular uproar did not allow him to do so. Finally, the Bishop of Constantinople consented to receive him back into the Church, but on the eve of his reinstatement he was suddenly taken ill and died (336), whereupon there was great rejoicing in the enemy’s camp, and thanksgiving to God for his good providence. As we know Arius mainly through his opponents, some deduction must be made from their abuse. But that he had an arid mind, and a temper that grew harsher as the winds of controversy blew upon it, admits of little doubt. The Nicene creed as now used is longer than that adopted at Nicæa, by the clauses beginning “I believe in the Holy Ghost,” and the phrase “and the Son” was added by a Western council in 589. The new clauses were added at or before the Council of Constantinople in 381; probably before, to be officially ratified at the Council of Chalcedon (a suburb of Constantinople) in 451. J. H. Newman’s *Arians of the Fourth Century*, though described by an ardent eulogist, R. H. Hutton, as “dry almost to grittiness,” is useful for the period, and Dean Stanley’s *Eastern Church* gives a picturesque account of the Arian controversy and its culmination at Nicæa.

JOHN W. CHADWICK.

Arizo’na: a southwestern Territory of the U. S., between lat. 31° 20’ and 37° N., and lon. 109° and 114° 35’ W. Bounded by Nevada and Utah on the N., New Mexico on the E., Mexico on the S., California and Nevada on the W. Area, 113,020 sq. miles, 72,332,800 acres, which is about equal to that of New York, New Jersey, Pennsylvania, Delaware, and Maryland combined.

Topography.—Surface generally elevated, and composed of wide plateaus, descending gradually from 7,500 feet above the sea in the N. to 80 or 100 feet in the S. These plateaus are crossed by ranges of mountains with towering peaks ris-

ing to the height of 12,000 or 14,000 feet. They are riven by streams and rivers which have cut for themselves beds varying from 1,000 to 6,000 feet below the surface. The mountains have many local names; the longer and more important ranges are the Mogolon and Zuni Mountains in the E., the Pinaleno and Santa Catalina in the S. E., the Santa Aña and the Dragon Mountains in the S., the Gila range, the Black Mesa, and the San Francisco Mountains in the center, the Gerbat and Black Mountains in the W., and the great



mass rising above the Colorado plateau, the Northside Mountains, in the N. W. The San Francisco Mountains seem to have been a group of volcanoes, none of them now active; but centuries ago they poured out immense streams of lava, which flowed northward to the banks of the Colorado Chiquito. Extensive *mesas*, or table-lands, rise above the plains, with perpendicular sides, often 1,000 feet or more in height. The whole of Arizona is drained by the Colorado river and its tributaries. It is the most remarkable river in the world. Its own course in Arizona for 400 miles is through the Grand Cañon, from 5,000 feet to 400 feet below the surface of the plateau, and its actual fall in the 400 miles is over 3,000 feet. Nearly all its affluents, and particularly the San Juan, Little Colorado, Zuni, Salt, and Upper Gila rivers, pass through similar and perhaps deeper cañons. These cañons are among the greatest wonders of the world. It is said they expose to view geological strata of all the formations in their regular places to the thickness of 25,000 feet. The Colorado is navigable for about 550 miles.

Minerals.—Gold, silver, platinum, quicksilver, copper, tin, lead, nickel, iron ores of all sorts, bituminous coal, and perhaps anthracite, salt, sulphur, gypsum, loadstones, opals, garnets, sapphires, chalcedony. Many gold and silver mines had been worked by the Spaniards and Mexicans successfully for years before the Territory came into possession of the U. S., and they are still largely productive.

Soil and Vegetation.—The lava-covered and granitic sides of the mountains are sterile. Aside from these, the soil is fertile where irrigation (now extensively introduced) is possible, and yields large crops; elsewhere it is dry and barren. There are forests, generally of pine and spruce, in the mountains, but protracted drought kills many of the trees. Wherever there is water, flowers and shrubs are profuse and beautiful. On the dry and hot plains, mimosas and cacti of many forms are the only vegetation.

Zoölogy.—The elk is found in Arizona, though not abundant; two species of deer, antelopes, the big-horn, wild horses or mustangs, pumas, jaguars, ocelots, black and cinnamon bears, wildcats, lynxes, the red or gray wolves, the true coyotes, foxes, raccoons, opossums, and skunks are very numerous. Birds of prey, game-birds, and birds of fine plumage abound.

Climate.—In the mountains and plateaus a warm but healthy and very uniform temperature prevails. At Prescott, lat. 34° 29', the mean of the year 65.49° F.; summer mean, 84°; only two days above 100°. In Southern Arizona very hot and dry. Yuma (lat. 32° 43', but low) had, in 1877, 106 days of summer above 100° F., 30 days above 108°, and 12 days above 110°; the maximum is 126° F. Tucson is not quite so hot; only 51 days were above 100°. But the whole Gila valley is very hot, yet the air is dry and invigorating, and sunstrokes are rare. The lack of rain is very general. Yuma has but 2 or 3 inches in the year, Prescott about 10 inches, and Tucson not over 6 or 7.

Industries.—Mining is the most important of these. Gold is found, both in placers and in quartz-lodes, at various points, and the latter are often very rich; silver in galena, and combined with both lead and copper as sulphides and carbonates; copper as gray sulphuret; quicksilver as cinn-



A 114 B 113 C 112 D 111 E 110 F 109

U T A H

St. George Kanab Fredonia Lees Ferry

Littlefield Antelope Plains Navajo Indian Reservation Carriso Mts.

White Hills Peach Springs Seligman Williams

Chloride Hackberry San Francisco Belmont

Campbell Mineral Park Ash Fork Rhoades Flagstaff

Pyramid Kingman Juniper Storm Cottonwood Jerome

Mohave City Cedar Kym Junction Whipple Cherry Aultman

Needles Signal Hillside Placerita Goodwin Bigbug Strawbery

Cedar Owens Yarnell Walnut Grove Craig Mayer Payson

Signal Big Maria Skull Valley Hillside Jersey Richbar

Wickenburg Peoria Cavecreek Cline Livingstone

Harrisburg Harqua Hala Glendale Scottsdale Lebi Mesa

Ehrenberg Quartzsite Buckeye Coldwater Silverking

Yuma Kofa Arlington Maricopa Casagrande Florence

Somerton Fortuna Monitor Mohawk Palomas Alpha Gilabend

Yuma Gila Somerton Monitor Mohawk Palomas Alpha

Yuma Gila Somerton Monitor Mohawk Palomas Alpha

Yuma Gila Somerton Monitor Mohawk Palomas Alpha

Yuma Gila Somerton Monitor Mohawk Palomas Alpha

Yuma Gila Somerton Monitor Mohawk Palomas Alpha

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Yuma Gila Somerton Monitor Mohawk Palomas Alpha

Yuma Gila Somerton Monitor Mohawk Palomas Alpha

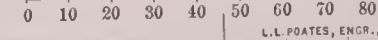
Yuma Gila Somerton Monitor Mohawk Palomas Alpha

Yuma Gila Somerton Monitor Mohawk Palomas Alpha

ARIZONA

County Towns

Scale of Miles



L.L. POATES, ENGR., N.Y.

A 114 B 113 Longitude C West 112 from D Greenwich 111 E 110 F

1 2 3 4 5 6 7 8

GULF OF CALIFORNIA

Rio del Altar

bar, etc.; platinum and nickel nearly pure; iron in all kinds of ores, and coal where it is easily accessible. The mines of both gold and silver are very numerous in Southern Arizona, near and below the Southern Pacific R. R.; copper, gold, some silver and iron, as well as the other metals, in Central and Western Arizona, between lat. 33° and 35°. In both sections the scarcity of wood and water renders mining very expensive. The estimated value of products of gold and silver for 1899 was \$3,739,113.

Agricultural Productions.—The Agricultural Report shows a yield in 1899 of 342,139 bushels of wheat. The amount of corn and oats raised is insignificant. There are good pasturage lands in Central Arizona and in Apache County in the N. E., where the Navajo Indians keep a great many sheep. The irrigable lands yield under irrigation immense grain and root crops, and the semi-tropical fruits are plentiful.

Farm Animals.*—In 1899 there were in the Territory 52,431 horses, 1,031 mules, 381,861 cattle, and 1,024,430 sheep.

Manufactures.—In 1880 there were 66 manufacturing establishments, employing 220 persons. capital \$272,600; in 1890, 76 establishments, capital \$616,629.

Finances.—The assessed valuation was, in 1900, \$33,782,466. Territorial debt, 1898, \$1,045,972. County and municipal debt, \$1,634,027. Receipts, \$236,437; expenditures, \$127,782.

Railroads.—The Southern Pacific crosses Arizona from W. to E. between the 32d and 33d parallels. Another crosses from E. to W. near the 35th parallel. The total valuation of railways in 1900 was \$4,363,624. Silver, copper, lead, and iron ores, wheat, and cattle are the principal freights.

Education.—Arizona in 1900 had 398 public schools, with 16,504 pupils; 2 public normal schools.

Pop., 1900.—(White and colored, except tribal Indians) 122,212. Pop. 1870, 9,658; 1880, 40,440; 1890, 59,620.

COUNTIES.	† Ref.	Pop. 1890.	Pop. 1900.	COUNTY-TOWNS.	Pop. 1900.
Apache.....	10-O	4,281	8,452	St. John's.....	646
Cochise.....	15-O	6,938	9,251	Tombstone.....	1,271
Coconino.....	9-L	.....	5,344	Flagstaff.....	1,495
Gila.....	12-N	2,021	4,264	Globe.....	629
Graham.....	13-O	5,670	14,162	Solomonville...	5,544
Maricopa.....	13-L	10,986	21,352	Phoenix.....	.....
Mohave.....	10-K	1,444	3,443	Kingman.....	.....
Navajo.....	10-N	.....	8,817	Holbrook.....	.....
Pima.....	14-M	12,673	14,689	Tucson.....	7,531
Pinal.....	13-M	4,251	6,884	Florence.....	.....
† Santa Cruz.....	15-N	.....	4,545	Nogales.....	1,761
Yavapai.....	11-L	8,685	13,799	Prescott.....	3,559
Yuma.....	13-K	2,671	4,145	Yuma.....	1,402
Totals.....		59,620	122,212		

The number of Indians (including the Navajo, most of whom are in Arizona) is nearly 35,000. These are of various tribes, the Apache, the most turbulent, numbering nearly 5,000, and the pueblo-dwelling Hopi or Moki, 1,976. The latter are an offshoot of the great Shoshonean linguistic stock and occupy a number of communal villages on three mesas in the northeastern portion of the Territory.

Cities and Towns, Pop. 1900.—Tucson, 7,531; Phoenix (capital), 5,544; Prescott, 3,559; Jerome, 2,861; Nogales, 1,761; Globe, 1,495; Yuma, 1,402; Winslow, 1,305; Flagstaff, 1,271; Tempe, 892.

History.—The Indians were originally Aztec or Toltec; these occupied the country long, and reared walled towns, of which there are now ruins; mostly dispossessed by more northern tribes; Spaniards and Jesuit missionaries came before 1600, and established many settlements in the seventeenth century. Arizona, as well as New Mexico, belonged to Mexico till 1848, when all N. of the Gila was ceded to the U. S.; the Gadsden Purchase made in 1853; Arizona made a separate Territory in Feb., 1863.

GOVERNORS.

John A. Gurley.....	1862-63	C. Meyer Zulick.....	1885-89
John N. Goodwin.....	1863-66	Lewis Wolley.....	1889-90
Rich. C. McCormick.....	1866-69	John N. Irwin.....	1890-92
A. P. K. Safford.....	1869-76	Nathan O. Murphy.....	1892-93
Charles E. G. French....	1876-77	Louis C. Hughes.....	1893-97
John P. Hoyt.....	1877-78	Benjamin J. Franklin...	1897
John C. Fremont.....	1878-82	Myron H. McCord.....	1897-98
Frederick A. Tritle.....	1882-85	Nathan O. Murphy.....	1899

Revised by A. R. SPOFFORD.

* On farms only.

† Reference for location of counties, see map of Arizona.

‡ Organized from part of Pima in 1899.

Arjish': a river of Roumania; rises in the East Carpathian Mountains; flows southeastward, and enters the Danube 42 miles S. S. E. of Bucharest. Length about 175 miles.

Arjish-Dagh: See ARGÆUS, MOUNT.

Arkadelphia: on railroad; capital of Clark co., Ark. (for location, see map of Arkansas, ref. 4-B); is situated at the head of steam-navigation, on the right shore of Washita river, 65 miles S. W. of Little Rock. Its chief products are lumber and cotton; it has water-power and an active trade. During the first two years of the civil war Arkadelphia was a principal military dépôt for the States of Arkansas, Missouri, and Louisiana. On Feb. 15, 1863, a skirmish took place here between a detachment of Union troops, under Capt. Brown, and a party of Confederates, in which the latter were defeated. Pop. (1890) 2,455; (1900) 2,739.

Arkansas: a river of the U. S., next to the Missouri the longest affluent of the Mississippi, rises in the Rocky Mountains and in the west central part of Colorado. Its general direction is eastward for more than 500 miles through extensive plains, large portions of which are sterile. Having crossed the eastern boundary of Colorado into the State of Kansas, and reached nearly the 98th degree of W. longitude, it turns and flows southeastward through Kansas and the Indian Territory to Fort Smith, on the western boundary of Arkansas; continuing thence in a southeastern course, it traverses the State of Arkansas, which it divides into two nearly equal portions, and enters the Mississippi in lat. 33° 54' N., lon. 91° 10' W.; length, 2,170 miles. It is navigable by steamers 800 miles from its mouth during nine months of the year; difference between high and low water in this river about 25 feet.

Arkansas (by act of its Legislature to be pronounced Ar'kan-saw): one of the southwestern States of the Mississippi valley; bounded N. by Missouri, E. by Missouri and the Mississippi river, S. by Louisiana, W. by Texas and the Indian Territory. It is between 33° and 36° 30' N. lat., and 89° 40' and 94° 42' W. lon. Area, 53,850 sq. miles, about the size of England without Wales. Arkansas, by census of 1900, ranked 24th in population, 21st in value of agricultural products, and 36th in value of manufactures.

Topography.—Eastern part of the State, from 30 to 100 miles west of the Mississippi, low, with lakes, bayous, and swamps; subject to overflow, except occasional bluffs. West of this, land rises by stages to the table-lands and hills of Ozark, Washita, and Black Hills, in N. W., W., and S. W. These rise 1,500 to 2,000 feet, and knobs 500 to 800 feet higher. The rivers are: Mississippi, eastern boundary; Arkansas, crossing diagonally; White, St. Francis, Washita, Red, and their affluents; 3,000 miles of navigable rivers in the State.

Minerals.—Gold, argentiferous galena, zinc, copper, manganese, iron (various ores), semi-bituminous coal, lignite, marble, novaculite or oilstone, millstone, kaolin, mineral paints, salt, and remarkably hot and other mineral springs. In 1899 279,584 tons of bituminous coal were mined.

Soil and Vegetation.—Arkansas has much good soil and some which is not productive. The lowlands are alluvial and highly fertile. Some of the table-lands are sterile, but are covered with scattered pines. The river valleys and some of the mountain slopes have a good and productive soil, and are largely covered with heavy forests. There are immense tracts of alluvial bottom-lands which might be made available for cultivation by a system of drainage. Oak, black walnut, hickory, red elm, maple, tupelo, gum trees (black and sweet), yellow poplar, American elm, white and blue ash, hornbeam, ironwood, Osage orange, red cedar, beech, pecan, sycamore, buttonwood, sassafras, persimmon, locust,



wild cherry, pine, cypress, and cottonwood are the principal forest trees. Wild and cultivated fruits of all kinds abound, and large portions of the uplands, particularly in the north, are adapted to the growing of apples of the best quality.

Zoölogy.—Wild game: Bears, deer of two species, rarely the buffalo and elk, peccaries and wild hogs, rabbits or hares, several species of squirrels and other rodents; cougars or panthers rarely, wolves, foxes, raccoons, opossums, skunks, Texan coyotes. Game-birds: Turkeys, ducks, partridges, quails, prairie-hens, etc.; eagles, vultures, hawks, owls, and many song-birds. The rivers, lakes, and bayous abound in fish, with an occasional alligator, serpents, and other reptiles.

Climate.—In the lowlands, mean annual temperature, 60°-6°; summer mean, 81°-4°; winter, average minimum, 9°; summer maximum, 98°; annual rainfall, 63°-42 inches. On the table-lands (Little Rock), annual mean, 62°-66°; maximum, summer, 96°; winter minimum, 4°; annual range, 92°; rainfall, 55 to 60 inches. Mountains in the west, annual mean, 60° F.; rainfall, about 58 inches. As a whole, the climate is very fine, and it has a high reputation for alleviation of pulmonary diseases.

Agricultural Productions, 1899.—Cotton, 919,469 bales; wheat, 1,953,361 bush.; Indian corn, 48,087,140 bush.; oats, 5,964,442 bush.; potatoes, 1,773,198 bush.; rye, 19,052 bush.; hay, 205,491 tons. Farm animals: horses, 234,127; mules, 142,594; cattle, 419,422; sheep, 108,957. Average wages of farm labor (1890), \$18.40, or, with board, \$12.55 a month.

Manufactures.—Principally of cotton-seed oil, flour and meal, lumber, leather, cotton and woolen goods, wagons, tobacco and cigars, and hones of novaeulite; amount moderate, but increasing. In 1880 there were 1,202 manufactories, \$2,953,130 capital, 4,557 employees, \$925,358 paid for wages, and \$6,756,159 in value of products. In 1890 there were 2,073 establishments with \$14,971,614 capital.

Railroads.—There were in 1885 2,146 miles completed, and in 1899 3,128°-44 miles in operation. The railway system of the State connects with the Texas and Southern Pacific lines.

Finances.—The State debt was in 1890 \$2,092,100 principal; past-due interest, \$2,884,897; total, \$4,976,997, exclusive of \$1,986,773 levee bonds (unconstitutional and invalid), \$5,350,000 railroad aid bonds (illegally issued), and \$1,370,000 other disputed debts. The assessed valuation in 1900 was: Real estate, \$127,062,908; personal, \$62,936,142; total, \$189,999,050; State tax, 50 cents on \$100. The commerce of Arkansas is wholly internal, there being no ports of entry.

Banks.—In 1900 there were 7 national banks with \$1,070,000 capital; and deposits, \$3,102,315.55. There were also 39 State banks—capital, \$1,243,509; deposits, \$4,464,013; and 3 private banks—capital, \$25,000; deposits, \$133,878.

Education.—Population of school age 1899 (six to twenty-one years), 472,508; enrolled in public schools, 296,785; number of school-houses, 2,535; number of teachers, 5,945; expenditure for public schools, \$967,609; amount of permanent school fund, \$458,888. There are normal departments in connection with colleges at Helena and Pine Bluff. There are 13 private schools and seminaries, with 64 teachers and 5,835 pupils. There are 5 universities and colleges, with 44 instructors, 1,023 students, and \$145,000 property. Included in these is the Arkansas Industrial University, with 524 students. There is also one school of medicine, with 14 teachers and 83 students.

Libraries, Newspapers, and Periodicals.—The number of public libraries in 1886 was 16, with 48,143 volumes, besides many school and college libraries. In 1900 the newspapers numbered 263, of which 26 were dailies.

Churches.—The Methodist and Baptist denominations are the most numerous, and, taking the various organizations of each, are of about equal numbers, having between 750 and 800 churches, and from 60,000 to 70,000 members each. The others, in the order named, were Presbyterians, Union, Episcopalians, Roman Catholics, Lutherans, etc.

Population.—In 1870 Arkansas had 484,471 inhabitants; in 1880, 802,525; in 1890, 1,128,179; in 1900, 1,311,564. The counties and county towns, with population of each, are as given in the table.

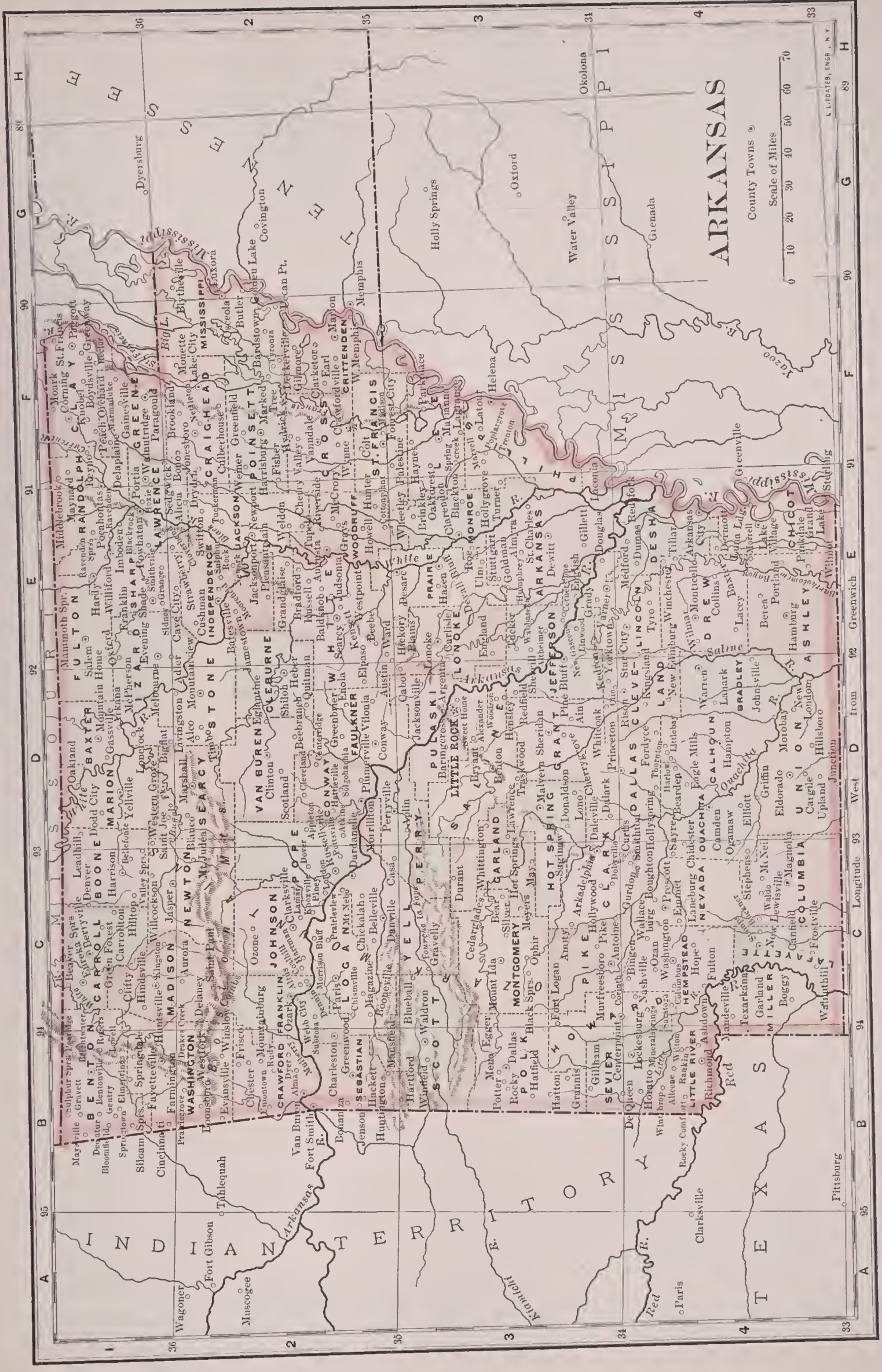
Principal Towns and Population in 1900.—Little Rock, capital, 38,307; Fort Smith, 11,587; Pine Bluff, 11,496; Hot Springs, 9,973; Helena, 5,550; Texarkana, 4,914; Jonesboro, 4,508; Fayetteville, 4,061; Eureka Springs, 3,572; Mena, 3,423; Paragould, 3,324; Newport, 2,866; Camden, 2,840; Arkadelphia, 2,739.

COUNTIES, COUNTY TOWNS, AND POPULATION.

COUNTIES.	* Ref.	Pop. 1890.	Pop. 1900.	COUNTY TOWNS.	Pop. 1900.
Arkansas.....	4-E	11,432	12,973	Dewitt.....	318
Ashley.....	6-D	13,295	19,734	Hamburg.....	1,260
Baxter.....	1-C	8,527	9,298	Mountain Home.....	364
Benton.....	1-A	27,716	31,611	Bentonville.....	1,843
Boone.....	1-C	15,816	16,396	Harrison.....	1,551
Bradley.....	5-D	7,972	9,651	Warren.....	954
Calhoun.....	5-C	7,267	8,539	Hampton.....	.....
Carroll.....	1-B	17,288	18,848	Berryville.....	551
Chicot.....	5-E	11,419	14,528	Eureka Springs.....	3,572
Clark.....	4-B	20,997	21,289	Lake Village.....	.....
Clay.....	1-F	12,200	15,886	Arkadelphia.....	2,739
Cleburne.....	2-D	7,884	9,628	Piggott.....	.....
Cleveland.....	5-D	11,362	11,620	Heber.....	.....
Columbia.....	6-B	19,893	22,077	Rison.....	.....
Conway.....	3-C	19,459	19,772	Magnolia.....	1,614
Craighead.....	2-E	12,025	19,505	Morrilton.....	1,707
Crawford.....	2-A	21,714	21,270	Jonesboro.....	4,508
Crittenden.....	3-F	13,940	14,529	Lake City.....	434
Cross.....	2-E	7,693	11,051	Van Buren.....	2,573
Dallas.....	5-C	9,296	11,518	Marion.....	.....
Desha.....	5-E	10,324	11,511	Vandale.....	.....
Drew.....	5-D	17,352	19,451	Princeton.....	168
Faulkner.....	3-D	18,342	20,780	Arkansas City.....	1,091
Franklin.....	2-A	19,934	17,395	Monticello.....	1,579
Fulton.....	1-D	10,984	12,917	Conway.....	2,003
Garland.....	4-C	15,328	18,773	Ozark.....	848
Grant.....	4-C	7,786	7,671	Salem.....	.....
Greene.....	1-F	12,908	16,979	Hot Springs.....	9,973
Heinpstead.....	5-B	22,796	24,101	Sheridan.....	210
Hot Spring.....	4-C	11,603	12,748	Paragould.....	3,324
Howard.....	4-A	13,789	14,076	Washington.....	374
Independence.....	2-E	21,961	22,557	Walvern.....	1,582
Izard.....	1-D	13,038	13,506	Centre Point.....	334
Jackson.....	2-E	15,179	18,383	Batesville.....	2,327
Jefferson.....	4-D	40,881	40,972	Melbourne.....	256
Johnson.....	2-B	16,758	17,448	Newport.....	2,866
Lafayette.....	6-B	7,700	10,594	Pine Bluff.....	11,496
Lawrence.....	1-E	12,984	16,491	Clarksville.....	1,086
Lee.....	3-E	18,886	19,409	New Lewisville.....	548
Lincoln.....	5-D	10,255	13,389	Powhatan.....	249
Little River.....	5-A	8,903	13,731	Marianna.....	1,707
Logan.....	3-B	20,774	20,563	Star City.....	251
Lonoke.....	3-D	19,263	22,544	Richmond.....	.....
Madison.....	2-B	17,402	19,864	Paris.....	836
Marion.....	1-C	10,390	11,377	Lonoke.....	951
Miller.....	5-B	14,714	17,558	Huntsville.....	.....
Mississippi.....	2-F	11,635	16,384	Yellville.....	578
Monroe.....	3-E	15,336	16,816	Texarkana.....	4,914
Montgomery.....	4-B	7,923	9,444	Osceola.....	953
Nevada.....	5-B	11,832	12,609	Clarendon.....	1,840
Newton.....	2-B	9,950	12,538	Mount Ida.....	.....
Ouachita.....	5-C	17,033	20,892	Prescott.....	2,005
Perry.....	3-C	5,538	7,294	Jasper.....	.....
Phillips.....	4-E	25,341	26,561	Camden.....	2,840
Pike.....	4-B	8,537	10,301	Perryville.....	300
Poinsett.....	2-E	4,272	7,025	Helena.....	5,550
Polk.....	4-A	9,283	18,552	Murfreesboro.....	200
Pope.....	2-C	19,458	21,715	Harrisburgh.....	462
Prairie.....	3-D	11,374	11,875	Dallas.....	.....
Pulaski.....	3-C	47,329	63,179	Dover.....	.....
Randolph.....	1-E	14,485	17,156	Des Arc.....	640
St. Francis.....	3-E	13,543	17,157	Devall's Bluff.....	605
Saline.....	4-C	11,311	13,122	Little Rock.....	38,307
Scott.....	3-A	12,635	13,183	Pocahontas.....	967
Searcy.....	2-C	9,664	11,988	Forest City.....	1,361
Sebastian.....	2-A	33,200	36,925	Benton.....	898
Sevier.....	5-A	10,072	16,339	Waldron.....	487
Sharp.....	1-D	10,418	12,199	Marshall.....	260
Stone.....	2-D	7,043	8,100	Fort Smith.....	11,587
Union.....	6-C	14,977	22,495	Greenwood.....	491
Van Buren.....	2-C	8,567	11,220	Lockesburg.....	550
Washington.....	2-A	32,024	34,256	Evening Shade.....	.....
White.....	3-D	22,946	24,864	Mountain View.....	226
Woodruff.....	3-E	14,009	16,304	El Dorado.....	1,069
Yell.....	3-B	18,015	22,750	Clinton.....	297
Totals.....	.....	1,128,179	1,311,564	Fayetteville.....	4,061
				Searcy.....	1,995
				Augusta.....	1,040
				Danville.....	600
				Dardanelle.....	1,602

* Reference for location of counties, see map of Arkansas.

History.—First settled in 1670 by the French, near St. Francis river; part of Louisiana Territory in 1803, of Missouri Territory in 1812, and of Arkansas Territory in 1819; organized as a State in 1836, Indian Territory being set off; its growth at first slow—only 97,574 inhabitants in 1840, 209,897 in 1850; large increase from Southern immigration in 1850-60. Having been settled almost exclusively from the Southern States, its population entered heartily into the secession movement. The State convention assembled at Little Rock, and passed the ordinance of secession May 6, 1861. Arkansas was overrun by both armies several times, 1861-63; controlled by Federal troops after Dec., 1863; a new constitution was adopted Mar. 18, 1864, but not accepted by Congress, and the State was for four years under military control; a constitution was



ARKANSAS

County Towns

Scale of Miles

0 10 20 30 40 50 60 70

L. L. POTTER, ENGR., N. Y.

adopted Mar. 13, 1868, Congress restored the State to the Union June 22, 1868, and the present constitution was adopted in 1874.

GOVERNORS.

<i>Territorial.</i>	
James Miller	1819-25
George Izard	1825-29
John Pope	1829-35
William S. Fulton	1835-36

<i>State.</i>	
James S. Conway	1836-40
Archibald Yell	1840-44
Saml. Adams (acting)	1844
Thomas S. Drew	1844-48
John S. Roane	1848-52
Elias N. Conway	1852-60
Henry M. Rector	1860-64

Isaac Murphy	1864-68
Powell Clayton	1868-71
Ozro A. Hadley (acting)	1871-72
Elisha Baxter	1872-75
Augustus H. Garland	1875-77
William R. Miller	1877-81
Thomas J. Churchill	1881-83
James H. Berry	1883-85
Simon P. Hughes	1885-89
James P. Eagle	1889-93
William M. Fishback	1893-95
James P. Clarke	1895-97
Daniel W. Jones	1897-1901
Jeff Davis	1901-

Revised by A. R. SPOFFORD.

Arkansas City: on three railroads and the southern border of Kansas, in Cowley County (for location of county, see map of Kansas, ref. 8-H); at the confluence of the Arkansas and Walnut rivers. Pop. (1880) 1,012; (1890) 8,347; (1900) 6,140.

Arkansas Indians: See SIOUAN INDIANS.

Arkansas Post: a post-village of Arkansas co., Ark. (for location of county, see map of Arkansas, ref. 4-E); on the left bank of the Arkansas river, 50 miles from its mouth; settled by the French in 1685. During the civil war this post was garrisoned and fortified by the Confederates. On Jan. 11, 1863, a combined attack of the U. S. military and naval forces under Gen. McClelland and Admiral Porter was made upon the place, and its works were finally carried by storm. Pop. (1880) 37; township (1900), 1,010.

Arkansas Stone: a stone consisting of NOVACULITE (*q. v.*), which is quarried extensively in Hot Springs and Grant cos., Ark. It is a very beautiful and valuable stone, and is largely used for hones and oilstones.

Ark'ausite: a name given to the thick black crystals of brookite (titanic acid) found at Magnet Cove in the Ozark Mountains of Arkansas. See TITANIC DIOXIDE.

Arko'na, or Arcona: a promontory on the north side of the Prussian island of Rügen, in the Baltic. Here is a lighthouse on the site of the heathen temple of Swantewit, which King Waldemar of Denmark burned in 1168.

Ar'kose: See SANDSTONE.

Arkwright, Sir RICHARD: English inventor; b. at Preston, in Lancashire, Dec. 23, 1732. He learned the trade of a barber, which he soon abandoned, and applied himself to the invention of machinery for spinning cotton. At that time no machine could produce cotton yarn fit for warp. In 1768 he set up at Preston his first spinning-frame, for which he obtained a patent in 1769. He removed to Nottingham in 1769, and formed a partnership with Need and Strutt. His machine caused a great extension of the cotton manufacture, and greatly promoted the prosperity of the nation, and he may be called the founder of the factory system. He was knighted by George III. in 1786. D. at Cromford, Aug. 3, 1792. See Baines, *History of the Cotton Manufacture in Great Britain* (1835).

Arlberg: a mountain mass which forms the boundary between the two Austrian provinces of Tyrol and Vorarlberg; 5,400 feet above the sea (see map of Switzerland, ref. 4-J). In 1880-84 it was pierced, at an elevation of 4,030 feet, with a railway-tunnel, 6,720 yards long.

Arles (anc. *Ar'elas, Arela'te, or Arela'tum*): city of France; department of Bouches-du-Rhône; on the Rhône, 15 miles from the Mediterranean (see map of France, ref. 8-G). It has a cathedral of the seventh century, a museum, a college, and a public library. It was once the capital of the kingdom of Arelate. Important councils of the Church were held here in 314, 354, 452, and 475 A. D. Here are the remains of a grand Roman amphitheater, and an ancient granite obelisk which was dug out of the Rhône about 1389. Arles has manufactures of hats, silk, brandy, etc. Pop. (1881) 23,480; (1896) 24,567.

Arlington: on railroad, Middlesex co., Mass. (for location of county, see map of Massachusetts, ref. 2-H); 7 miles N. W. of Boston. It has national and savings banks, an elegant new library building costing \$200,000 (the gift of Mrs. Eli Robbins), gas and water works, electric cars to Boston, and sends a large supply of ice to market. There are im-

portant manufactures. The principal business is market-gardening. Pop. of township (1880) 4,100; (1890) 5,629; (1900) 8,603.

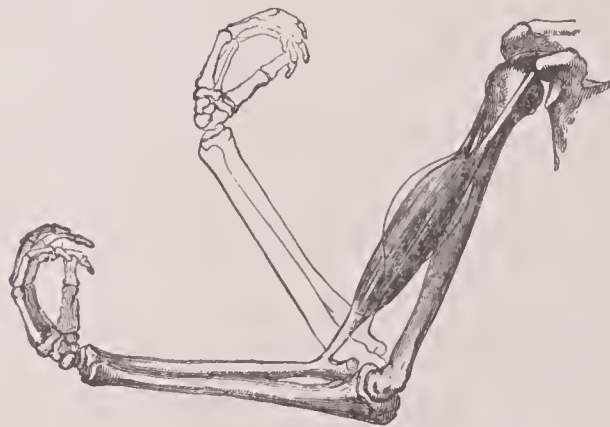
EDITOR OF "ADVOCATE."

Arlington, HENRY BENNET, Earl of; b. in 1618; served as a royalist in the civil war (1642-45); was knighted at Bruges (1658), became Secretary of State (1662), a baron (1664), a member of the "Cabal" (1667), received the Garter, and was sent as ambassador to the King of France in the same year; was impeached by the Commons, resigned, and was appointed Lord Chamberlain (1674). D. July 28, 1685.

Arlt, FERDINAND: German oculist; b. at Obergraupen, near Teplitz, Apr. 18, 1812. He wrote, among other works, *Krankheiten des Auges* (3 vols., 1851-56; 4th ed. 1867); *Pflege der Augen im gesunden und kranken Zustande* (3d ed. 1865).

Arm: in man and the higher animals, the upper or anterior limb, extending from the shoulder to the wrist. The human arm consists of the *brachium* or arm proper (sometimes called the upper arm) and the *antebrachium* or forearm. The former has one bone, the humerus; the latter two, the ulna upon the inside (as the hand lies with the palm upward) and the radius upon the outside. The humerus articulates with the shoulder-blade or scapula, forming the shoulder. This is a ball-and-socket joint, having universal movement. At the elbow-joint the inner bone of the forearm, the ulna, articulates with the lower end of the humerus, forming a hinge-joint. The upper end of the radius practically does not enter into the elbow-joint, but acts as a fulcrum upon which the radius swings as the hand is pronated and supinated, for an account of which see the article HAND. And the lower end of the radius and ulna are bound closely to each other with ligaments, and form an articulation with the upper row of the carpal bones of the hand—that is, turned palm upward or palm downward.

The muscles of the arm may be divided into separate groups; the shoulder-joint is covered over and rounded by the powerful deltoid muscle which springs from the shoulder-blade and clavicle, and is attached to the upper and outer part of the humerus, so that in its action the arm is moved from the side. It is opposed by the great pectoral muscle in front and the latissimus dorsi behind, the two latter in their action drawing the arm to the side and downward. On the front of the arm proper is the biceps, which



The bones of the upper extremity with the biceps muscle.

flexes the forearm upon the arm and behind the triceps acts in the opposite direction. The forearm has two groups of muscles, the one on the outer side surrounding the radius containing the extensor muscles for the wrist and hand, that on the inner or ulnar side being composed of the flexor muscles.

The blood-supply of the arm is mostly derived from the brachial artery, which is a continuation of the axillary artery. This vessel may be felt beneath the skin on the inner side of the biceps muscle of the arm, and especially at the elbow-joint, where it is quite superficial below the elbow before it divides into a radial and an ulnar branch, which continue downward into the hand. The nerves of the arm are branches of the brachial plexus. They accompany the axillary and brachial artery, giving off numerous branches in their descent.

W. P.

Arma'da, The Spanish: often called the "Invincible Armada," a great Spanish fleet or armament which was fitted out by Philip II. for the conquest of England in 1588. It

consisted of about 130 vessels, some of which were of enormous size, carrying in all 2,431 guns and more than 19,000 soldiers. The command of this armada was given to the Duke of Medina Sidonia, who was not a competent naval commander. Lord Howard of Effingham commanded the English fleet, which was greatly inferior in size. Among the subordinates were some of the best naval officers of the time, such as Drake, Hawkins, and Frobisher. The armada sailed from Spain about the end of May, 1588, and in passing through the English Channel was harassed by the English, who avoided a general engagement. During a night in August Lord Howard sent eight fire-ships against the armada, and produced a panic and great disorder, in consequence of which the English captured or destroyed about twelve ships early the next morning. This defeat induced the Spanish admiral to abandon the invasion of England, and he resolved to return to Spain by sailing around the Orkney islands, the passage of the English Channel being closed by the enemy. Many of the Spanish ships were wrecked on their circuitous voyage, and only fifty-three returned to Spain. See Fronde, *Spanish Story of the Armada* (London and New York, 1892).

Armadillo [Span. dimin. of *armado*, armed, one who is armed < Lat. *armatus*, partic. of *armare*, to arm]: the common name of the *Dasyproctidae* (*q. v.*), a family of edentate mammals, natives of South and Central America. They derive their name from a bony armor which covers the body, and consists of polygonal pieces united to form solid bucklers, one over the rump, one piece over the shoulders, and between them a dorsal cloak consisting of a number of plates disposed in transverse bands, which are movable and allow freedom of motion. The head is protected by a similar buckler, not continuous with that of the body. They have short legs and feet adapted to burrowing in the ground, in which, when pursued by enemies, they bury themselves quickly. These animals are nocturnal, and feed on insects, carrion, and vegetable food. Their flesh is often eaten by the natives, but, owing to its rank and strong flavor, it is not agreeable to European palates. The giant armadillo (*Priodon gigas*), the largest member of the family, is about 3 feet long, exclusive of the tail. The claw of the third toe of the forefoot is extremely large and much flattened, forming an admirable instrument for digging out the ants which constitute the animal's chief food. It is found in the forests of Surinam and Brazil, but is rare. Although it is quite commonly believed that all armadillos can curl up into a ball, the members of the genus *Tolypeutes* are the only ones which can do so, this feat being rendered possible by the arrangement of the back armor, which is divided into five portions, a large shield over the shoulders, another of the hinder portion of the body, and three narrow bands between. The fore and hind legs are drawn up under their respective coverings, the head and short tail filling in the little space left below. The peba (*Tatusia peba*) is one of the best known species, and is widely distributed, ranging from Southern Texas to the Argentine Republic. The GLYPTODON (*q. v.*) is an extinct gigantic relative of the armadillo.



Armadillos.

Armageddon (mount of Megiddo): the Plain of Esdraelon, the great battle-field of the Old Testament; used figuratively in Rev. xvi. 16.

Armagh, ar-maa': an inland county of Ireland, province of Ulster; bounded N. by Lough Neagh, E. by Down, S. by Louth, and W. by Monaghan and Tyrone. Area, 512 sq. miles. The surface is undulating or level, except the S. W. part, where Slieve Gullion rises to the height of 1,893 feet. The soil is mostly fertile. The chief rivers are the Bann, Blackwater, and Callan. Granite, trap, carboniferous limestone, and lower Silurian rocks underlie the county. Capital, Armagh. Pop. of the county (1881) 162,823; (1891) 143,056.

Armagh [Ard-magha, high field]: a city of Ireland; capital of county of same name; situated on high ground 36 miles by rail S. W. of Belfast (see map of Ireland, ref. 6-H). It is built of limestone quarried in the vicinity, and has a Protestant cathedral of red sandstone crowning the central eminence, down the sides of which the streets diverge. Armagh is the archiepiscopal seat of the primate and metropolitan of all Ireland, both in the Anglican and Roman

Catholic churches. It has a Roman Catholic cathedral, a college, a large public library, a famous astronomical observatory, and a lunatic asylum. It was the capital of Ireland in the sixth and seventh centuries, and was renowned as a school of theology, etc. On account of the Danish incursions and the English conquest and wars it fell into decay, but is now one of the best-built cities in Ireland. Pop. 10,070.

Armagnac, aar-maan'yak: a former name of a region in France, now comprised in Gers and parts of Haute-Garonne, Tarn-et-Garonne, and Lot-et-Garonne. Its ancient counts were feudal to the crown of France until the time of Henry IV., who united it in his own person to the crown. In later times the title of Count of Armagnac was an honorary one.

Armagnac, BERNARD, Count, d': constable of France; was an ambitious and turbulent nobleman. He became in 1407 the enemy of the Duke of Burgundy and the chief of the faction called "Armagnacs," who waged a civil war against the Burgundians. In 1415 he obtained the office of constable of France, the highest in the nation. Having excited the odium of the Parisians by his tyranny, he was killed by the populace June 12, 1418.

Armagnac, JEAN V., Count, d': a grandson of Bernard, noticed above; b. about 1420. He was notorious for his crimes (he married his sister), and was excommunicated by the pope, but subsequently absolved. As a party to the League of Public Good, he revolted against Louis XI. in 1465. He was put to death by order of that king in Paris, Mar. 5, 1473.

Armausperg', JOSEPH LUDWIG, Count von: an able German statesman; b. at Kötzing, in Bavaria, Feb. 28, 1787. He became a leader of the liberal party, Bavarian Minister of Finance in 1826, and Minister of Foreign Affairs in 1828. By the influence of the Roman Catholic priests he was removed from office in 1831. From Jan., 1833, to Feb., 1837, he governed Greece as regent or chief minister under King Otho, who was a minor. D. in Bavaria, Apr. 3, 1853.

Armatoli, or **Armatoles**: a body of Greek militia organized about 1500 A. D., or earlier. They lived and operated in mountainous regions that were difficult of access, and were very tenacious of their independence. They were employed by the Turkish sultan to protect the fertile plains from the raids of the *klephts* (mountain-robbers) of Thessaly. Northern Greece was divided into about sixteen districts, each of which was placed under the supervision of an armatol. In the war of Greek independence the armatols fought against the Turks, and distinguished themselves by daring exploits.

Armature [Lat. *armatu'ra*, armor]: a piece of soft iron which is placed in contact with the poles of a permanent magnet to preserve its magnetic power. To such an armature the name "keeper" is frequently applied. In dynamos the armature is the coil or set of coils of wires in which current is generated, either by revolution in the magnetic field of the machine or by periodical fluctuations otherwise produced in the number of lines of force which pass through the coils in question. See DYNAMO-ELECTRIC MACHINES, ELECTRIC MOTOR, and ELECTRICITY. E. L. NICHOLS.

Armenia (Turk. *Erminee'yeh*): an important country of Western Asia which has now no political existence, but is historically very interesting as the original seat of an ancient civilized people (Armenians), who have preserved their nationality to the present time. Armenia, the boundaries of which varied in different periods, was situated between Asia Minor and the Caspian Sea. It was mostly included between lat. 37° and 42° N., and between lon. 36° and 49° E. It was divided into Armenia Major and Armenia Minor, the former of which was bounded on the N. E. by the river Kur, on the E. by the Caspian Sea, and on the W. partly by the Euphrates. The Lesser Armenia was situated on the western side of the other. This country is an elevated table-land, inclosed on several sides by the ranges of Taurus and Anti-Taurus, and partly occupied by other mountains, the highest of which is the volcanic peak of Ararat. It is drained by the Euphrates and Tigris, which rise within its limits, and traversed by the river Aras (Araxes). Among its physical features are the large lakes of Van and Sevan, the former of which is saline. It abounds in romantic mountain scenery. The climate of Armenia is very cold in the highlands, while the summer heat of the valleys is intense. Here is a variety of soils, some of which in the valleys produce good crops of cotton, rice, tobacco, and grapes. Grazing

and cattle-breeding are more extensively followed than agriculture. Among its mineral resources are copper, iron, lead, alum, and salt. The chief towns of ancient Armenia were Artaxata, Anni, and Tigranocerta. The chief modern towns are Erivan, Erzroom, and Van. The Armenians call themselves *Haiks* or *Haikans*, a name derived from Haik, or Haig, represented as the first King of Armenia and a descendant of Japhet. Among the most famous of their ancient kings was Dikran or Tigranes, who lived about 550 B. C., and was a friend and ally of Cyrus the Great. The kingdom was conquered by Alexander the Great in 325 B. C., and recovered its independence about 190 B. C. It was afterward ruled by the Parthian Arsacidæ, among whom was Tigranes the Great, a son-in-law of Mithridates, King of Pontus. He waged war against the Romans, and was defeated about 63 B. C. The Armenians are physically a fine variety of the Indo-European race. They have excellent talents for business, and are especially skillful in banking and mercantile pursuits. Christianity is said to have been introduced into Armenia by the apostle Thaddeus. It became, through the influence of Gregory the Illuminator, the established religion of the state in 289. King Tiridates was baptized in 289, and Gregory the Illuminator made "hierarchy" in 302. Political troubles prevented the Armenian Church from taking part in the Council at Chalcedon (451). Hence a misunderstanding, which led the Armenians to set up a separate communion in 491, without ever having become really monophysitic. The Armenians believe in the worship of saints, but not in purgatory, and are especially rigid in the observance of fasts. A small portion of the Armenians in Turkey, Persia, Austria, and Russia have recognized the supremacy of the pope, and are called United or Roman Catholic Armenians; they date from 1316-34. Some years ago a split took place among the United Armenians of Turkey, on account of the changes which the pope made in the ancient constitution of their Church. They were excommunicated by the pope, and in 1872 entered into official communication with the Old Catholics of Germany. In 1830 a very successful Protestant mission among the Armenians was organized by the American Board of Commissioners for Foreign Missions, out of which grew the Evangelical Protestant Church in 1850.

Since 1894 the Armenians in Turkey have been subjected at the hands of the Kurds and Turkish soldiery and officials to atrocities which have shocked the whole civilized world, and called forth strong protests from the U. S. and the great powers of Europe. It has been estimated that during these years over 50,000 persons of both sexes have been massacred. Hitherto (1897), owing chiefly to international jealousies, the so-called "concert of the great powers" of Europe has failed to secure to the Armenians and other Christians in the Turkish empire the protection which they need and deserve, and to which they are entitled. Since the early years of the Christian era this country has been the subject and scene of many bloody contests between the Romans, Persians, Byzantine Greeks, Saracens, Turks, etc., who have successively been masters of it. It now belongs partly to Russia, partly to Persia, and partly to Turkey. The scourge of war and persecution for religious opinions drove great numbers of the Armenians from their native land, and they are now dispersed in various parts of Europe and Asia Minor. The number of Armenians is estimated at not more than 4,000,000, of whom 2,500,000 are in Turkey, and of these about 1,000,000 live in Armenia. See Saint-Martin, *Mémoire historique et géographique sur l'Arménie* (1818); Curzon, *Armenia* (1854); Creagh, *Armenians, Koords, and Turks* (1880); Gatteyrias, *L'Arménie* (Paris, 1880); Norman, *Armenia* (1896); *The Rule of the Turk* and *The Armenian Crisis in Turkey*, by F. D. Greene (1896); and Vartoogian's *Armenia's Ordeal* (1896). See also *Life and Times of St. Gregory the Illuminator* (trans. by Malan, 1868); and Hamachod, *Chronological Succession of the Armenian Patriarchs* (1865). Revised by R. LILLEY.

Armenian Language and Literature: The language of Armenia belongs to the Indo-Germanic family of languages, under which it forms an independent branch like the Greek and Albanian. This view regarding its independence is the generally accepted one, in accordance with Hübschmann's investigations; though the Armenian tongue, especially on the claim of De Lagarde and Fr. Müller, was formerly regarded merely as a subdivision under the Iranian group. We possess monuments of Armenian dating back to the fourth or fifth century of our era. Three stages are

recognized in its linguistic development: (1) the early period, prior to the fifth century; (2) the classical period, from the fifth century, or the date of Bishop Mesrob, to the twelfth century; (3) the later period, from the twelfth century to the present.

A statement preserved in Philostratus (about 200 A. D.) would point to the existence of an Armenian alphabet at the beginning of our era; but tradition usually ascribes the invention, or perhaps rather the reconstruction, of an Armenian alphabet on the Greek basis to Bishop Mesrob in the fifth century. Mesrob's alphabet consists of thirty-six letters, to which there were added two new characters, one for *f* and one for long *ō*, in the twelfth century. The writing runs from left to right.

In addition to the usual familiar sounds the Armenian phonology presents an indefinite vowel *ə* (cf. Eng. *but*), likewise affricatives *č* (*tsh*), *č'* (*thsh*), etc., and spirants (*š* = *sh*, *ž* = *zh*, etc.) and aspirates (*k'* = *k-h*, etc.). The accent of words is prevailing on the final syllable. The inflectional system does not distinguish grammatical gender; but in declension seven cases, including the instrumental, are recognized. A so-called "narrative" case and a "circumlocutory" are also formed by added prefixes. There is no dual. The adjective, moreover, is declined like the substantive, but it sometimes remains invariable. The comparative degree is usually formed by adding *guin* to the stem; the superlative has no special form, but is expressed by repeating the positive, or by emphasizing it by strengthening adverbs resembling *most*, *very*. The numerals, as well as the pronouns, show full declensions. The demonstrative pronouns present a characteristic formative element, *s*, *d*, *n*, which amalgamates with the stem-form to indicate nearness or less and greater remoteness, somewhat like Lat. *hic*, *iste*, *ille*. The verb-system distinguishes three persons, two numbers, three modes, namely, indicative, conjunctive, imperative, likewise an infinitive ending in *l*, and also participial forms. There are four tenses, a present, an imperfect, an aorist of twofold formation, and a future of two forms. Four conjugation classes, based on the characteristic vowels, *e*, *a*, *u*, *i*, are distinguished. The fourth or *i* conjugation may be generally regarded as a passive.

Armenian literature, like Anglo-Saxon, practically begins with the introduction of Christianity, about the fourth century, but there are only scanty remains until the fifth century. The fifth century, or the age of Mesrob, is one of the most flourishing periods in Armenian literary activity. Mesrob, like the great Gothic Bishop Ulfilas, practically invented an alphabet, and created an epoch by his work on a translation of the Bible. Aided by two of his pupils he joined the Patriarch Isaac in work upon a version. The translation was begun from the Syriac Peshito version, but was finally made from the Greek version. Its completion is assigned to the year 411, or perhaps rather about 431. To the same century belongs the famous historian Moses of Khoreni or Chorene (d. 488), who wrote the Armenian *Chronicle* (transl. by Lauer, Regensburg, 1869) from the time of Haig down to his own day. His contemporary, Bishop Eghishe, or Elisæus, recorded the events of the wars of Vartan with the Persians (transl. by Neumann, London, 1830). The succeeding six centuries all contain literary works, but there are no names of real importance till the twelfth and thirteenth centuries. To this era belong, among other names, the distinguished religious writer and poet Nerses Klayensis (d. 1173) and his nephew, Nerses Lampron. In the eighteenth century the Venetian Mekhitarists did much toward reviving and encouraging Armenian literary work, and the comparatively recent historical writings of Tschamtschean (3 vols., Vienna, 1786), for example, are of genuine value. Armenian literature shows almost unbroken continuity since its beginning, and it is of historical and philological importance, as well as of interest from the literary side.

Reference may be made to Petermann, *Grammatica Linguae Armeniacæ* (Berlin, 1837); *Brevis Linguae Armeniacæ Grammatica, Litteratura, Chrestomathia cum Glossario* (Leipzig, 1872); Lauer et Carrière, *Grammaire Arménienne traduite et augmentée* (Paris, 1883); Fr. Müller, *Armeniaca* (Vienna, 1860-92); Hübschmann, *Armenische Studien* (Leipzig, 1883); also Bedrossian, *New Armenian Dictionary* (Vienna, 1875-79); Neumann, *Geschichte der armenischen Literatur* (Leipzig, 1836). A. V. WILLIAMS JACKSON.

Armentières: a town of France; department of Nord; on the river Lys; 12 miles by rail N. W. of Lille (see map)

of France, ref. 1-F). It has manufactures of cotton, linen, lace, and sailcloth. Pop. (1896) 29,603.

Armes, PHILIP: musician; b. in Norwich, England, in 1836. He was first a chorister in Norwich cathedral, afterward going to Rochester. In 1857 he was appointed organist of St. Andrew's, Wells Street, London; Chichester cathedral, 1861, and Durham cathedral, 1862, where he still remains. Most important among his compositions are the two oratorios *Hezekiah* and *St. John the Evangelist*. He has composed largely in the field of church music, and his anthems and services are well known and appreciated.

D. E. HERVEY.

Arm'felt, GUSTAF MAURITZ: Swedish general and courtier; b. in the province of Åbo, Apr. 1, 1757. He became a favorite of Gustavus III., who, after he was mortally wounded by an assassin in Mar., 1792, appointed Armfelt governor of Stockholm. This appointment was nullified by the Duke of Sudermania, who was the enemy of Armfelt, and acted as regent during the minority of Gustavus IV. The regent sent him on a mission to Naples, and during his absence charged him with treason, for which he was sentenced to death. When Gustavus IV. began to reign in 1799 he restored Armfelt to honor and office. He became governor-general of Finland in 1805, and commanded the army in a war against Norway in 1808. Having entered the service of Russia in 1810, he obtained several high civil offices. D. at Zarskoje-Selo, Aug. 19, 1814.

Armi'da: the name of a beautiful sorceress in Tasso's poem of *Jerusalem Delivered*. She attempted to seduce Rinaldo and other crusaders. The former was fascinated for a time, but finally returned to the war against the infidels, and converted Armida to Christianity.

Ar'millary Sphere [*armillary* is from Lat. *armilla*, ring, circle, deriv. from *armus*, upper arm]: an ancient and obsolete astronomical machine; consisted of an assemblage of rings or circles fixed together, so as to represent the principal circles of the celestial sphere in their proper relative positions. These rings were movable round the polar axis within a meridian and horizon, as in the celestial globe. The observations of Hipparchus were made by means of the armillary sphere.

Arminius and Arminianism: (1) **ARMINIUS.**—The name of Arminius in his native language was **JACOBUS HERMANS**, identical with Herman, the name of the hero of Germany who destroyed the Roman legions under Varus. And as this name was transformed into Arminius by Tacitus and other Roman writers, so, in accordance with the custom of the age when Latin was the language of current literature, this name was Latinized, and has come down in modern English as **JAMES ARMINIUS**. He was born in 1560 at Oudewater (old water), a small town in the Southern Netherlands. He lost his father in early childhood, and, his mother being left in straitened circumstances, the promising intellect of the boy so attracted the attention of patrons that he was taken to school at Marburg. When fifteen years of age his native town, Oudewater, was taken by the Spaniards, and his mother, brother, and sister were all massacred, leaving him the sole survivor of his family. He was sent by his patrons to the new university at Leyden, where he remained six years. Such was his proficiency that the city of Amsterdam adopted him as her *vesterling* or foster-child, to be educated at the public expense, he being bound by a written obligation to be at the command of the city through life. He studied at Geneva under Beza, as well as at Basel under Gryneas. At the latter place he was offered a doctorate, but declined the honor on account of his youth. By Beza he was commended to Amsterdam in high terms. He then went to Italy to become accomplished in philosophy under Zarabella, and having visited Rome and the other principal cities returned to Amsterdam, where he was installed minister at the age of twenty-eight.

Arminius's ministry in Amsterdam, of fourteen years' duration, forms the second period of his life. His learning and eloquence were rapidly rendering him one of the leading theologians and preachers of his age. He was of middle size, had dark, piercing eyes, and voice light but clear, and possessing a winning mellowness. His manners were magnetic, and he had the power of fastening firm friends. He was condescending to the lowly and a sympathizing guide to the religious inquirer. At the same time he was an independent seeker and follower of truth.

In 1585 the extreme predestinarianism prevalent in the

Netherlands had been for ten years so effectively attacked by Richard Coornhert, an eminent patriotic and acute layman of Amsterdam, that Arminius was invited by the city to refute him. In a debate at Delft between Coornhert and two high Calvinistic clergymen, the latter were so hard pressed that they yielded, and took the lower or sublapsarian ground, and published a pamphlet against the higher view. The extreme Calvinists called upon Martin Lydius, Professor of Theology in Friesland, to refute them, but he handed over the task to Arminius, who had thus a double request on his hands. He bravely undertook the task, but was soon convinced of the untenableness of either the higher or lower predestination. At the expense of an ignominious failure in even *attacking* Coornhert, he resolved to pursue the light of honest conviction. Avoiding the entire subject in public, he prosecuted his investigations with earnest study. Yet, in lecturing on Romans vii., having given the non-Calvinistic interpretation, he found himself generally assailed by the high Calvinists as a Pelagian and Socinian. He was arraigned before the ecclesiastical courts, where he successfully defended himself on the ground that, though adverse to the prevalent opinions, his interpretation contradicted nothing in the standards—namely, the Belgic Confession and the Catechism. Being questioned as to predestination, he declined to answer, as no fact was alleged against him.

In prosecuting his inquiries he determined to consult privately the best theologians of the day. He commenced a confidential correspondence with Prof. Francis Junius of the University of Leyden, the most eminent of the Dutch theologians. He was delighted to find how far Junius coincided with him, but when he addressed to Junius the arguments for still more advanced views the professor kept the letter by him unanswered for six years, when he died. The friends of Arminius believed that this silence arose from the fact that Junius found more than he could answer or was willing to admit. Unfortunately, this correspondence was inadvertently exposed by Junius to discovery, and was used to the disadvantage of Arminius. Arminius also, having received a treatise in favor of predestination by Prof. Perkins, of Cambridge, prepared an epistle to him, but was prevented by Perkins's death from sending it. His letters both to Junius and Perkins are embodied in his published works, and, whatever may be thought of the validity of the argument, no one will deny that in candor, courtesy, and Christian dignity, they are hardly to be surpassed.

On the death of Junius the curators of the University of Leyden looked to Arminius as his successor. The reluctant consent of Amsterdam being at length gained, Arminius assented. But the predestinarians, led by Gomarus, senior Professor of Theology at Leyden, opposed his election. After a long series of strifes, Arminius offered to meet Gomarus and satisfy his objections. The meeting took place, and Gomarus, admitting that he had judged Arminius by hearsay, after Arminius had fully declared his entire opposition to Pelagianism and Socinianism, fully renounced his objections. So far as predestination was concerned, each professor was to deliver his own sentiments with moderation, and all collision with the other was to be avoided; and Arminius was thereupon elected.

The six years of his Leyden professorship closing with his death are the most important, yet troublous, period of his career. The terms of peace were broken within the first year by Gomarus, who delivered a violent public harangue on predestination in terms of insult to Arminius, who was personally present; to which the latter prepared a refutation clothed in terms of personal respect toward his opponent. Arminius was held as invalidating the Belgic Confession, and so was everywhere traduced by the clergy as a papist, a Pelagian, and a Coornherter. Yet, really, the doctrines he taught were essentially the doctrines of St. Chrysostom, Melancthon, Jeremy Taylor, and John Wesley. In regard to the Confession, he ever treated it with reverence, and only claimed the right of that same liberality of interpretation which Lutherans exercised with the Augsburg Confession. Arminius was proscribed by the clergy, harassed by irresponsible deputations, and his students were subjected to persecutions and exclusions from the ministry. The more intelligent laity, including the magistracy, and especially the chief magistrate, Olden Barneveldt, were favorable to Arminius, who at length appealed to the national legislature (called the States-General) for protection. That body appointed a committee or council, who, having heard both Gomarus and Arminius in full, reported that the latter

taught nothing but what could be tolerated. Before the States-General themselves Arminius delivered a full oration, expounding his entire views, given in full in the edition of his works published in the U. S. The clergy demanded the appointment of a national synod, consisting purely of ecclesiastics, but the States-General, well knowing what would be the fate of Arminius in their hands, refused. Under the constant pressure of these years of persecution the gentle spirit of Arminius at length sunk. He was taken from the bloody times that followed the Synod of Dort. His nervous system was prostrated, and, attended by his faithful pupil, the afterward celebrated Episcopius, he died in the faith he had maintained at Leyden, Oct. 19, 1609, a martyr to his views of truth.

(2) ARMINIANISM.—Arminianism, as the customary antithesis to Calvinism, is, within the limits of the evangelical doctrines, the theology that tends to freedom in opposition to the theology of necessity or absolutism. This contrast rises into thought among all nations that attain to reflection and philosophy. So in Greek and Roman thinking, Stoicism and all materialistic atheism held that mind, *will*, is subject to just as fixed laws in its volitions as physical events are in their successions. When, however, men like Plato and Cicero rose to a more transcendent sense of moral responsibility, especially of eternal responsibility, they came to say, like Cicero, "Those who maintain an eternal series of causes despoil the mind of man of free will, and bind it in the necessity of fate."

Theistic fatalism, or Predestination, consists in the predetermination of the Divine Will, which, determining alike the volitions of the will and the succession of physical events, reduces both to a like unfreedom; but those who hold Predestination very uniformly hold also to volitional necessity, or the subjection of will in its action to the control of strongest motive force. And as the Divine Will is held subject to the same law, so Necessity, as master of God, man, and the universe, becomes a universal and absolute Fate. This doctrine, installed by St. Augustine, and still more absolutely by John Calvin, in Christian theology, is from them called Augustinianism, or more usually Calvinism.

In opposition to this theology, Arminianism maintains that in true *responsibility, guilt, penalty*, especially *eternal penalty*, there must be in the agent a *free will*; and in a true responsible free will the freedom must consist in the power, even in the same circumstances and under the same motives, of *choosing either way*. No man can justly be eternally damned, according to Arminianism, for a choice or action which he can not help. If fixed by Divine decree or volitional necessity to the particular act, he can not be held responsible or justly punished. In all such statements, however, it is presupposed, in order to a just responsibility, that the agent has not responsibly abdicated or destroyed his own power. It is also to be admitted that there may be suffering which is not penalty—finite sufferings for which there are compensations, and for which every one would take his chance for the sake of life. But eternal suffering, for which there is no compensation, inflicted as a *judicial penalty* on the basis of *justice*, can be justly inflicted only for avoidable sin. If Divine decree or volitional necessity determine the act, it is irresponsible, and judicial penalty is unjust.

Arminianism also holds that none but the person who freely commits the sin can be guilty of that sin. One person can not be guilty of another person's sin. A tempter may be guilty of tempting another to sin, but then one is guilty of the sin, and the other of solely the sin of temptation. There can thus be no vicarious guilt; and as punishment, taken strictly, can be only infliction *for guilt upon the guilty*, there can literally and strictly be no vicarious punishment. If innocent Damon die for Pythias guilty of murder, Damon is not guilty because he takes Pythias's place in dying, and his death is not *to him* a punishment, but a suffering, which is a substitute for another man's punishment. The doer of sin is solely the sinner, the guilty, or the punished. These preliminary statements will elucidate the issues between Calvinism and Arminianism on the following points:

1. *Foreordination*.—Calvinism affirms that God does unchangeably and eternally foreordain whatsoever comes to pass. That is, God from all eternity predetermines not only all physical events, but all the volitions of responsible agents. To this Arminianism objects that the predetermination of the agent's volitions destroys the freedom of his will; that it makes God the responsible predeterminer and willer of

sin; and that it makes every sinner to say that his sin accords with the Divine Will, and therefore, so far as himself is concerned, is right. It makes God first decree the sin, and then punish the sinner for the sin decreed. The Arminian theory is this: God does from all eternity predetermine the laws of nature and the succession of physical and necessary events; but as to free moral agents, God, knowing all possible futurities, does choose that plan of his own conduct which, in view of what each agent will ultimately in freedom do, will bring out the best results. His system is a system of his own actions. And God's predeterminations of his own acts are so far contingent as they are based on his precognition of what the agent will freely do; yet as his omniscience knows the future with perfect accuracy, so he will never be deceived nor frustrated in his plans and providences.

Some Arminians deny God's foreknowledge, on the ground of the intrinsic impossibility of a future contingency being foreknown. As the performance of a contradictory act is impossible, intrinsically, even to Omnipotence, so, say they, the knowability of a future contingency, being an essential contradiction, is impossible even to Omniscience. A contradiction is a nothing; and it is very unnecessary to say in behalf of God's omnipotence that he can do all things, and all nothings too. So it is equally absurd to say in behalf of his omniscience that he knows all things, and all nothings too. The exclusion of contradictions does not *limit* God's omnipotence or omniscience, but *defines* it. Arminians do not condemn this reasoning, but generally hold that their theory is maintainable against Calvinism on the assumption of foreknowledge. They deny, as against the Calvinist, that foreknowledge has any influence upon the future of the act, as predetermination has. Predetermination *fixes* the act—foreknowledge *is fixed* by the act. In foreordination God determines the act as he pleases; in foreknowledge the agent fixes the prescience as he pleases. In the former case God is alone responsible for the creature's act; in the latter case God holds the creature responsible, and a just divine government becomes possible. Yet most Arminians probably would say: If the divine foreknowledge of the volitions of a free agent contradicts the freedom, then the freedom, and not the foreknowledge, is to be believed.

2. *Divine Sovereignty*.—Calvinism affirms that if man is free God is not a sovereign. Just so far as man is free to will either way, God's power is limited. Arminians reply that if man is not free, God is not a sovereign, but sinks to a mere mechanist. If man's will is as fixed as the physical machinery of the universe, then *all* is machinery and not a government, and God is a mechanist and not a ruler. The higher man's freedom of will is exalted above mechanism, so much higher is God elevated as a sovereign. Here, according to Arminians, Calvinism degrades and destroys God's sovereignty, and Arminianism exalts it; the freedom of man no more limits God's power than do the laws of nature by him established; in both cases, equally, there is simply a self-limitation by God of the *exercise* of his power; Arminianism holds to the absoluteness of God's omnipotence just as truly as Calvinism, and to the grandeur of his sovereignty even more exaltedly.

3. *Imputation of Adam's Sin*.—Calvinism affirms that Adam's posterity is truly *guilty* of Adam's sin, so as to be eternally and justly punishable therefor without a remedy. As *guilty* of this sin, God might have the whole race born into existence under a curse, without the power or means of deliverance, and consigned to eternal punishment. Arminians deny that guilt and literal punishment can, in the nature of things, be thus transferred. Their theory is that upon Adam's sin a Saviour was forthwith interposed for the race as a previous condition to the allowance of the propagation of the race by Adam, and a provision for inherited disadvantages. The race inherits the nature of fallen Adam, not by being held *guilty* of his sin, but by the law of natural descent, just as all posterity inherit the species-qualities, physical, mental, and moral, of the progenitor. The race in Adam, without redemption, is totally incapable of salvation; yet under Christ it is placed upon a new redemptive probation, is empowered by the quickening spirit given to all, and through Christ may, by the exercise of free agency, attain eternal life.

4. *Reprobation*.—Of the whole mass of mankind thus involved in guilt and punishment for sin they never actually committed, Calvinism affirms that God has left a large share "passed by"—that is, without adequate means of recovery, and with no intention to recover them—and this from the

“good pleasure of his will” and for a display of his “glorious justice.” The other portion of mankind God does, from “mere good pleasure,” without any superior preferability in them, “elect” or choose, and confers upon them regeneration and eternal life, “all to the praise of his glorious grace.” Arminians pronounce such a proceeding arbitrary, and fail to see in it either “justice” or “glorious grace.” The reprobation seems to them to be injustice, and the “grace,” with such an accompaniment, unworthy the acceptance of honorable free agents. Election and reprobation, as Arminianism holds them, are conditioned upon the conduct and voluntary character of the subjects. All, submitting to God and righteousness, by repentance of sin and true self-consecrating faith, do meet the conditions of that election; all who persist in sin present the qualities upon which reprobation depends. And as this preference for the obedient and holy, and rejection of the disobedient and unholy, lies in the very nature of God, so this election and reprobation are from before the foundations of the world.

5. *Philosophical or Volitional Necessity.*—Calvinism maintains the doctrine that all volitions are determined and fixed by the force of strongest motive, just as the strokes of a clock-hammer are fixed and determined by the strongest force. The will can no more choose otherwise in a given case than the clock-hammer can strike otherwise. There is no “power of contrary choice.” Calvinism often speaks, indeed, of “free agents,” “free will,” “self-determining power,” and “will’s choosing by its own power”; but bring it to analysis, and it will always, say the Arminians, be found that the freedom is the same as that of the clock-hammer—the freedom to strike as it does, and no otherwise. Arminianism affirms that if the agent has no power to will otherwise than motive-force determines, any more than a clock-hammer can strike otherwise, then there is no justice in requiring a different volition any more than a different clock-stroke. It would be requiring an impossibility. And to punish an agent for not performing an impossibility is injustice, and to punish him eternally an infinite injustice. Arminianism charges, therefore, that Calvinism destroys all just punishment, and so all free volition and all divine government.

6. *Infant Damnation.*—Holding that the race is truly *guilty*, and judicially condemnable to endless torment for Adam’s sin, Calvinism necessarily maintains, according to Arminians, that it is just for God to condemn all infants to eternal punishment, even those who have never performed any moral act of their own. This was held by Augustine, and wherever Calvinism has spread this has been a part of the doctrine, more or less explicitly taught. Earlier Calvinists maintained against the Arminians that there is actual reprobation—that is, a real sending to hell—as well as particular election, of infants. Arminianism, denying that the race is judicially *guilty*, or justly damnable for Adam’s sins, affirms the salvation of all infants. The individual man as born does, indeed, irresponsibly possess within his constitution that nature which will, amid the temptations of life, commence to sin when it obtains its full-grown strength. If born immortal, with such a nature unchangeable, he must be for ever unholy, and for ever naturally unhappy under the divine repugnance. Under such conditions Divine Justice would not permit the race, after the fall, to be born. But at once the future Incarnate Redeemer interposes, restores the divine complacency, and places the race upon a new probation. Man is thereby born in a “state of initial salvation,” as Fletcher of Madeley called it, and the means of final salvation are amply placed within the reach of his free choice.

7. *Pagan Damnation.*—On its own principle, that power to perform is not necessary in order to obligation to perform, Calvinism easily maintains that pagans, who never heard of Christ, are rightly damned for want of faith in Christ. They may be damned for original sin, and for their own sin, and for unbelief in Christ, without any Saviour. Arminianism, on the contrary, maintains that there doubtless are many in pagan lands saved even by the unknown Redeemer. They, not having the law, are a law unto themselves. Nay, they may have *the spirit of faith*, so that were Christ truly presented he would be truly accepted. They may have faith in that of which Christ is the embodiment, like the ancient worthies enumerated in Heb. xi. There may not be as great differences in the chances for salvation in different lands as Calvinism assumes. Where little is given, much is not required. Arminianism holds that no one of the human race is damned who has not had full chance for salvation. Mis-

sions are none the less important in order to hasten the day when *all* shall be converted. If that millennial age shall come, and be of long duration, Arminianism hopes that the great majority of the entire race of all ages may be finally saved.

8. *Doctrines of Grace.*—Calvinism maintains that the death of Christ is an expiation for man’s sin: first, for the guilt of men for Adam’s sin, so that it is possible for God to forgive and save; and second, for actual sin—that thereby the influence of the Spirit restores the lapsed moral powers, regenerates and saves the man. But these saving benefits are *reserved for the elect only*. Arminianism, claiming a far richer doctrine of grace, extends it to the very foundations of the existence of Adam’s posterity. Grace underlies our very nature and life. We are born and live because Christ became incarnate and died for us. All the institutes of salvation—the chance of probation, the Spirit, the Word, the pardon, the regeneration, the resurrection, and the life eternal—are through him. And Arminianism, against Calvinism, proclaims that these are for *ALL*. Christ died for all *alike*; for no one man more than for any other man, and sufficient grace and opportunity for salvation is given to every man.

Calvinism maintains the irresistibility of grace; or, more strongly still, that grace is *absolute*, like the act of creation, which is called *irresistible* with a sort of impropriety from the fact that resistance in that connection is truly unthinkable. Against this Arminians reply that will, aided by prevenient grace, is free even in accepting pardoning grace; that though this acceptance is no more meritorious than a beggar’s acceptance of an offered fortune, yet it is accepted freely and with full power of rejection, and is none the less grace for that.

9. *Justifying and Saving Faith.*—Faith, according to Calvinism, is an acceptance of Christ wrought absolutely, as an act of creation in the man, whereby it is as impossible for him not savingly to believe as it is for a world to be not created or an infant to be not born. And as this faith is resistlessly fastened in the man, so it is resistlessly kept there, and the man necessarily perseveres to the end. Faith, according to Arminianism, is, as a *power*, indeed the gift of God, but as an *act* it is the free, avoidable, yet really performed act of the intellect, heart, and will, by which the man surrenders himself to Christ and all holiness for time and eternity. In consequence of this act, and not for its meritorious value or its any way compensating for or earning salvation, it is accepted for righteousness, and the man himself is accepted, pardoned, and saved. And as this faith is free and rejectable in its beginning, so through life it continues. It is of the very essence of his probationary freedom that he is as able to renounce his faith and apostatize as to reject it at first.

10. *Extent of the Atonement and Offers of Salvation.*—Earlier Calvinism maintained that Christ died for the elect alone; later Calvinism affirms that he died for one and all, and so offers salvation to all on condition of faith. But Arminianism asks, With what consistency can the atonement be said to be *for all* when, by the eternal decree of God, it is foreordained that a *large part* of mankind shall be excluded from its benefits? How also can it be *for all* when none can accept it but by efficacious grace, and that grace is arbitrarily withheld *from a large part*? How can it be *for all* when God has so fastened the will of a large part of mankind, by counter motive-force, that they are unable to accept it? The same arguments show the impossibility of a *rightful offer* of salvation to *all*, either by God or by the Calvinistic pulpit. How can salvation be rationally offered to those whom God by an eternal decree has excluded from salvation? What right to exhort the very men to repent whom God determines, by volitional necessity, not to repent? What right to exhort men to do otherwise than God has willed, decreed, and foreordained they shall do? If God has decreed a thing, is not that thing right? What an awful sinner is the preacher who stands up to oppose and defeat God’s decrees? If a man is to be damned for fulfilling God’s decrees, ought not that imaginary God to be, *a fortiori*, damned for making such decrees? If a man does as God decrees, ought he not to be by God approved and saved? And since all men do as God decrees, wills, and determines they shall do, ought not all men to be saved, so that the true theory should be Universalism? How can grace be offered to the man whom God had decreed never to have grace? or faith be preached to those to whom God has made faith impossible? or conditions proposed to those from whom God withholds the power of performing conditions? Hence the Arminian affirms that in all

public offers of a free or conditional salvation to *all* the Calvinistic pulpit contradicts its own creed.

Basis of Morality.—Calvinism claims that the very severity of its system, its deep view of human guilt and necessary damnability by birth and nature, its entire subjection to divine absolutism irrespective of human ideas of justice, tend to produce a profound piety. Arminianism replies that this is missing the true ideal of piety. It seems to be basing Christian morality on fundamental immorality. For God to will and predetermine the sin, and then damn the sinner—for him to impute guilt to the innocent, and so eternally damn the innocent as guilty—are procedures that appear fundamentally unrighteous, so far as the deepest intuitions of our nature can decide. Thus first to make God in the *facts* intrinsically and absolutely bad, and then require us to *ascribe* holiness and goodness to his character and conduct, perverts the moral sense. It is to make him what we are in duty bound to hate, and then require us to love and adore him. Such adoration, secured by the abdication not only of the reason, but of the moral sense, and the prostration of the soul to pure, naked absolutism, naturally results in the somber piety of fear; just as children are frightened into a factitious goodness by images of terror. While the piety of Jesus is serene, firm, winning, and gently yet powerfully subduing, the piety of absolutism tends to be stern and Judaic-like. While thus apparently defective at the roots, it does nevertheless often present an objective character of rectitude, a practical hardihood and aggressive energy in the cause of morality and regulated freedom. Arminianism, in order to a true and rational piety, sees the ideal of rectitude in the divine character and conduct, not by mere *ascriptions* contradicted by *facts*, but both in the *facts* and the *ascriptions*. A harmony of facts and intuitive reason is produced, love to the Divine Being becomes a rational sentiment, and a piety cheerful, hopeful, merciful, and gladly obedient becomes realized.

Civil and Religious Liberty.—As the freedom of the individual, and his own intransferable responsibility for his own voluntary character and conduct, are fundamental principles with Arminianism, it is in its own nature adverse to civil or religious despotism. It has been said that when Romanism persecutes, it accords with its fundamental *principle*, the denial of right of private judgment, while when Protestantism persecutes, it contradicts itself. So when Calvinism persecutes, it obeys an intrinsic absolutism, while if Arminianism persecutes, it contradicts its own freedom and individualism. Yet *position* has often in history produced in all these parties palpable violations of, and discordances with, their *principle*. Romanists often become by *position* asserters of ultra-democracy, and Protestants of absolute despotism. And so Calvinism has, historically, been by *position* the advocate for revolution, and Arminianism the asserter of authority. In fact, as Arminianism has been, as above shown, the ruling doctrine of the Church, and Calvinism an insurgent specialty, so the historical *position* of the first has been favorable to the assertion of authority, and the normal position of the latter has been revolt. This may be called one of the *accidents of history*.

Nor was Calvinism, as Prof. Fisher truly affirms, the advocate of liberty of conscience. Not only did Calvin himself banish Bolsec, ruin Castellio, and favor the execution of Servetus, but he maintained, doctrinally, the *duty of the magistrate to punish heresy*. Beza, his learned successor, wrote a treatise in favor of punishing heretics. Bogerman, the president at the Synod of Dort, was the translator of Beza's essay. It is but too evident that the Protestant Calvinists differed with the Romanists not about the punishment of heretics, but about who the heretics to be punished were. In this respect the Calvinism of the new Church and the Arminianism of the old were nearly upon a par. The new Church, however, belonged to the progressive order of things; but whether, finally, the Calvinism or the Arminianism of the new Church first actually proclaimed toleration is a matter of question.

Comparative Morality.—Mr. Froude endeavors by comparison to show that Calvinism is superior to Arminianism in morals by selecting his own examples. But the Arminian may perhaps in reply make also *his* selections. Scottish Calvinism has an unquestioned severity of morals, but are Scotch character and history, as a whole, even ethically superior to the English? Is the morality of Presbyterianism in its entire aspect superior to that of Moravianism, Quakerism, or Wesleyan Methodism? Are Calvinistic Baptists more Christian in morals than the Free-will Baptists?

Is there any umpire qualified to decide that the devout Presbyterian is superior to the devout Episcopalian? Did Jonathan Edwards present a type of piety superior to that of Fletcher of Madeley? or John Calvin to that of James Arminius? Can Calvinism show a grander type of an evangelist than was John Wesley in England or Francis Asbury in America? Has she produced, in all her history, a system of evangelism as earnest, as self-sacrificing, as aggressive as the itinerant ministry of English and American Methodism? Taking the entire body of Calvinism since the Reformation, does it excel in purity, martyrdom, doctrine, and missionary enterprise the (Arminian) Church of the first centuries?

Comparative Republicanism.—Nor did, nor does, Predestination, as compared with Arminianism, possess any peculiar affinity with republicanism against monarchy. By its very nature Calvinism establishes an infinite and eternal distinction between different parts of mankind made by divine prerogative, by which one is born in a divine aristocracy, and the other in an eternal helpless and hopeless pariahism; while Arminianism, holding every man equal before God, proclaims an equal yet resistible grace for all, a universal atonement and Saviour alike to all, an equal power of acceptance in all, a free, unpredestined chance for every man to be the artificer of his own eternal, as well as temporal, fortunes. Caste, partialism, are the characteristics of the former; equality, universality, republicanism, of the latter. It is as plain as consciousness can make any fact that it is the latter that is the natural ally; not of monarchies, aristocracies, or hierarchies, but of regulated freedom. Augustine and Gottschalk were good papists, and Augustinianism was as entirely at home under the tiara of Gregory the Great as under the cap of Bogerman—in the court of Charlemagne as in the camp of the Covenanter. Irrespective of their Calvinism, the Reformers everywhere acted *according to conditions*. Where kings and nobles favored them, they favored kings and nobles; where (as was generally the case) they were rejected by rank and power, and had nothing to make royalty and aristocracy out of, they fashioned a theocratic Commune, out of which modern political experience has picked some aids and methods for voluntary government. Modern experience has eliminated the theocracy, the intolerance, and the predestinarianism, and added the elements to make republicanism. For all this it duly thanks the Reformers, but does not thank their Calvinism.

HISTORY OF ARMINIANISM.—The theology of freedom, essentially Arminianism, in opposition to predestination, necessitated volitions, and imputation of guilt to the innocent is universally acknowledged to have been the doctrine of the entire Christian Church through its most glorious period, the martyr age of the first three centuries. The Calvinistic historian of theology, Hagenbach, says (vol. i., p. 155): "All the Greek Fathers, as well as the apologists Justin, Tatian, Athenagoras, Theophilus, and the Latin author Minucius Felix, exalt the autonomy or self-determination of the human soul. They know nothing of any imputation of sin, except as a voluntary and moral self-determination is presupposed. Even Irenæus and Tertullian strongly insist upon this self-determination in the use of freedom of the will." Again (157): "Even the opponents of human liberty, as Calvin, are compelled to acknowledge this remarkable unanimity of the Fathers, and in order to account for it they are obliged to suppose a general illusion about this doctrine!"

Arminians contend that we know as well when predestination was introduced into the Church—namely, by Augustine—as we do when transubstantiation and image-worship were introduced; that it was in the fourth century, when Pelagius upon one extreme made free will dispense with divine grace, Augustine on the other extreme made divine grace irresistibly nullify free will, and thus both lost their balance; that both invented dogmas never before recognized in the Church; that, tried by the previous mind of the Church, both were equally heretical; that the heresy of one, pushed to extreme, becomes rationalism and pure deism—the heresy of the other, pushed to extreme, becomes presumptuous antinomianism. They assert that the Eastern Church maintained her primitive position, neither Pelagian on one side nor Augustinian on the other, essentially in the position of modern Arminianism; that hence Arminianism is not a *compromise*, but the primitive historical position, the permanent center, rejecting innovations and extremes on either side; that the Western Church, in spite of the great name of Augustine, never became Augustinian.

It is indeed customarily said by anti-Arminian writers that this was because the "age of systematic theology" had not then arrived. Arminians reply that a theology not only unrecognized during that best period of the Church, but, still more, a theology unanimously condemned as heretical by that period, has little right now to lay claim to pre-eminent Christian orthodoxy. The Eastern Church—namely, the churches of Asia, with whom the language of our Lord and his apostles was essentially vernacular; the Greek Church, to whom the language of the New Testament was vernacular; and the Russian Church, embracing many millions—all inherited and retain, firmly and unanimously, the theology of freedom, essential Arminianism. The learned Calvinistic scholar Dr. Shedd, in his *History of Doctrines* (vol. ii., p. 198), says: "The Augustinian anthropology was rejected in the East, and, though at first triumphant in the West, was gradually displaced by the semi-Pelagian theory, or the theory of inherited evil [instead of inherited guilt] and synergistic [or co-operative] regeneration. This theory was finally stated for the papal Church in exact form by the Council of Trent. The Augustinian anthropology, though advocated in the Middle Ages by a few individuals like Gottschalk, Bede, Anselm, slumbered until the Reformation, when it was revived by Luther and Calvin, and opposed by the papists." It will thus be seen, on a review of the universal Church in all ages, how small though respectable a minority Augustinianism or Calvinism, before the Reformation, ever was. With minor exceptions, Arminianism was the doctrine of the universal Church.

The accuracy of Dr. Shedd's statement of the general non-existence of Augustinianism during the Middle Ages is not invalidated by the fact of the great authority of Augustine's name, arising from the powerful genius and voluminous writings of the man. It was no proof that a man was truly Augustinian because he belonged to the "Augustinian order," or quoted Augustine's authority. Such Schoolmen as Bernard, Anselm, and Peter Lombard modified Augustine's doctrine materially; Bonaventura and Duns Scotus were essentially Arminians, and Hincmar of Rheims and Savonarola literally so. Gottschalk, the high predestinarian, was condemned for heresy, and Thomas Bradwardine, the "second Gottschalk," made complaints, doubtless overstrained, that in his day "almost the whole world had become Pelagian."

At the Reformation, however, we encounter the phenomenon that all the eminent leaders at first not only adopted, but even exaggerated the absolutism of Augustine. This might seem strange, for it was apparently natural that the absolute papacy should identify itself with the absolute, and that asserters of freedom would have stood on the free-will theology. The twin doctrines of the supremacy of Scripture and of justification by faith were amply sufficient, without predestination, for their purpose to abolish the whole system of popish corruption. The former dethroned alike the authority of tradition and the popedom; the latter swept away alike the mediations of Mary, saints, and priests. But the first heroic impulse of reform tends to magnify the issues to their utmost dimensions. The old free-will theology belonged universally to the old historic Church, and was identified by the first Reformers with its corruptions. Luther at first, in his reply to Erasmus *On the Bondage of the Will*, uttered fatalisms that probably had hardly ever before been heard in the Christian Church, and perhaps it would be hard to find a Calvinist at the present day who would adopt the trenchant predestinarian utterances of Calvin. Under the indoctrinations of these leaders, especially of Calvin at Geneva, the absolute doctrines were diffused and formed into the creeds of Germany, the Netherlands, France, England, and Switzerland. But in Germany the "second sober thought" of Melancthon, who at first coincided with Luther, receded from predestination, and Melancthon himself intimates that Luther receded with him. In the Netherlands the same "second thought," led by Arminius himself, was suppressed by state power. In France, Protestantism, which was Calvinistic, was overwhelmed in blood. In England the Calvinism was generally of a gentle type, and the same "second thought" was awakened by the Arminian writings of Grotius and Episcopius diffused through Europe. And as the English Church gradually inclined to the ancient high episcopacy of the old Church, so it adopted the ancient Arminianism. Calvinism, persecuted and oppressed, overthrew monarchy and Church, and for a brief period ruled with hardly less intolerance, until, over-

thrown in turn, Calvinism took refuge in America, and laid foundations here. Even here past sufferings did not teach tolerance, and that doctrine had to be learned from checks and lessons administered by surrounding sources. Calvinism has, nevertheless, here acted a noble part in our Christian civilization. It perhaps about equally divides the evangelic Church with Arminianism.

Arminianism, proper and Protestant, came into existence under the severe persecution by Dutch Calvinism, in which the great and good Arminius himself was a virtual martyr. The Synod of Dort, the standard council of the Calvinistic faith, made itself subservient to the unprincipled and sanguinary usurper Maurice; and even during its sessions the judicial murder of the great Arminian and republican statesman Olden Barneveldt was triumphantly announced at Dort to overawe the Arminians at the synod, who were bravely maintaining their cause under the leadership of the eloquent Episcopius. Then followed the banishment of Episcopius, the imprisonment of Grotius, the ejection of hundreds of Arminian ministers from their pulpits, and the firing of soldiers upon the religious assemblies of Arminian worshipers. The great Arminian writers of Holland, Episcopius, Grotius, and Limborch, are claimed by Arminian writers to be the first public proclaimers of the doctrine of liberty of conscience in Europe, as those two Arminian Puritans, John Milton and John Goodwin, were its earliest proclaimers in England.

Wesleyan Methodism is now by all admitted to be a great modern Arminian development. Beginning most humbly as a half-unconscious awakening amid the general religious chill of Protestantism, it has not only quickened the religious life of the age, but gathered, it is said, 25,000,000 of worshipers into its congregations throughout the world. Its theology is very definite, and very nearly the exact theology of James Arminius himself, and of the first three centuries. Cradled in both the Arminianism and High-Churchism of the English establishment, Wesley's maturer years earnestly approved the Arminianism, but severed it from the High-Churchism. The connection between Arminianism and High-Churchism is hereby clearly revealed to be historical and incidental rather than intrinsic or logical. Yet, even after adopting the doctrine that every church has the right to shape its own government, as a lover of the primitive, post-apostolic Church, as well as from notions of Christian expediency, Wesley preferred, and provided for American Methodism, an episcopal form of government. Arminian Methodism has apparently demonstrated that the Augustinian "systematic theology" is unnecessary, and that the primitive theology is amply sufficient for the production of a profound depth of piety, a free ecclesiastical system, an energetic missionary enterprise, and a rapid evangelical success. She exhibits in her various phases every form of government, from the most decisive system of episcopacy to the simplest congregationalism, all voluntarily adopted, and changeable at will. The problems she has thus wrought suggest the thought that the free, simple theology of the earliest age may be the universal theology of the latest.

THE LITERATURE OF ARMINIANISM.—The literature of the controversy of free will and predestination, beginning with Justin Martyr, Chrysostom, and the Greek Christian Fathers generally, is very extensive. Since the Reformation we may name the following: Arminius's *Works* (3 vols. 8vo. translated into English by Nicolls and Bagnall, Auburn and Buffalo, 1853); Episcopius, *Instit. Theol.* (Amsterdam, 1650); Episcopius's works, in two volumes folio, are mainly devoted to the maintenance of the Arminian views against the doctrines of the Synod of Dort; Stephen Curcellæus, *Opera Theologica* (1675, 1 vol. fol.); Limborch's *Theologia Christiana*, the first complete body of Arminian theology (1686), translated into English by Rev. William Jones, presbyter of the Church of England (London, 1702; 2d ed. 1713); Bishop Burnet's *Exposition of the Thirty-Nine Articles* (1699) furnishes what was intended as an impartial presentation of the argument on both sides, though expressing a preference for the Arminian in his preface; Whitby, *On the Five Points* (London, 1710, 1 vol. 8vo), a standard work on the subject in English theology; Wesley's *Works* (New York, 7 vols.); *Checks to Antinomianism* and other works, by Fletcher of Madeley (New York, 4 vols. 8vo); Richard Watson's *Theological Institutes* (New York, 2 vols.), a standard work in Methodist theology; Nicolls's *Calvinism and Arminianism Compared* (London, 1824, 2 vols. 8vo).

The maintenance of the Arminian view of the divine government has, during the present period, proceeded largely

from the Methodist body, and most of the productions have been furnished in America. We may enumerate the following: Dr. Wilbur Fisk's *Calvinistic Controversy* (New York, 1830, 1 vol.), a work which exerted much influence on Methodist theology in the U. S.; Bishop Randolph S. Foster's *Calvinism as it Is* (Cincinnati, 1840), and *Studies in Theology* (3 vols., New York, 1889); Dr. A. T. Bledsoe's *Theodicy* (New York, 1853); Whedon's *Freedom of the Will* (New York, 1864); *Bibliotheca Sacra* (April, 1862); Dr. William B. Pope, professor in the Wesleyan Theological School, Didsbury, England, has published in one large 8vo volume *A Systematic Theology* (London, 1875); Dr. Miner Raymond, professor in the Methodist Theological Seminary, Evanston, Ill., has published (New York, 1879) *A Systematic Theology* (in 3 vols.); Dr. Arnold Sulzberger, professor in the German Methodist Theological Seminary, Frankfurt-am-Main, has issued (1878, in 3 vols.) *Christliche Glaubenslehre vom Methodisten Standpunkt*; Dr. John Miley, Professor of Systematic Theology in Drew Theological Seminary, has published (2 vols. 8vo) *Systematic Theology* (New York, 1892-93). See CALVINISM.

D. D. WHEDON.

Revised by JOHN F. HURST.

Ar'mistice [from Lat. *arma*, arms, war + *-stitium* (as in *sol-stitium*, etc.), a halt]: a truce; a suspension of hostilities between two armies or belligerent powers, which often agree to suspend operations for a definite time while the diplomatists are negotiating the preliminaries of a peace. During the third crusade Richard Cœur de Lion and Saladin made a truce for three years, three months, and three days. In modern times the duration of armistices is much less. After the Germans captured Paris, Jan. 30, 1871, the French people, having no regular Government, desired to elect a national assembly, for which purpose an armistice was granted by the Germans. The armistice, during which the armies on both sides were bound to remain stationary, ended in a treaty of peace, the preliminaries of which were ratified on Feb. 26, 1871. The definitive treaty of peace was signed at Frankfort in May of that year.

Armistie'io: a territory of Venezuela formed between 1881 and 1884 from parts of the states of Bolivar and Zamora. It lies between the Arauca and Caparra rivers, and includes the upper valley of the Apure river. It is a narrow strip of territory, with Colombia on the south and Zamora on the north. The separation of this territory appears merely nominal, and has perhaps been already abandoned. Area, 7,046 sq. miles. M. W. H.

Armitage, EDWARD, R. A.: painter of historical and other figure subjects; b. in London, May 20, 1817. Studied in Paris under Paul Delaroche; Royal Academician (London) 1872. Appointed professor and lecturer on painting at the Royal Academy 1875. Painted the fresco of *The Thames* in 1852, and in 1854 that of *The Death of Marmion*, in the Houses of Parliament. D. May 24, 1896. W. A. C.

Armitage, THOMAS, D. D., LL. D.: b. at Pontefract, England, Aug. 2, 1819; became in his youth a Methodist preacher. In 1838 he removed to New York, and entered the ministry of the Methodist Episcopal Church. In 1848 he became a Baptist, and settled as a pastor in New York; retired in 1888. He warmly advocated the movement for Bible revision, which led, in 1850, to the formation of the American Bible Union, of which organization he became an efficient officer, and subsequently the president. He occupies a high rank as a pulpit orator and as a writer of great power and elegance. His position as a leader in the denomination with which he was identified is generally acknowledged. D. at Yonkers, N. Y., Jan. 20, 1896. Author of *A History of the Baptists* (New York, 1887).

Armitage, WILLIAM EDMOND, D. D.: second Bishop of Wisconsin; b. in New York city, Sept. 6, 1830; graduated at Columbia College in 1849, and at the General Theological Seminary in 1852. Ordained deacon June 27, 1852, and priest Sept. 27, 1854, he ministered at St. John's, Portsmouth, N. H., St. Mark's, Augusta, Me., and at St. John's, Detroit, Mich. He was consecrated assistant to the venerable Bishop Jackson Kemper, Dec. 6, 1866, and succeeded to the episcopate of Wisconsin in 1870. D. in St. Luke's Hospital, New York city, Dec. 7, 1873.

Armor: garments of defense. The term includes all forms of shields. The materials usually employed are, beginning with the easiest to make and least costly, quilted and stuffed garments, which are often an excellent security against sword-cuts and arrows, and which also serve better

than metal the purpose of protecting the body from bruises and broken bones; secondly, leather; thirdly, metal used in small pieces, such as plates or rings, which are sewed to textile or leather fabrics, or very small rings, which are linked together as in a making of chains, but so as to cover a surface, and called chain mail or simply mail; fourthly, metal in larger pieces, as the strips or ribbons of steel, which form the body-armor of the Roman soldiers and that of the Japanese, and the larger splints or plates of steel used in large and elaborately made pieces such as the cuirass, the head-piece (see HELMET), the greaves, and the like. Armor in antiquity was nearly always light and manageable; it usually covered the body only in part, and was never allowed to interfere with ease of movement. The Roman and Greek warriors depended upon their helmet and shields for their chief defense; otherwise their armor was confined to the trunk, the tops of the shoulders, and the front part of the legs below the knees, the boots, however, affording some protection to the feet; even a Roman general or prince engaged in battle with the face, neck, arms, and thighs unprotected, except by the shield. In the Middle Ages, however, there was a general disposition to cover the person completely. As early as the tenth century the helmet had a long nasal, which protected the face, and the hauberk had long sleeves (even gloves attached at a later period), and protected the thighs to the knees. As the skill of armorers became greater the hauberk was reinforced by plates of steel applied to its surface, covering the back of the upper arm, the whole of the forearm, the shoulder, the legs, and afterward parts of the trunk. During the same epoch stuffed armor and armor made by quilting pieces of steel between two thicknesses of strong textile fabric were in constant use, and it was customary to combine many kinds of armor in one equipment; thus the hauberk was worn over the stuffed gambison. In the fourteenth century smithwork had been greatly developed, and suits of complete steel were worn. The head-piece in particular had become a complete covering closed in front and fitting closely at the neck, so that the wearer looked through small openings in the movable visor, and obtained air through minute holes in the movable beaver. At this time the armor of mounted men became extremely heavy and cumbersome, and when the heavy heaume was set upon the bascinet or steel cap as an addition of the defense in time of battle, the wearer was liable to suffocation. It must be remembered, however, that the tilting suits found in collections, and sometimes weighing 200 lb., were not worn in war. In fact, from the beginning of the fourteenth century the armor for the just and the tourney grew continually more and more unlike that intended for battle. The manufacture of armor reached the highest excellence about 1500. Soon after this it began to be given up, because only the most perfectly forged breast-plates could resist a musket-ball; but those who could afford to purchase the best work of the armorer continued to wear steel on the head and body down to the close of the seventeenth century. Moreover, as armies became national in character, so that their equipment was provided out of the national treasury, regiments of cuirassiers were established, some few of which were kept up even down to the Franco-Prussian war in 1870. As steel armor was gradually given up, leather replaced it to a certain extent; thus the buff or buff-coat was worn either to replace the cuirass or in addition to it. RUSSELL STURGIS.

Armor, in modern usage, is a metallic covering for ships or fortifications, intended to furnish protection against gun-fire. The introduction of shell-guns, and the signal instance of their effect in the annihilation of the Turkish fleet at Sinope, showed the necessity of providing protection against their destructive fire. To John Stevens, of Hoboken, N. J., belongs the credit of originating the idea of applying armor to the sides of ships, but the French first gave this idea practical shape in the floating batteries which on Oct. 17, 1855, silenced the Russian forts at Kinburn. For the moment the defense was ahead, but its superiority was short lived, and the introduction of new weapons of attack and the continued advance of artillery in weight and power forced a corresponding development of armor. For some years manufacture of armor was limited to plates of small area; and imperfect welds and steely spots, as well as great irregularity in quality, were necessary evils, owing to imperfect appliances for the production of thick plates. Laminated plating, when tried, was found greatly inferior to the same thickness in a single plate. In 1859, however, armor manufacture had so far developed

that French 4 $\frac{3}{4}$ -inch plating proved superior to the attack of the 68-pounder, then the most powerful naval gun, and in 1860 the British report "vessels clothed in rolled iron plates 4 $\frac{1}{2}$ inches thick are to all practical purposes invulnerable against any projectile that can at present be brought against them at any range." But the general adoption of rifled guns on the Continent and the introduction of the 11-inch and 15-inch smooth-bore guns in the United States called for renewed exertions on the part of the armor makers, and in 1867, it being still impossible to produce plates of reliable quality more than 6 or 7 inches thick, the plate-upon-plate system, in which several thick plates were superimposed, was tried and proved superior, in the then state of the art, to the solid plate of equal thickness. In 1868 plates over 8 inches thick were tested, and in 1872 12-inch plates were tested both in Great Britain and Prussia, and, though of good quality, were hardly a match for the guns brought against them. Such had been the development of the artillery with which armor had to contend that while as late as 1863 4 $\frac{1}{2}$ -inch plating made a ship invulnerable, in 1868 it took 9-inch plating, and in 1872 a 12-inch plate was pierced on the firing-ground. With the introduction of 12-inch plates the limit of regularity in manufacture with wrought iron seemed to be reached, and the cost of the plate-upon-plate system, owing to difficulty in making the plates fit each other, led to the trial and adoption of the sandwich system, in which layers of wood separate the two or more plates making up the complete target. The first application of this system was to the British ship *Dreadnaught*, whose turrets, built up of two 7-inch plates separated by 9 inches of teak and secured to a backing of 6 inches of teak and two $\frac{3}{4}$ -inch skin-plates, were considered more than a match for the 12-inch rifle. But the advent of the 14 $\frac{1}{4}$ -inch Krupp rifle in 1875 and the 81-ton Woolwich gun in 1876 marked the final supremacy of the gun. Wrought-iron armor had now reached its highest development in the *Inflexible*, whose armor consisted of two layers of 12-inch plates with 11 inches of teak between, backed by 6 inches of teak and two 1-inch skin-plates. Simultaneously with the adoption of this armor-disposition the Italian Government, desirous of building the most powerful ships in the world, called for competitive tests of 22-inch armor, and, two French and two English firms having submitted plates, in 1876 the famous Spezzia trials which revolutionized armor manufacture in Europe took place. The plates submitted were solid wrought iron, sandwich wrought iron, sandwich with wrought-iron face-plate and cast-iron rear-plate, and solid steel (the latter made by Schneider & Co., of France). The guns used were the 10-inch and 11-inch Woolwich rifles and the Armstrong 100-ton gun. The Italian commission condemned the types containing cast iron as of relatively feeble defensive qualities, stated that the remarkable advantages realized with the single plates left no doubt of the superiority of this disposition over the sandwich, and concluded that the most advantageous disposition of armor was embodied in the solid steel plate, this having kept out all shot, although wrecked thereby, while the iron targets were pierced by the shot from the 100-ton gun. Thin steel plates and iron plates faced with steel had ere this been tried in Great Britain with doubtful success, but it was now recognized that the day of wrought iron had passed, and attention was at once turned to the production of armor having the resisting qualities of the Schneider plate without its brittleness. In Aug., 1877, the first of what are known as compound plates was tested at Shoeburyness, England. This plate, made by casting a steel face upon a wrought-iron back and rolling the whole to a thickness of 9 inches, was tested with the 7-inch rifle, the penetration being but 3 $\frac{1}{2}$ inches, whereas in a wrought-iron plate it would have been fully 8 inches. In another year 9-inch compound plates, now adopted for the *Inflexible's* turrets, resisted the 9-inch rifle, so rapid was the development of the new system, and in 1880 the manufacture of both compound and steel armor had so progressed that they were brought into close competition. In 1882 the Italian Government again invited armor makers to submit plates to test in order to determine the best system for use on the *Lepanto*, and Cammel & Co. and Brown & Co., of England, the foremost makers of compound armor, and Schneider & Co., of France, the leading makers of steel armor, each submitted a plate 18.9 inches thick. Two shots from the 100-ton gun wrecked each compound plate, while the steel plate, after three, still covered the greater part of its backing. The commission concluded that the Schneider plate was superior to the compound

plates and better adapted to protect a ship's side. Steel plates were not always victorious, however, for in several trials, notably that at Ochta in 1882, the compound plate proved the better, and the less cost and more rapid development of this system in Great Britain led to its exclusive use there and its general adoption on the Continent during the next ten years. The demand for steel armor was, however, sufficient to continue its development, and its increasing superiority was so demonstrated by various tests that when the U. S., in 1886, had before it the task of domesticating the manufacture of heavy armor, the decision as to the preferable material was not doubtful, and steel armor was ordered for all the armored ships then authorized by law. In 1890 the first public trial of a new material for armor, steel alloyed with nickel, took place at Annapolis, Md., a competitive test of a Cammel compound, a Schneider steel, and a Schneider nickel-steel plate being held by the U. S. Navy Department. The compound plate proved inferior in a marked degree to the others, and the nickel-steel showed a remarkable resistance to cracking. In the same year a steel plate hardened on one face by a process of superficial carbonization was also tried at Annapolis, and showed phenomenal resistance to penetration. In 1891 the U. S. Navy Department tested three plates made by the Bethlehem Iron Company of Pennsylvania by the usual forging process, and three made by Carnegie, Phipps & Co. of Pennsylvania by rolling in a heavy plate mill erected for the purpose. Five of these plates were of nickel-steel and three had been surface-hardened, or *Harveyed*, as it was called from the inventor of the process. This test demonstrated that good armor can be produced by the rolling process, a fact of great importance, since enormous and costly hammers are thus unnecessary; that the nickel-steel plates made in the U. S. were markedly superior to any armor that had been publicly tested abroad; and that the process of surface-hardening offered a probable means, after some difficulties were overcome, of greatly increasing resistance to perforation. As a result of these trials it is now generally recognized that nickel-steel is the best material for armor yet produced, and that progress for the present at least lies in the direction of surface-hardening, with the object of breaking up projectiles before they can penetrate.

The armor applied to the protection of ships is also used on coast and frontier defenses, but another armor, ill adapted to naval use on account of its great weight, has also been developed for land fortifications. The Gruson system consists in building up ellipsoidal-shaped turrets of very heavy iron castings, chilled on the outer surface, and fitted together without bolts. This chilled cast iron was first tried in Prussia in 1868, and showed such remarkable resisting qualities in this and many subsequent tests that it has been largely adopted for land fortifications on the Continent.

Methods of Manufacture.—Gruson armor is made as follows: A plaster model of the plate is first made, and from this a chill mold of cast iron representing its outer face. Upon this a sand mold is built up corresponding to the other surfaces; and finally the plate is cast of specially selected iron. No machining is needed, and the use of bolts is avoided by hollowing the ends and running solder into the cavities thus formed between the adjacent blocks. Wrought-iron armor is made by piling a number of slabs or thin plates of wrought iron together, raising them to a welding heat, and either forging or rolling the mass into a solid plate. Rolled iron plates were considered better than forged ones.

Compound armor is made by Brown & Co. under the Ellis patents, as follows: Around three sides of a wrought-iron plate is fixed an iron or steel frame, to which is bolted a thin steel plate, its surface parallel to the iron plate and at the desired distance therefrom, and the sides of the frame having webs extending into the space between the two plates. Thus prepared it is heated to a high temperature, the exposed steel surfaces protected by gannister, and is placed upright in a pit, where a hydraulic ram pushes a movable iron plate against it and holds it firmly against another iron plate. The space between the iron and the thin steel plate is then filled with molten steel, and the top is covered with sand and weighted. After cooling, the compound plate is reheated, rolled to the desired thickness, bent, and machined as required. Cammel & Co. make compound armor under the Wilson patents, the process being as follows: A wrought-iron plate, prepared in the usual way by rolling, is heated to a high temperature and slid horizontally into an iron mold lined with refractory material; iron strips

are then placed along the sides of the plate, between it and the opposite face of the mold, so as to hold the plate firmly in place, and the mold is placed upright in a pit, where it is filled with molten steel, the top being then covered with sand and weighted. After cooling the mold is removed, the plate rolled to the required thickness, reheated, bent to shape, and machined. Compound plates are usually made with one-third the thickness steel and two-thirds iron.

Steel armor, as made by Schneider & Co. and the Bethlehem Iron Company, is of open-hearth steel. An ingot of approximately rectangular cross-section and about twice the weight of the finished plate is cast, and after cooling is stripped, reheated, and forged to the required thickness under a 100-ton hammer, the first operation being forging the upper end of the ingot into a porter-bar for handling, and the entire operation requiring several heats. The upper part of the forging is next cut off under the hammer, and the remainder, after cooling, is trimmed nearly to size either by a saw or a planer; it is then again heated, bent to shape under a hydraulic press, reheated to a high temperature, plunged in oil, where it is allowed to cool, again heated to a somewhat lower temperature in a closed furnace, and allowed to cool there slowly. Lastly it is machined to size, the bolt-holes are bored and tapped, and the curvature is rectified under the bending-press at a low heat not sufficient to undo the work of the previous oil tempering and annealing. The manufacture of steel armor by rolling is similar to the above, except that instead of being forged the ingot, after reheating, is passed back and forth through heavy rolls which reduce its thickness several inches at each pass, water or salt being thrown on the surface from time to time to break up the hard scale. The rolling operation reduces the ingot to a plate of the desired thickness in a single heat, but the temperature of rolling is higher than needed in the forging operation, where immense hammers are used, and it is on this account that it has been generally supposed that the resulting plate would have a coarser texture and be inferior to the forged plate. In making nickel-steel armor enough nickel is added to the furnace charge to give about 3 per cent. in the ingot, the remaining operations being the same as in making steel armor.

Backing and Fastenings.—Armor was first applied to wooden ships, but when iron and steel ships succeeded these it was found necessary to interpose a certain thickness of wood between the skin-plating of the ship and the armor to decrease injury to the ship's side from impact of shot, and to provide a surface that could be trimmed to exactly fit the plates as manufactured. This backing is of oak or teak, and in modern ship-design is usually of moderate thickness. In fortifications masonry has been used for backing with great advantage. From the first much trouble was experienced with fastenings, the through bolts originally used causing leaks, and snapping at the bottom screw-thread when the plate was struck. These defects were remedied by using bolts like wood-screws, extending not quite through the backing. The bolts now used are forged steel, pass through the skin-plating and backing, and screw into the plate from 2 to 3 inches. They have shanks of reduced diameter to prevent breaking at the thread; are packed with hard rubber to prevent leakage around them; and have rubber washers under the nut-heads. With steel armor one bolt is used to about every 4½ sq. feet of plate, and the diameters vary from 1½ inches for thin plates to 3½ inches for thick plates. With compound armor the bolts are larger and fewer in number.

Disposition and Uses.—The armor of modern ships has a twofold end: to prevent the effective use by an enemy of explosive shell containing large bursting charges, compelling resort to armor-piercing shell, which are practically solid shot; and to prevent destruction of a ship by a single blow from a heavy projectile. For the first purpose the armor need only be thin and should cover a wide area; to be effective for the second purpose it must be concentrated about the more vital parts. These systems are both used, and in the largest ships a combination of the two is found. At first sight it would appear that a means of greatly increasing the protective power of armor would consist in placing it so as to receive the shot at a sharp angle, but numerous experiments have shown that where a given area is to be covered with a fixed weight no advantage is gained by inclining the plates, since every increase of inclination requires a decrease of thickness to keep the total weight within the limit allowed. The principle of inclined armor is, however, largely used in protective decks which cover the propelling machinery and in shields for the defense of guns'

crews. The marked superiority of guns to armor on the firing-ground has led to the opinion that the use of armor will ere long be abandoned, but the circumstances of naval warfare are such as to greatly increase the value of armor over that shown in experiments, and it is probable that as long as ships of war are built armor will be used for one or both of the purposes described above. PHILIP R. ALGER.

Armor'ica [Lat.; supposed to be from Celtic *ar*, upon + *mor*, sea]: the ancient name of the northwestern part of Gaul, bordering on the ocean, and extending from the Seine to the Loire. The Armoricians had numerous ships, and were extensively engaged in maritime pursuits. About 400 A. D. Mariadec, a Briton, obtained the chief power in Armorica, which became an independent state. In consequence of the immigration of Britons or Welsh in the sixth or seventh century, the name of Armorica was changed to Bretagne. The language of the country is closely allied to the Welsh.

Arms [Lat. *arma*]: weapons of war; offensive weapons or instruments, which are divisible into two great classes—firearms and arms which are used without gunpowder or any explosive substance. The latter, which are the more ancient, are the sword, spear, dart, javelin, lance, arrow, battle-axe, cutlass, dagger, dirk, bayonet, scimitar, pike, sling, etc. The principal varieties of firearms are described under the heads ARTILLERY, ORDNANCE, MAGAZINE-GUNS, and SMALL-ARMS. Arms for both war and the chase have been used from the most remote time. Beautifully finished specimens of stone axes or tomahawks, arrow and spear heads, and stone knives or daggers have been found with the remains of prehistoric men. The bow and arrow seem to have reached a somewhat high state of perfection at a very early age. The most ancient sculptures show missile and cutting arms differing but little from the more modern forms.

A *stand of arms* is a complete set necessary for arming one soldier.

Arms, or Armorial Bearings: See HERALDRY.

Arm'strong**, DAVID MAITLAND:** genre and decorative painter; b. at Newburg, N. Y., June 12, 1837; pupil of Luc Olivier Merson. Member of the Society of American Artists and Architectural League, New York. Legion of Honor, 1878. Studio in New York. W. A. C.

Armstrong, GEORGE DODD, D. D., LL. D.: a brother of Dr. W. J. Armstrong; b. at Mendham, N. J., Sept. 15, 1813; graduated at Princeton in 1832, studied theology in Union Seminary, Prince Edward co., Va., was Professor of Chemistry and Mechanics in Washington College, Lexington, Va. (1838-51), and since then pastor of a Presbyterian church in Norfolk, Va.; became *pastor emeritus* 1891. He has been a large contributor to periodicals and has published *The Summer of the Pestilence* (Phila. 1856); *The Doctrine of Baptisms* (N. Y., 1857); *The Christian Doctrine of Slavery* (1858); *The Theology of Christian Experience* (1860); *The Sacraments of the New Testament* (1880); *The Books of Nature and Revelation* (1886).

Armstrong, GEORGE FRANCIS: poet; b. near Dublin, May 5, 1845; educated at Trinity College, Dublin; professor in Queen's College, Cork, 1871; author of *Poems, Lyrical and Dramatic* (2d ed. 1872); *Ugone* (1870); *Israel* (1872-76); and *Mephistopheles in Broadcloth* (1888).

Armstrong, JAMES: commodore U. S. N.; b. at Shelbyville, Ky., Jan. 17, 1794; entered the navy as a midshipman in 1809; was captured by the British while serving in the Frolic in 1814; received the regular promotions, becoming a captain in 1841, commanding the East India squadron (1855-58), and captured the Barrier Forts in the Canton river in 1857. Jan. 12, 1861, he was compelled to surrender Pensacola navy-yard to a greatly superior force of Confederates. D. Aug. 27, 1868.

Armstrong, JAMES: Canadian jurist; b. at Berthier, P. Q., Apr. 27, 1821. He was admitted to the bar in 1844, was appointed queen's counsel in 1867, and subsequently became chief justice of Tobago, W. I., which he held conjointly with the chief justiceship of St. Lucia till his resignation in 1882. He was instrumental in introducing the English criminal law into the islands. He was made a Companion of the Order of St. Michael and St. George in 1857. Since his return to Canada he has been president of the Montreal and Sorel Railway, and has written many valuable treatises on law. NEIL MACDONALD.

Armstrong, JOHN, M. D.: physician, poet, and miscellaneous writer; b. in parish of Castleton, Roxburghshire, Scot-

land, about 1709; received degree of M. D. from Edinburgh University in 1732, and went to London to practice. He was not famous as a physician, but he was popular as a poet. His best known poems are the *Economy of Love* (1737), and *Art of Preserving Health* (1744). D. in London, Sept. 7, 1779.

Armstrong, JOHN: soldier; b. at Carlisle, Pa., Nov. 25, 1758. He served in the Revolutionary war with the rank of major. He was the author of the anonymous and celebrated *Newburg Addresses*, written in March, 1783, in order to obtain from Congress a payment of the money due to the officers of the army. He was a member of the old Congress, and in 1800 was sent to the U. S. Senate from New York. He was sent as minister to France in 1804, and was appointed Secretary of War in January, 1813. He was censured because he failed to defend Washington in 1814, and resigned in September of that year. D. at Red Hook, N. Y., Apr. 1, 1843.

Armstrong, JOHN: b. in the north of Ireland in 1725; commanded successfully the expedition sent in 1756 against the Indian allies of the French at Kittanning; served as brigadier-general in the Revolutionary army at Fort Moultrie, and commanded the militia at Brandywine and Germantown. He was a member of Congress (1778-80 and 1787-88). D. at Carlisle, Pa., Mar. 9, 1795.

Armstrong, SAMUEL CHAPMAN: educator; b. at Wailuka, Maui, Hawaiian islands, where his father was a missionary, Jan. 30, 1839; educated at Oahu College and Williams College, Mass. (graduated 1862); after being chief clerk of the Department of Public Instruction, Hawaii islands, entered the Union army as captain, 1862; became brevet brigadier-general 1865; superintendent of ten counties in Virginia in Freedman's Bureau, 1866-68; principal of Hampton Normal and Agricultural Institute (1868), from which time he devoted his life with eminent success to the improvement of the Negro and Indian races. D. at Hampton, Va., May 11, 1893.

Armstrong, Lord (formerly Sir) WILLIAM GEORGE, C. B., LL. D., D. C. L., F. R. S.: mechanical engineer, etc.; b. at Newcastle-upon-Tyne in 1810. He was educated at the school of Bishop-Auckland, Durham, and articled to a solicitor of Newcastle, whose partner he subsequently became. A strong bent for scientific pursuits diverted him from the law. He early investigated the subject of electricity. In 1840 a workman of Newcastle, having put one hand in the steam blowing off from a high-pressure engine while his other hand was on the lever of the valve, received a powerful electric shock. The investigation of this case by Armstrong led to the invention of the hydro-electric machine, which far surpassed any ordinary machine in the quantity of electricity furnished in a given time. For this, while very young, he was elected a fellow of the Society of Arts. He then invented the hydraulic crane, and the "accumulator" to furnish an artificial head for working hydraulic machines, and he extended the application of hydraulic power to machines of every kind. He founded the Elswick engine-works for the construction of this machinery. In 1854 he invented the rifled ordnance gun that bears his name. In 1858 the gun was recommended for adoption, and upon presenting his patents to the British Government Mr. Armstrong was knighted, made a C. B., and appointed engineer of rifled ordnance. Between 1858 and 1870 the Armstrong gun underwent many changes; the breech-loading feature was abandoned, but the general principle of its construction—by which coiled bars are shrunk one over the other upon a tube made with the fiber lengthwise—was retained. The system is applied to all sizes, from the 6-pounder to the 600-pounder. Within three years he furnished 3,000 guns to the British service.

In 1863 Sir William resigned his position with the Government and rejoined the Elswick company, which has become one of the most important works of Europe, constructing not only guns but armor and armored ships for various governments. In 1863 he was president of the British Association at Newcastle-upon-Tyne, when he drew attention to the probable exhaustion of the coal of Great Britain at some future time. He was made a member of a royal commission to inquire into this subject and make report. He received the honorary degree of LL. D. from the University of Cambridge in 1862 and that of D. C. L. from Oxford in 1870. Lord Armstrong is a Knight Commander of the Bath, of the Danish order of Dannebrog, of the Austrian order of Francis Joseph, and of the Brazilian order of the Rose. He is also a Grand Officer of the Italian order of SS. Maurice

and Lazarus since 1876. Lord Armstrong is active in opposition to the patent laws of Great Britain, and has worked for their repeal. He has been president of the Institution of Civil Engineers, of the Institution of Mechanical Engineers, and of the Newcastle Literary and Philosophical Society. He was made a peer in 1887, the year of the queen's jubilee, under the title of Baron Armstrong.

WILLIAM RICH HUTTON.

Army [from O. Fr. *armee*, Mod. Fr. *armée*, ultimately from Lat. *armatus*, armed, *arma*, arms]: the entire organized land forces of a nation, or a force of considerable size so organized, armed, and equipped as to be able to act independently or in combination with others.

In the first sense we speak of the *army of the United States*, the *French army*, etc. In the second we include such forces as the Army of the Potomac, the first, second, or third German armies, etc., and also organized bodies sometimes of less size which take their names from their duties. For instance, a *covering army*, which interposes itself between the enemy and some place to be secured or protected; a *blockading army*, which surrounds a place and prevents ingress and egress; an *army of observation*, which is held in close proximity to an enemy, watching his movements, but generally avoiding an engagement; and many others whose names sufficiently indicate their duties.

The characteristic feature which separates an army from a mob is its organization, by which is meant that system of subordination which enables one man to control the entire mass and move it in accordance with his will. This implies a subdivision of the mass into units of such small size that the commander of each one can personally supervise, direct, and control the movements of each man in it. This is the *unit of combat*, whether called a tetrachia by the Greeks or a company, troop, or battery at the present time, and has varied in numbers at different epochs with the use of different weapons, from about 60 to 250 men.

These units of combat combine to form *tactical units*, which while small enough to be under the personal observation and control of one man are yet large enough to be an efficient factor in attack or defense, and when acting alone may use their subdivisions for successive attack, mutual support, etc. In modern armies the tactical unit of infantry is the battalion.

For administrative purposes, such as supplying clothing, food, arms, etc., and for recruiting and keeping records, the tactical units are united into *units of administration*, now called regiments.

The regiments are again united into brigades, the brigades into divisions, the divisions into corps, and the corps into armies. Each of these subdivisions in turn is controlled by its immediate commander, who holds those beneath him to a strict accountability, and is himself similarly held by his superiors.

It is evident that by this system of subordination in command, sometimes called the "military hierarchy," the commander of the army can control each and every man in the army, and that the relative command and responsibility of each subordinate can be fixed.

Coexistent with this organization, and absolutely essential to its existence, is a proper state of discipline in the army. This discipline is not limited (as is popularly supposed) to training the men in the use of their arms and the details of military drill, but includes thoroughly instructing both officers and men in their military duties, and in developing in them a respect for the authority of their superiors and a devotion to their duty which will cause them to implicitly obey the orders given them, even to the unhesitating sacrifice of their own lives. These elementary principles of army organization, which are the outgrowth of the experience of the world, being understood, the reader is at once enabled to decide to what extent the armed forces of a nation are entitled to be called an army as distinguished from a mob.

It must not be inferred that magnificent results have not been attained by the struggles of nations, who, actuated by patriotism, religious fervor, or some other strong emotion, have fought as individuals or in bands without being formed into armies properly so called; but such results have been possible only when every man of the nation was aroused, and even then at a much greater cost of life than would have been necessary with an organized army.

Before describing the organization of modern armies a short *résumé* will be given of ancient and mediæval ones,

sketching their development only, since the progressive growth of the different arms is given in more or less detail in the articles ARTILLERY, CAVALRY, INFANTRY, etc.

In the earliest stage of civilization armies, strictly speaking, did not exist; the active men of the tribes were all warriors, while the old men, women, and children looked after the supplies, etc., as among the savages and barbarians of to-day, the different bands fighting among themselves or uniting for a foray or common defense as circumstances might determine.

The Egyptian Army.—History points to Egypt as the first nation to establish a military organization which may be called an army. Under Sesostris the nation was divided into thirty-six provinces, in each of which a warrior-class raised a contingent, all of which when united gave an army, stated by Diodorus Siculus to consist of 600,000 infantry, 24,000 cavalry, and 27,000 chariots (probably an exaggerated estimate). The army was commanded by the king in person, assisted by his companions, who like himself had been trained for war by his father, Amenophis. With this army, which seems to have been well drilled, disciplined, and commanded, he, in a campaign of some nine years, made his extended conquests in Africa, India, Tartary, and Asia Minor.

After these conquests, however, the Egyptian army assumes no further prominence as an aggressive force.

The tactical formation of its infantry seems to have been in solid squares of 100 front and depth, or total of 10,000 men. But little is known of its cavalry, which was not a prominent arm.

Persian Army.—The Persian army, at first mainly cavalry, starting out from the sterile mountains, gradually extended its conquests through the more fertile surrounding regions, garrisoning the cities and occupying the country with the native Persians known as the "king's troops."

Each province was under a military commander who was responsible for the troops of his province, who were annually mustered and inspected.

These troops made up the standing army, efficient for defense against ordinary inroads and insurrections.

In case of foreign war this army was supplemented by the addition of a militia force collected from all the provinces and conquered nations, making up a mass of troops immense in numbers but of little organization or discipline.

The army which Darius led against Alexander was of this character and very large, stated by historians to consist of from 750,000 to 1,000,000 men. That it so easily fell before Alexander must be due to its heterogeneous character and lack of organization, rather than to the lack of fighting power of the Persians themselves, who, except as cavalry which retained its old efficiency, made up but a small part of this force.

The Greek Armies.—The armies of the Greek states consisted almost entirely of infantry, their leaders fighting either on foot with the men or in chariots. Their military system was rather that of a state militia than of a standing army, since but few garrisons were maintained and the men were called out only when needed, returning to their homes when the war was over.

Their frequent wars, however, domestic and foreign, together with their acceptance of service as mercenaries, kept them in constant familiarity with war. And the fact that it was the proud duty and privilege of every freeman to bear arms, while slaves only were called upon to work, led them to keep themselves fitted, by constant military training and physical exercise, to take their place and properly perform their duties in the phalanx.

The Athenian freeman was enrolled at the age of eighteen, and for two years was kept upon home service; from twenty to forty he was liable to service anywhere. But very few were exempt. The more wealthy were allowed to serve in the cavalry, but the mass of the army was infantry. The characteristic feature of the Athenian troops was the vigor and dash of their attack.

The Spartans, under the laws of Lycurgus, were subjected to rigid discipline, unquestioning obedience, endurance of pain and fatigue, and contempt of danger. They were under constant drill, training, and exercise, more so in peace than in war; since in war they were, so far as possible, relieved of labor and fatigue by slaves, baggage-wagons, etc., so that they might be fresh for battle.

Every citizen was called upon for military duty, and their term of service was between the ages of twenty and sixty.

Macedonia, although rising into civilization later than the

above-mentioned states, became the leading state of Greece. Under the reign of Philip she built up a standing army whose organization was developed from but improved upon that of the other states.

At Philip's death, just as he was about to invade Persia, he was succeeded by his son Alexander the Great, who with the army so provided commenced his wonderful career of conquest. His actual force at the outset was about 35,000 men, of which between 4,000 and 5,000 were cavalry, about 5,000 foreign mercenaries, 12,000 Macedonians, and 13,000 Greeks of other states and allies. Recruits subsequently sent to his army brought up its strength to about 60,000 men, constituting two grand phalanxes; the heavy troops armed with the sarissa or pike, 24 feet long, the light troops with the javelin, sling, etc. The formation of the Greek infantry was in the PHALANX (*q. v.*). The small size of this conquering army is the strongest proof of its excellence in individual courage and skill, and in its organization, discipline, and tactics.

The Roman army, like the Greek, was made up originally from free citizens only. Every Roman citizen was liable to military service between the ages of seventeen and forty-six. Yearly levies were ordered by the Senate, and from them were selected the new men required. They were thoroughly trained in the arts of fighting, camping, fortifying, and in marching, working, carrying their heavy arms, equipments, etc.

The cavalry was recruited from the families of rank. One regiment of ten turmae, each of thirty men, was attached to the legion, constituting about 6 per cent. of its entire strength. The earlier tactical formation of the infantry was the legion of ten maniples.

Under Marius we first find slaves fighting among the legionaries, and at about the same time the replacement of the maniple by the cohort.

These changes seem to mark the epoch at which that decadence of the Roman army began which ended in its succumbing to the barbarians of the north. The organization and arms of the legion, maniple, and cohort, are described in the article INFANTRY (*q. v.*).

Medieval Armies.—The Franks and Germans in their warfare against the Romans were organized by tribes and families united into larger masses, who, under the direction of some selected ruler, fought usually in their wedge-shaped columns of attack, aided by their cavalry and light infantry, the latter at the time a *corps d'élite*, but which at a much later date lost this character, and the foot troops became merely attendants upon the mounted men or knights.

All the freemen of these tribes were entitled to bear arms, and in peace claimed perfect liberty and a voice in deciding all public questions. In war, commanders were elected and given absolute power. The more ambitious of these commanders, uniting contiguous tribes for defense or conquest, gradually gathered around themselves bands of retainers, whom they rewarded by allotting to them booty and lands gained by conquest. Soon the acceptance of these gifts was made equivalent to a pledge of future service, and by this means they increased the number of their retainers, augmented their power, and subjected the freemen who were not among their followers to oppressions and exactions of all sorts, until they became in all things subject to the petty suzerains, and the feudal system was established.

The feudal armies were composed of knights, men at arms, and vassals, who were called out as needed, and when disbanded returned to their ordinary pursuits. The fighting power rested in the knights; the infantry, being poorly armed and equipped and almost without organization or training, were held in contempt.

About the middle of the fifteenth century, however, the victories of the Swiss pikemen over the chivalry of Burgundy, and the establishment by Charles VII. of a standing army, demonstrated the superiority of trained and organized forces over the feudal bands, and in a degree re-established the prestige of well armed and drilled foot troops. These changes marked the beginning of the downfall of the feudal system, which was completed by the almost universal establishment of standing armies and the general introduction of firearms at the beginning of the sixteenth century.

The standing armies of this date, and up to the French Revolution, were recruited by voluntary enlistment from the citizens or from foreign mercenaries. The organization and tactical development of the different arms being given under the heads ARTILLERY, CAVALRY, INFANTRY, TACTICS, WAR, etc., will not be repeated. Attention need be called here only to the progressive extension of front and diminu-

tion of depth of formation resulting from improvements in firearms, and to the successive subdivisions of the larger masses into smaller units, in order to increase the mobility of the whole by the greater freedom of movement of its components, at the same time retaining the control of the entire army under one head through the subordination of commanders, to which reference has already been made.

Under this progressive change the masses of the Swiss infantry disappeared, and by the time of Gustavus Adolphus, during the Thirty Years war (1618-48), were replaced by lines with a depth of six ranks, which with the introduction of the bayonet were still further reduced to four ranks.

Under the First Frederick, the "drillmaster of Europe," guided by Leopold of Dessau, was formed that army with which Frederick the Great won his battles. The infantry was reduced to three ranks in depth, and by its drill, still further perfected by the Second Frederick, the mobility of the army was increased, the volume of infantry fire very much developed, and that system of mathematical accuracy of movement was established which enabled him to strike with his army as a whole or by wings, and with a rapidity and dash that secured to him the victory in almost every case in which he could maneuver.

Frederick's successes led not only to the perpetuation of his system in Prussia, but also to its servile following by the other nations of Europe. Many traces of his drill still remain in the armies of to-day, and are only now disappearing, forced out by the requirements of modern methods and weapons.

Napoleon, applying under all varying circumstances that one great principle of tactics which he had learned by his studies of all previous campaigns—that success results from being stronger than the enemy at the point of actual conflict, irrespective of the total strength of the two armies—so modified the tactical handling of his armies that he was able to move the smaller units independently to the points at which they were to be used, and there combine them for the attack or defense. From his acts and writings have been developed the principles of the strategy and tactics which are accepted as the basis of the art of war, and which, while most simple in themselves, have been made to appear by pedantic military writers extremely abstruse and difficult of application.

The immense losses during the Napoleonic wars so depleted the armies that new methods of recruiting became necessary. In consequence the "conscription" was established, by which every male citizen was declared liable to military service for five years, and under which every citizen between twenty and twenty-five years of age was enrolled by name and called out as required.

This system has in recent years been adopted with some modifications by nearly all European nations, and has made possible the formation of the immense armies of modern times.

Under the terms of the Peace of Tilsit the Prussians were allowed to maintain a standing army of 42,000 men only; but under Scharnhorst and Gneisenau at this time was established the "short-service system," by which each man, so soon as he was trained in his military duties, was sent home and was replaced by a recruit. By this method it became possible to augment indefinitely the trained force of the kingdom.

This system once established became permanent in Prussia, and, with the necessary modifications due to the growth of the state and its relations to its neighbors, remains in force at the present time.

The other nations of Europe did not seem to fully realize the value of this system until they were awakened by the results of Sadowa and the Franco-German war. It is now adopted with slight modifications by almost all the nations of Europe. The German army has thus become the model upon which most modern armies are formed, and a *résumé* of its organization will be given first in order. Many details not included in this article will be found in the article WAR (*q. v.*).

German Army.—Under the military laws of Germany, 1867-90, every able-bodied citizen is liable to military service. Each year a muster is made of all young men who have reached the age of twenty-one years, together with those who have been previously mustered, found not fully qualified, and "postponed" for further examination. The annual contingent is selected by lot. Those who fail to pass the inspections for lack of physical development are postponed for the next year's examination. (Two postponements are allowed.) Those who are permanently disquali-

fied for active service are passed into the reserve, to be called upon for such service as they are able to perform. Those not drawn by lot pass into the Landsturm. The selected men serve three years with the colors, four years in the reserve, five years in the first ban of the Landwehr, and seven years in the second ban of the Landwehr. They then pass into the Landsturm, which includes in addition all men between the ages of seventeen and forty-six who are able to bear arms and who are not otherwise enrolled.

The term of service with the colors is shortened to one year for volunteers who pay their own expenses, and frequently to two years for men who are thoroughly trained in their duties by that length of service, the design being to have in the state the largest possible body of trained soldiers at the least expense.

The empire is divided into nineteen districts, each of which furnishes an army-corps. The Guard Corps is recruited from the entire kingdom of Prussia. The districts are divided and subdivided until each battalion, and even each company, is localized, receiving its recruits from its own locality, and returning its reserves to it. The typical organization of an army-corps in time of peace (departures from which are made in the Guard and Bavarian Corps, which will not be specified here) consists of two divisions made up of infantry and cavalry, a brigade of field-artillery, a regiment or less of foot-artillery, a battalion of pioneers, and a battalion of train.

Each division contains two brigades of infantry and one brigade of cavalry. Each brigade (infantry, cavalry, and artillery) consists of two regiments.

Each regiment of infantry contains three battalions, known generally as grenadiers, musketeers, and fusiliers, from their older arms and drill. They are now all armed and drilled alike. The battalion is made up of four companies, and its peace strength is about 588 enlisted men. There are also independent battalions of "Jägers," or rifles recruited from the foresters, gamekeepers, etc., who are specially skillful as riflemen.

The infantry arm is the Mauser rifle, model 1888, with fixed magazine carrying five cartridges (caliber, 7.874 mm. = 0.31 in.). Each regiment of cavalry consists of five squadrons of 133 men each, armed with the cavalry saber, lance, and Mauser carbine, model 1888. The cuirassiers carry the straight sword or "Pallasch" instead of the saber.

Each brigade of field-artillery is made up of two regiments, one consisting of three sections, each of three "mounted" batteries usually of six guns; the other regiment of three sections "mounted" and one section of two "horse-batteries." The total strength of the field-artillery is 277 six-gun and 110 four-gun mounted batteries, and 28 six-gun and 19 four-gun horse-batteries. To each artillery brigade there is attached a battalion of train of three companies. There are in addition fourteen regiments of foot-artillery divided among the army-corps (caliber of field-pieces, 88 mm. = 3.5 in.). Twenty battalions of pioneers, the railroad brigade, and the balloon-companies complete the organization of the combatants; to which must be added the non-combatant or supply departments.

The total strength of the army in time of peace in 1892 was as follows, viz.:

DIVISIONS.	Officers.	Men.
Staff and special troops.....	2,598	2,580
Infantry, 538 battalions.....	10,983	328,713
Cavalry, 465 squadrons.....	2,351	65,347
Field-artillery, 434 batteries.....	2,363	48,397
Train, 62 companies.....	299	6,842
Foot-artillery, 31 battalions.....	728	17,169
Pioneers, 101 companies.....	588	12,724
Landwehr, 277 districts.....	530	5,211
Totals.....	20,440	486,983

Organization during War.—The division into twenty army-corps is rigidly maintained; these corps are united into armies as required. Each corps contains two divisions, the infantry battalions of which are brought up to a strength of about 1,000 men; one regiment of mounted artillery of six six-gun batteries, one or two companies of pioneers, and a sanitary detachment.

The corps-cavalry consists of one brigade of two regiments, each of four squadrons of about 150 men. The remaining artillery makes up the "corps-artillery," as distinguished from that belonging to the divisions; and the trains containing artillery and infantry ammunition, pontoons, spare

horses, bakeries, provisions, ambulances, etc., complete the corps organization.

The remaining cavalry brigades are not attached to corps, but are united in cavalry divisions provided with horse-artillery, and these are again combined into cavalry corps, etc., as required.

The reserves of all arms are called out, armed, equipped, and formed into their proper divisions, etc.; the dépôts become centers of recruiting and instruction, under the charge of the officers of the dépôt battalions, companies, squadrons, or batteries respectively.

The strong places are garrisoned as needed by the Landwehr and Landsturm.

The following is given as the most reliable estimate of the effective war-strength in 1892, viz.:

Active army and reserve, less 10 per cent.....	1,081,550
First ban of Landwehr, less 20 per cent.....	605,890
Second ban of Landwehr, less 30 per cent.....	692,860
Officers of active army and reserve.....	36,000
Total	2,416,300

The armies of the other nations of Europe having been modeled upon that of Germany, it will not be necessary to describe their organization in detail. Attention will be called only to the marked departures from the German system.

Austrian Army.—Every male subject of the Austro-Hungarian empire is liable to military service, beginning on the first of January of the year in which he reaches the age of twenty-one.

The contingent each year is selected by lot; for the year 1893 it was 103,100 men for the army and navy, and 23,000 for the Landwehr. A few exemptions are made, as in the case of those preparing for special professions, etc.

The selected recruits serve for twelve years—three years in the line, seven in the reserve, and two in the Landwehr. Those not drawn by lot pass into the dépôt reserves for ten years or the Landwehr for twelve years. Those not able to bear arms pay an annual military tax during a corresponding number of years. All able-bodied citizens not otherwise enrolled constitute the Landsturm, of which there are two bans, the first including all between the ages of nineteen and thirty-seven years, the second those between thirty-eight and forty-two. The Landsturm can be called out only in time of war.

The empire is divided into fifteen military districts, each furnishing a corps, consisting usually of two divisions of infantry, each of two brigades of two regiments, one brigade of cavalry of two or three regiments, and one brigade of artillery consisting of one regiment of corps-artillery, two divisions of heavy batteries, and one to three battalions of fortress-artillery.

The two regiments of engineers and three of pioneers have each five battalions of four companies of 116 men, with their bridge-trains and other equipments. They are attached to the divisions as needed, generally by battalions.

The infantry regiment contains four battalions of four companies, each of ninety-five men, armed with the Mannlicher rifle (caliber, 8 mm. = 0.32 in.), fixed magazine carrying five cartridges.

The cavalry regiment has six squadrons of about 170 men each.

The artillery regiment is made up of two divisions of three mounted four-gun batteries each, one division of foot-artillery of three two-gun batteries, the necessary battery wagons, forges, etc.

Some of the regiments have in addition a division of horse-artillery of two six-gun batteries, and others a four-gun mountain battery. The guns are of Uchatius bronze (calibers, 87, 75, and 70 mm. = 3½, 3, and 2¾ in. nearly).

The methods of recruiting, mobilization, etc., resemble those adopted in Germany. The total strength of the army on a peace footing in 1891 was as follows, viz.:

DIVISIONS.	Officers.	Men.
Staff and special troops.....	5,485	18,830
Infantry, 450 battalions and 135 cadres.....	9,153	179,502
Cavalry, 258 squadrons and 43 cadres.....	1,982	46,864
Field-artillery, 241 batteries and 70 cadres.....	1,374	23,992
Fortress-artillery, 18 battalions and 18 cadres ...	420	7,346
Engineers, 81 companies and 16 cadres.....	584	9,564
Train, etc., 84 squadrons and 22 cadres.....	386	3,465
Landwehr, 171 battalions, 60 squadrons, and 134 cadres.....	1,977	26,495
Totals.....	21,361	316,058

In time of war this effective would be increased to about the following figures, viz.:

DIVISIONS.	Officers.	Men.
Staff and special troops.....	9,386	57,068
Infantry.....	12,435	635,118
Cavalry.....	2,475	71,580
Field-artillery.....	1,680	90,268
Fortress-artillery.....	648	21,798
Engineers, etc.....	705	46,914
Train.....	1,020	45,642
Landwehr, Austrian.....	3,129	252,960
“ Hungarian.....	4,178	174,062
Landsturm.....	9,582	431,540
Totals.....	45,238	1,826,940

French Army.—Under the French military law of 1872, and its modifications up to Nov., 1890, every Frenchman becomes liable to military service upon reaching twenty years of age, the service to consist of three years in the active army, seven in the reserve, six in the territorial army, and nine in the reserve of the territorial army. A certain portion of each contingent, however, is relegated to the reserve after two years' service in the active army, and for special reasons a limited number pass into the reserve after one year's service.

Those found to be not physically qualified for service and certain others partially exempt pay an annual military tax.

The methods of recruiting, mobilization, etc., do not differ materially from those of Germany.

There are eighteen military districts in France and one in Algeria, each furnishing and garrisoned by a *corps d'armée*. The typical corps, from which some variations exist, is made up of two divisions of infantry, a brigade of cavalry, a brigade of artillery, a battalion of engineers, a squadron of train, and a legion of gendarmes.

There are also six divisions of cavalry not attached to any corps.

Each infantry division consists of two brigades of infantry.

Each cavalry division contains one brigade of cuirassiers, one brigade of dragoons, and one brigade of chasseurs or hussars.

Each brigade of infantry, cavalry, and artillery is made up of two regiments.

The infantry regiment contains three battalions of four companies each, and a separate battalion or company for recruiting, etc.

The battalion on a peace footing contains about five hundred men.

The infantry is armed with the Lebel rifle (caliber, 8 mm., fixed magazine holding eight cartridges).

The cavalry regiments have each five squadrons of about one hundred and fifty men. The firearm of the dragoons, chasseurs, and hussars is a carbine, that of the cuirassiers a revolver.

The nineteen regiments of divisional artillery have each twelve mounted batteries, the nineteen regiments of corps-artillery have each nine mounted and three horse batteries. There are, in addition, twenty-four mountain batteries in Algeria, Tunis, Corsica, and attached to the Fourteenth and Fifteenth army corps.

All batteries have six pieces each, the calibers being 90 mm. for mounted, 80 mm. for horse, and 95 mm. for the foot batteries.

The strength of the army on a peace footing in 1891 was as follows, viz.:

DIVISIONS.	Officers.	Men.
Staff and special troops.....	4,000	3,473
Infantry, 564 battalions.....	11,712	318,502
Cavalry, 478 squadrons and 8 companies.....	3,326	73,006
Field-artillery, 480 batteries.....	3,046	54,238
Fortress-artillery, 100 battalions, 54 companies..	1,158	20,008
Engineers, 108 companies.....	483	12,623
Train, etc.....	3,336	16,134
Totals.....	30,341	508,686

In time of war the *corps d'armée* are united in armies according to the needs of the service, and all the organizations are recruited up to their full war footing from the trained reserves, bringing the effective strength of a regiment of infantry up to about 3,000 men, a regiment of cavalry to 650 men, and a mounted battery to about 192 men.

The probable effective in 1892 is estimated to be as follows, viz.:

Active and reserve army, less 10 per cent.....	1,395,000
Territorial army, less 20 per cent.....	740,000
Reserve of territorial army, less 33 per cent.....	815,000
Dépôt, etc.....	90,000
Total.....	3,040,000

The estimated total for 1893 is 3,254,000 men.

Spanish Army.—Under the laws of 1877–82 military service is made obligatory in Spain. Beginning at the age of twenty years it continues for three years in the active army, three in the first reserve, and six in the second reserve. Exemptions can be purchased.

The kingdom is divided into ten conscription districts; but no corps, division, or brigade organizations exist in time of peace. The infantry and engineer regiments consist usually of two battalions, each of four companies. There are also a certain number of dépôt battalions.

The cavalry consists of lancers, chasseurs, dragoons, and hussars; each regiment of four squadrons.

The field-artillery regiment contains from four to seven batteries, the battalion of fortress-artillery from three to six companies, and the regiment of siege-artillery four batteries.

The total strength on a peace footing is about as follows:

Infantry.....	90,327
Cavalry.....	13,968
Artillery.....	11,340
Engineers.....	4,671

besides the train-ambulance, etc., belonging to the active army, and the territorial troops, which bring the total up to about 120,000 men.

In time of war the strength would be increased to about—

Infantry.....	734,680
Cavalry.....	23,300
Artillery, 460 guns, etc.....	30,350
Engineers.....	7,500
Workmen, sanitary troops, and territorial troops.....	9,570
Total.....	805,400

The colonial troops are not included.

Russian Army.—Under the laws of 1874, 1876, and 1888, military service is obligatory. Christian clergymen are totally exempt. Mohammedans are exempt upon payment of a fixed tax, and certain artists and members of learned professions are exempt in time of peace. The remaining able-bodied men are subject to conscription upon reaching the age of twenty-one.

The annual contingent for 1892 was 262,400 men. The term of service in European Russia is five years in the active army, thirteen in the reserve, and five in the first ban of the territorial army. In the provinces these periods differ somewhat. Those able-bodied men between the ages of twenty-one and forty-one not otherwise enrolled constitute the first ban of the territorial army, and those not physically qualified for active service make up the second ban, used for local defense, etc. The first ban can furnish about 1,000,000 men for their annual drills.

The conscription for the Cossacks takes place at the age of nineteen. They serve three years in their native villages under instruction, four in active service in the first ban, four in the second ban, four in the third ban, and five in dépôt. All other Cossacks may be called out by the emperor for national defense in exceptional cases during war.

European Russia is divided into 13 conscription districts, some of which furnish two to four army corps, giving a total of 20 corps. Each corps is, as a rule, made up of 2 divisions of infantry, 1 division of cavalry, 2 brigades of mounted artillery, and 2 horse-batteries. Owing to variations in corps organization the total strength is 48 divisions of infantry, 18 divisions of cavalry, 48 brigades of mounted artillery, and 31 horse-batteries.

Each infantry division contains 2 brigades of 2 four-battalion regiments.

Each battalion has four companies, all armed with the Berdan rifle (caliber, 10.7 mm. = 0.42 in.).

The cavalry division is made up of 2 brigades of 2 regiments, each of 6 squadrons, armed with the dragoon rifle with bayonet and saber. There are included in the regular cavalry 16 regiments of Cossacks. Each brigade of field-artillery has 6 mounted batteries (2 heavy—caliber, 106.8 mm. = 4.2 in., and 4 light—caliber, 86.9 mm. = 3.4 in.), each in time of peace of 4 guns, increased to 8 in time of war. The horse-batteries have 6 light guns. The mountain-batteries have a still lighter gun (caliber, 63.5 mm. = 2.5 in.).

The special troops do not belong to the corps, but are assigned as needed. The infantry of the guard, the regiments of grenadiers and chasseurs, the cavalry, horse-artillery, artillery of the reserve, and the technical troops are recruited from the empire at large.

The strength of the army in 1892 on a peace footing is given as follows, viz.:

DIVISIONS.	Officers.	Men.
Infantry, 888½ battalions.....	15,764	429,383
Cavalry, 356 squadrons.....	2,262	59,916
Field-artillery, 350 batteries.....	2,073	60,787
Engineers, 44 companies.....	772	23,547
Train.....	428	7,254
Reserve, 125 battalions and 33 batteries.....	4,225	76,280
Garrison troops, 28 battalions of infantry, 54½ battalions and 5 batteries of artillery.....	1,742	40,501
Dépôt troops.....	202	4,836
Cossack infantry, 6½ battalions.....	150	4,956
“ cavalry, 11 squadrons and 275 sotnias.....	1,912	44,714
“ artillery, 20 horse-batteries.....	100	3,340
Caucasian militia, 26 sotnias, horse, 2 sotnias, foot.....	71	3,358
Custom or frontier guards.....	860	28,500
Totals.....	30,561	787,372
		818,033 combatants

Upon a war footing this force is increased as follows, viz.:

	Officers and men.
Infantry, 889 battalions.....	876,651
Cavalry, 360 squadrons, regulars.....	57,464
Field-artillery, 353 batteries, regular.....	77,594
Engineers, 121 companies.....	29,944
Train, etc.....	146,298
Reserve troops, 527 battalions, 92 batteries, and 46 companies.....	544,578
Garrison troops, 143 battalions of infantry, 57½ battalions of artillery, and 16 field-batteries.....	210,921
Dépôt troops, 205 battalions, 113 squadrons, and 48 batteries.....	290,493
Cossack troops, 868 sotnias and 38 batteries.....	154,014
Caucasian militia.....	3,429
Frontier guards.....	29,360
Total.....	2,420,746

Not counting the territorial army and the Cossack troops available for national defense.

Turkish Army.—Under the laws of 1880–88, military service in Turkey is compulsory. The term of service in the permanent army is three years for the infantry and four for the other arms; in the reserve three or two years, in the Landwehr (redif) eight, and in the Landsturm (moustahfiz) six. Conscripts assigned to dépôts serve only six months. Exemptions may be purchased after serving five months in the active army. The army is divided into seven corps of an organization similar to the German.

The Landwehr divisions are attached to and form part of the army-corps.

Each infantry regiment contains four 4-company battalions armed with the Mauser rifle (caliber, 11 mm. = 0.44 in.), with fixed magazine holding eight cartridges. There are also unattached battalions of rifles, zouaves, etc.

The cavalry regiments have five squadrons each, and the typical field-artillery regiment has 3 horse, 4 mounted, and 2 mountain batteries; or 3 sections, each of 4 mounted batteries.

The heavy artillery is organized in regiments, separate battalions, and companies, which will not be described here.

The engineer regiments contain either two or three battalions.

The enlisted strength (1891) is about as follows, viz.:

Infantry, 243 battalions of 400 men.....	97,200
Cavalry, 185 squadrons of 160 men.....	29,600
Field-artillery, 208 six-gun batteries of 100 men.....	20,800
Foot-artillery and lancers and 122 companies of 100 men.....	12,200
Engineers, 50 companies of 100 men.....	5,000
Train, 20 companies of 100 men.....	2,000
Landwehr, 352 cadres of 10 men.....	3,520
Total.....	170,420

To this must be added about 1,200 officers. The artillery has 1,248 field and mountain guns and 2,300 heavy guns. The troops not serving with the colors are 27,000 reserves on leave, 37,500 dépôt troops, 590,000 Landwehr, and 262,000 Landsturm; which, added to the active force, gives a total available for an European war of between 800,000 and 1,000,000 men.

Bulgarian Army.—Although under Turkish sovereignty, the Bulgarian army constitutes a factor in the European armaments.

Military service is obligatory, beginning at twenty years of age. The term is in the active army two years for the infantry and three for the other arms; then in the reserve eight or five years, in the first ban of Landwehr to the age of thirty-seven, and in the second ban to forty-five.

Mohammedans may buy an exemption, and some others are exempt by law. The annual contingent is about 16,000 men.

The Bulgarian principality is divided into six districts, each furnishing a brigade. The composition of brigades, regiments, etc., does not differ materially from that previously described. The infantry is armed with the Mannlicher repeating rifle (caliber, 8 mm.), the cavalry with the Berdan carbine, and the artillery with Krupp guns (of 8.7, 7.5, and 7 cm. caliber). The strength on a peace footing is about as follows, viz.:

	Officers and men.
Staff and special troops.....	68
24 regiments of infantry, 48 battalions.....	26,181
4 regiments of cavalry, 17 squadrons.....	2,981
6 regiments of artillery, 27 batteries.....	4,062
1 siege-battery and 2 dépôts.....	765
1 regiment of engineers.....	1,603
Total.....	35,650

In time of war the total force of trained troops available is estimated at 2,300 officers and 133,000 men, with an untrained force of Landwehr, etc., of about 150,000 men in addition.

Roumanian Army.—The army of Roumania, organized under the military laws of 1876–91, is recruited by a general conscription similar to those already described. It is divided into 4 army corps, containing 33 regiments and 4 separate battalions of infantry, 15 regiments of cavalry, 8 regiments of artillery, 2 regiments of engineers, and the train, administrative departments, etc., which in time of peace make up a total of about 3,000 officers and 49,000 men, besides the territorial army of about 71,000 men. On a war footing this strength may be brought up to a total of 3,500 officers and 149,000 men.

Servian Army.—Under the law of Jan., 1889, military service is obligatory at twenty-one years of age. The term of service is one year in the active army, of which cadres only are maintained in time of peace, nine in the reserve, ten in the first ban, and ten in the second ban of the national militia.

The kingdom is divided into five territorial divisions, in which the cadres of the active army are located, forming a force of about 1,000 officers and 20,000 men.

In case of mobilization these cadres filled out form five divisions, in addition to a force of unattached troops of all arms and the reserves and militia.

The total effective strength is about as follows:

ACTIVE ARMY AND RESERVE.			
	Men.		
75 battalions.....	70,000		
30 squadrons.....	3,500		
57 batteries, 282 pieces.....	7,000		
24 companies of engineers, etc.....	3,500		
Total.....	84,000	84,000	
NATIONAL MILITIA.			
120 battalions.....	70,000		
10 squadrons.....	1,000		
20 batteries with 120 pieces.....	2,000		
5 companies of engineers, etc.....	500		
Total.....	73,500	73,500	
Grand Total.....			157,500

Not including trains, etc.

Italian Army.—Under the laws of 1875–91, military service is compulsory in Italy. The age of conscription is twenty years. The conscripts generally serve three years with the colors, five in the reserve, four in the mobile militia, and seven in the territorial militia. The annual contingent is 82,000 men, one-third of whom, selected by lot, serve only two years with the colors. The cavalry contingent serves four years with the colors, five in the reserve, and ten in the territorial militia. Those who are not enrolled in the active army are formed into the second and third classes, and liable to such service as may be required, under the law, up to the age of thirty-nine.

The army is made up of twelve corps, whose organization does not differ materially from those already described. Its composition is as follows, viz.: Infantry, 96 regiments of the

line, 12 of bersaglieri (or rifles), 75 companies of Alpine troops, and 98 separate companies. The infantry arm is the Vetterli rifle (caliber, 10.388 mm. = 0.42 in.), with fixed magazine holding 5 cartridges. Cavalry, 24 regiments of 6 squadrons each; artillery, 24 regiments of 8 batteries each; engineers, 4 regiments of from 17 to 21 companies, beside the territorial troops and militia.

The total strength in 1891 was 276,013 men with the colors, 566,152 on leave of absence, 449,016 mobile militia, and 1,553,158 territorial troops, giving a grand total of 2,844,339 men.

Belgian Army.—The Belgian army is recruited by voluntary enlistment and by conscription by lot of an annual contingent, fixed by law, which will keep the strength of the active army at about 13,300 men. The conscription is made from the young men who have reached the age of nineteen, but many exemptions are allowed.

The term of service is eight years in the active army and five in the reserve.

The strength in time of peace is as follows:

DIVISIONS.	Officers.	Men.
Staff and special troops.....	602	869
Infantry, 58 battalions and 415 cadres.....	1,745	28,810
Cavalry, 4 squadrons and 8 cadres.....	304	5,744
Field-artillery, 34 batteries and 14 cadres.....	290	3,400
Fortress-artillery, 58 batteries and 4 cadres.....	244	4,518
Engineers, 17 companies.....	146	1,541
Train, 7 companies, 1 dépôt, etc.....	29	402
Totals.....	3,360	45,284

The *gendarmerie* and *garde civique* make up an additional force of 42,827 men. In time of war the strength is brought up to a total of 3,849 officers and 127,119 men, besides about 90,000 men of the local *garde civique*.

Swiss Army.—By the laws of 1874–87 every able-bodied Swiss is liable to military service from his twentieth to his thirty-second year in the *Anszug*, and from his thirty-third to his forty-fourth year in the Landwehr. Service in the *Anszug* includes a short course of training, followed by several weeks' drill each year. The Landwehr is designed to be eventually a trained army similar to the *Anszug*.

Those not rendering personal service pay an annual military tax.

The Landsturm includes every able-bodied man between the ages of seventeen and fifty who is not otherwise enrolled.

The army is divided into 4 army-corps. The peace strength is 32 regiments and 2 battalions of fusiliers and 8 battalions of carbineers, armed with the Rubin rifle (caliber, 7.5 mm. = 0.3 in.), with fixed magazine carrying 12 cartridges; 8 regiments of cavalry, each of 3 squadrons, and 12 companies of "guides"; 24 regiments of field-artillery, each of 4 batteries; 1 regiment of mountain-artillery of 2 batteries, 8 companies of foot-artillery, 8 battalions of engineers of 3 companies each, train, ambulance, etc.

The effective strength on a peace footing in 1891 was as follows, viz.:

Regular army, 127,973; Landwehr, 80,272: total, 208,245. This was without the Landsturm, which contains about 272,000 men.

Holland.—The army of Holland is composed one-third of men enlisted for six years and two-thirds of conscripts raised by an annual contingent of 11,000 militia. Service in the militia is obligatory from the age of twenty to that of twenty-five, but by frequent exchanges, etc., the active service of each man generally is limited to from six months to one year. In addition, every able-bodied citizen is enrolled in the *garde civile* between the ages of twenty-five and thirty-five, and all citizens capable of bearing arms in the Landsturm between the ages of nineteen and fifty.

The kingdom is divided into three military districts, which are expected to furnish an effective strength in time of war as follows, viz.:

DIVISIONS.	Officers.	Men.
Staff and special troops.....	158	693
Infantry, 46 battalions.....	1,060	42,908
Cavalry, 16 squadrons.....	143	3,988
Artillery, 21 batteries and 51 companies.....	503	13,843
Engineers, etc., 8 companies.....	98	1,614
Other troops.....	27	626
Totals.....	2,359	63,672

Add in all reserves except the Landsturm and civil societies of riflemen, etc., this sum is increased to about 185,600 men.

In peace the strength of the organizations is about one-third of that given.

Danish Army.—In Denmark military service is obligatory, beginning at the twenty-second year.

The service with the colors is limited to six months' instruction for infantry and nine months for cavalry, after which the recruits pass into the first ban for eight years, during which time they are called upon for several terms of service of thirty days each. They then pass into the second ban for eight years.

The annual conscription is about 11,000 men. The strength of the army in 1891 was as follows, viz.:

DIVISIONS.	Officers.	Men.
Staff and special troops.....	25	16
10 regiments of infantry.....	801	33,192
5 regiments of cavalry.....	139	2,420
2 regiments of field-artillery.....	175	4,755
2 battalions, not artillery.....		
1 regiment of engineers.....	61	1,366
Totals.....	1,201	41,749
Add during war—		
11 dépôt battalions.....	245	13,525
4 battalions and 6 companies of artillery.....	49	2,793
Totals on war footing.....	1,493	58,067

Sweden and Norway.—Military service is obligatory. Commencing at twenty-three years, it includes nominally five years in the active army, four in the Landwehr, and four in the first levy of the Landsturm. The service is limited, however, to an instruction of from two to four months for the first year and about one month the second year. All able-bodied men not otherwise enrolled belong to the Landsturm between their eighteenth and fiftieth years.

The Landwehr is available for national and the Landsturm for local defense only. The total strength of the army is about 40,000 men. In time of war, by adding the first levy of the Landwehr, it can be increased to about 800 officers and 18,000 men, maximum.

British Army.—The British army is recruited entirely by voluntary enlistment. The term of service in the regular army is twelve years, of which nine in the infantry of the guard and seven in the infantry of the line may be in the reserve. Any soldier of good habits may, however, enlist for a term of twenty-one years, which will entitle him to be "retired" at the expiration of his term.

The militia of the kingdom is recruited also by voluntary enlistment, but every able-bodied man between the ages of eighteen and fifty years, belonging neither to the regular nor volunteer forces, is liable to conscription for service in the militia. The term of this service is six years, which may be prolonged to twelve. The active service in the militia is limited to six months for the first year, and to three or four weeks for the following years. Those enrolled in the volunteers are exempt from militia service, but are called out for manœuvres of nine days each year.

The United Kingdom is divided into fifteen military districts, and these into sixty-seven sub-districts, each of which is expected to furnish a regiment of infantry, two or three battalions of militia, and to form a dépôt for instruction of recruits and for collecting the reserves, etc. The infantry of the guard and the rifles is recruited from the country at large, and the cavalry and artillery from special districts.

In time of peace no corps, division, or brigade organizations exist, and the regimental organizations differ very much among themselves. The typical infantry regiment contains two battalions, each of eight companies of from 100 to 130 men. The infantry arm is the Lee-Metford rifle (caliber, 0.30 in., with detachable magazine holding eight cartridges). The cavalry regiment is made up of eight troops of about sixty men each, two troops forming one squadron.

The artillery is organized in batteries of six guns each (calibers for horse-batteries, 3-inch 12-pounders; for field-batteries, 3½-inch 22-pounders; and for mountain-batteries, light 22-pounders, muzzle-loaders, pattern of 1882. The guns of the horse and field batteries are breech-loaders with interrupted screw ferreture), and the engineers into companies and battalions.

The strength in time of peace (1891-92) is as follows, viz.:

DIVISIONS.	Officers.	Men.
Staff and special troops.....	1,891	8,510
Infantry, 148 battalions, 71 dépôts, and 345 cadres.....	4,785	142,059
Cavalry, 186 squadrons, 11 dépôts, and 43 cadres.....	856	18,412
Artillery, 230 batteries and 89 cadres.....	1,445	35,446
Engineers, 70 companies and 24 cadres.....	933	6,620
Colonial troops, 3 battalions, 4 batteries, and 16 cadres.....	171	5,064
Totals.....	10,081	216,111
		226,192

In time of war the troops are united into brigades, divisions, and corps, and the cadres are filled to a war footing. The organization includes 2 army-corps, 1 division of cavalry, and the dépôt troops for foreign service; and for home defense 2 army-corps and 4 brigades of cavalry made up from the volunteers and militia. The army-corps, besides its staff and special arms, contains 3 divisions of infantry and 1 battalion of corps-infantry with 2 machine-guns. Each infantry division has its staff, 3 brigades, each of 4 battalions of infantry, each battalion of about 1,000 men with 2 machine-guns; 1 squadron of cavalry, 3 mounted batteries, and the proportionate force of engineers, ambulances, train, etc., with a strength of about 327 officers and 10,000 men.

Each cavalry division contains 2 brigades of cavalry, each of four 4-squadron regiments, 2 machine-guns, 2 horse-batteries, train pioneers, etc.; 4 battalions of mounted infantry with 2 machine-guns, a company of train, ambulances, etc., with a total strength of about 7,300 officers and men, and 18 pieces of artillery.

The estimated effective war strength is about as follows:

	Officers.	Men.
Militia.....	4,517	146,000
Volunteers.....	8,723	252,007
	13,240	398,007
Reserves of regular army.....		411,247
Regular army of United Kingdom.....		73,825
Total.....		117,211
		602,283

To this may be added the regular army:

In the colonies.....	108,981
Irish police, etc.....	13,000

The colonial troops are not included in this total, as they are organized principally for local defense, although they may contribute a contingent for foreign wars in some cases. Their strength in 1892 may be summarized as follows, viz.:

CANADA.		Men.
British troops at Halifax.....		1,494
Canadian standing army.....		1,200
“ militia.....		37,359
“ militia reserve.....		655,000
Total.....		695,053

AUSTRALIA, NEW ZEALAND, AND TASMANIA.	
Regular troops and volunteers, about.....	27,000

INDIA.	
British troops, about.....	72,500
British officers commanding native troops.....	26,400
Native troops.....	125,000
Police, partly officered by British.....	120,000

The United States Army.—The regular army of the U. S. is recruited by voluntary enlistment. The Act of Feb. 2, 1901, provides for the following organization: 30 regiments of infantry, each of 12 companies; 15 regiments of cavalry, each of 12 troops; 126 companies of coast artillery, and 30 batteries of field artillery; 1 battalion of engineers, of 12 companies; the signal corps, the officers and cadets of the Military Academy, unattached enlisted men, Indian scouts, hospital attendants, messengers, etc. Total enlisted strength, 75,787.

The staff and administrative departments consist of three major-generals, fifteen brigadier-generals with their aides, and the following departments, viz.: The adjutant-general's department, charged with orders, correspondence, etc.; the inspector-general's department, charged with inspecting the troops, etc.; the judge-advocate-general's department, charged with supervision of courts martial; the quartermaster's department, charged with transportation, quarters, etc.; the subsistence department, charged with provisioning the army; the medical and pay departments, chaplains and signal-corps, whose names indicate their duties; the corps of engineers, charged with the construction of fortifications,

military engineering, etc., and in time of peace with the improvements of rivers and harbors and other civil works; and the ordnance department, charged with the construction and repair of cannon, small arms, and military equipments and supplies.

No brigade division or corps organization exists in time of peace; but the U. S. is divided into military departments commanded by the general officers, who control the troops stationed in their respective commands.

The regular army is used in time of peace principally for suppressing Indian outbreaks, disorders upon the frontier, and enforcing the laws of the U. S. when necessary. It is officered from graduates of the Military Academy, supplemented by promotions from the ranks and selections from civil life. It is regarded rather as a training-school for educating officers and preserving military knowledge and traditions than as an efficient defense against foreign armies.

The main reliance of the nation in a great war is upon the volunteers and militia, the probable strength of which is indicated by the numbers called into service during the civil war, at the close of which there were in service 1,000,516 men, with an available reserve of 2,500,000 men.

The total number of men in the U. S. available for military service is now between 11,000,000 and 12,000,000. See MILITIA.

The trained militia is, however, relatively small in numbers, although in some States the organized regiments are well trained in drill, etc.

The drill, arms, equipments, etc., of the militia are very generally modeled on those of the regular army, and the efforts of the war department are directed to making this resemblance more complete, and to assisting in every way the more thorough instruction and discipline of the citizen soldiery.

The arms and equipments of the U. S. army are now in a state of transition from the older to the newer types, not yet fully adopted. They will not be described in this article.

For methods of educating the officers of modern armies see MILITARY ACADEMIES, ARTILLERY, SCHOOLS OF, and STAFF AND STAFF SCHOOLS.

JAMES MERCUR.

Army-corps: See CORPS D'ARMÉE.

Army-list: an official publication issued by the British War Office; contains the names of all the commissioned officers in the British army, arranged according to the dates of their commissions. Then come the officers of that portion of the queen's army which belongs exclusively to India. The bulk of the work is filled with an enumeration of all the regiments in the queen's army, and all the officers in each regiment.

Army-register is an annual register published by order of the Secretary of War, in compliance with an act of Congress, containing lists of the departments, regiments, and commissioned officers of the U. S. army, with the promotions and casualties for the year.

Army-regulations is the name of a volume published by the U. S. War Department, containing rules for the management of troops in camp and field, with instructions for keeping accounts and making returns to the army bureaus. It is based upon the Articles of War and other acts of Congress. See ARTICLES OF WAR.

Army-worm: in the Northern U. S. the larva or grub of a night-flying moth (*Leucania unipuncta*). It varies considerably in color and size with age and locality, but its markings are characteristic. It is usually from less than an inch to an inch and three-quarters in length; dark gray, with three narrow yellowish stripes above, and a broader one of nearly the same color on each side; thinly clothed with short hairs, especially about the head, which is of a dull yellow color. The ravages of these worms, which sometimes march over grain-fields in great numbers, are best prevented by plowing a double furrow around or across the field on which they are moving. Then they may be killed by setting fire to straw in the furrows or by turning pigs and fowls (after removal of the crop) into the field. Crows and blackbirds will also destroy them rapidly.

The army-worm of the Southern U. S., a near relative of the above, sometimes appears in countless hosts and devours the cotton. In the West Indies its ravages have led to a general abandonment of the cotton crop. Various other destructive larvæ are called by this name.

Arnald'o, or Arnold of Brescia: an eloquent Italian reformer; b. at Brescia about 1100. He was a pupil of the celebrated Abelard in France, and adopted the monastic life. As a preacher he boldly reprov'd the prevalent venality, luxury, and corruption of the clergy. He affirmed that the clergy ought not to possess temporal power or property. The second Council of the Lateran, in 1139, condemned Arnaldo as a disturber of the peace, and banished him from Italy. He retired first to France, where he encountered the hostility of St. Bernard, and next to Switzerland, where he gained many adherents. In the meantime there was formed in Rome a numerous party which favored the principles of Arnaldo and was friendly to civil liberty. These revolted against the pope, who fled or was driven out of the city. Arnaldo in 1146 returned to Rome, again raised his voice for religious reform, and endeavored to organize a republic. His success was hindered by the violence and excesses of the populace, which filled the city with disorder for nearly ten years. A reaction ensued, and Pope Adrian IV. reduced the Romans to submission by laying the city under an interdict in 1154. Arnaldo was arrested in Rome by the aid of the Emperor Frederik Barbarossa, and was hanged in 1155, his body burnt, and his ashes scattered on the Tiber. A statue to him at Brescia was unveiled Aug. 14, 1882. See Gregorovius, *Geschichte der Stadt Rom im Mittelalter*, and biographies by Clavel (Paris, 1868); Bonet-Maury (Paris, 1881); Bonghi (Rome, 1885).

Arnald'us Villanova'nus [It. *Arnald'o di Villano'va*], sometimes called ARNALDUS NOVICOMENSIS; an eminent physician; b. about 1235. He devoted much attention to alchemy, wrote treatises on medicine, alchemy, and religion, and was suspected of heresy. He was employed in diplomacy by the King of Naples. D. near Avignon, in 1312. His works, in Latin, with a life by S. Campegius, appeared in last edition at Basel, 1585, fol. See his life by Pierre Joseph de Haitze (Paris, 1719).

Arnauts: See ALBANIA.

Arnason, aar-na-son, Jón: Icelandic scholar; librarian at Reykjavik; b. Aug. 17, 1819; d. at Reykjavik, Nov. 13, 1888. His very important collection of Icelandic popular tales and legendary stories, *Íslenskar Þjóðsögur og Æfintýri*, was published at Leipzig in 2 vols. (1862-64). G. L. KITTREDGE.

Arnatto: See ANNOTTO.

Arnaud, aar-nō, HENRI: a pastor of the Waldenses and an able military commander; b. at Embrun, Hautes-Alpes, France, Sept. 30, 1641; educated at Basel and Geneva; licensed by the Waldensian Church 1670; was pastor in Tours at the time of the edict abolishing the Waldensian Church. This was the occasion of the daring resolve which eventuated in the famous "Glorious Return of the Vaudois." He was the commander of his brethren, who after defeating the French in several actions recovered their native valleys in France (August, 1689), from which they had been driven by persecution, as they were again later on. He served as colonel in the allied army in the war of the Spanish succession (1702-13), but in his closing years preached to the exiled Waldensians (Jan. 31, 1686) at Schönenberg, Würtemberg, where he died Sept. 8, 1721. He published an *Histoire de la glorieuse Rentrée des Vaudois* (1710; n. e. Nenchâtel, 1845), translated by Ackland (London, 1827). The Return was celebrated August and September, 1889.

Arnauld, ANGÉLIQUE, called also ANGÉLIQUE DE SAINT-JEAN: an eminent French nun; b. in Paris, Nov. 28, 1624; was a daughter of Robert Arnauld d'Andilly. She was educated at Port Royal by her aunt, Marie Angélique, and was a zealous Jansenist. In 1669 she was elected prioress of the convent of Port Royal. She acquired a high reputation for piety, learning, and courageous endurance of persecution. She became abbess of Port Royal in 1678, after which she was persecuted by the Jesuits. She wrote memoirs of her aunt, the abbess Marie Angélique Arnauld (1591-1661). D. in Paris, Jan. 29, 1684. She was the principal author of the *Mémoires pour servir à l'histoire de Port Royal* (Utrecht, 1742, 3 vols.). See Sainte-Beuve, *Port Royal*; also Beard, *Port Royal*.

Arnauld (formerly written *Arnaud*), ANTOINE, surnamed L'AVOCAT: a famous orator; b. in Paris in 1560; was the most eloquent French advocate of his time. He was also distinguished for his probity. He became procureur-général in 1585. His most memorable performance was his speech against the Jesuits in 1594, which resulted in their temporary banishment. He was the father of four distinguished

sons (the eminent Arnaulds of Port Royal) and of six daughters. D. in Paris, Dec. 29, 1619.

Arnauld, ANTOINE, called LE GRAND ARNAULD: a celebrated Jansenist theologian and philosopher; a son of the preceding; b. in Paris on Feb. 8, 1612. His mother was Catherine Marion. He was educated in the Sorbonne, ordained a priest in 1641, became a doctor of the Sorbonne in 1642, and engaged in the controversy between Jansenius and his opponents on the subject of grace. He published in 1643 a work *On Frequent Communion*, which was highly esteemed, but gave offense to the Jesuits, of whom he was a constant and strenuous adversary. This book promoted a reform in the style of French theologians. Having retired to Port Royal (1648), a convent near Paris, he passed there many years in seclusion, and wrote numerous works on theology and philosophy. In 1650 he published an *Apology for the Fathers (Apologie pour les Saints Pères)*. He was expelled from the Society of the Sorbonne in 1656 for maintaining that Jansen had been misunderstood and maligned, after which the Jansenists were generally proscribed and persecuted, both by the civil and ecclesiastical powers. He aided Pascal in his *Provincial Letters*, and Lancelot in a *Grammaire générale et raisonnée*. Among his other works are *Logic, or the Art of Thinking*, commonly called *The Port Royal Logic* (1662), written in collaboration with Nicole, and the only one of his books not entirely forgotten (the 10th ed. of the Eng. trans. appeared Edinburgh, 1887); *The Moral Theology of the Jesuits*; *The Perpetuity of the Catholic Faith touching the Eucharist defended against Sieur Ctaude* (1669); and *The Practical Morality of the Jesuits* (8 vols., 1683-94). To escape the persecution which the Jesuits instigated, he became an exile in 1679, and passed the remainder of his life in Flanders and Holland. He died near Liège, Aug. 8, 1694. Boileau, who wrote his epitaph, pronounced him the "most learned mortal who ever wrote." Arnauld was distinguished for his earnestness and simplicity of character, his industry, and his alacrity in controversy. His works occupy forty-five closely printed quarto volumes, which were published, Paris and Lausanne, in 1775-83. See P. Quesnel, *Histoire de la Vie et des Ouvrages de M. Arnauld* (Paris, 1697); N. de Larrière, *Vie d'Antoine Arnauld* (1783); Sainte-Beuve, *Port Royal*, vol. ii.; P. J. Varin, *La Vérité sur les Arnaulds* (2 vols., 1847).

Arnauld, MARIE ANGÉLIQUE, proper name *Jacqueline Marie*, sister of preceding: b. in Paris, Sept. 8, 1591; became through influence abbess of Port Royal when only eleven years of age, and was of course inefficient, but from 1608, when she was converted, she discharged her duties in the most exemplary manner, and won great fame. She resigned in 1626, was superior of another community of nuns, but returned in 1636 and became prioress under her sister, who had succeeded her as abbess. D. in the convent of Port Royal, Paris, Aug. 6, 1661. See her life by Miss Frances Martin, London, 1873.

Arnauld d'Andilly, ROBERT: French writer; b. in Paris in 1589; a brother of Antoine Arnauld (1612-94), and the father of Angélique (de Saint-Jean). He was appointed intendant of the army in 1634, and retired to the monastery of Port Royal about 1643. He produced a translation of Josephus's *History* (1669), and wrote autobiographical memoirs (1734), besides two volumes of lives of saints, called *Vies des Saints Pères du Désert*. D. in Paris, Sept. 27, 1674. His son Simon was Marquis de Pomponne, and his brother Henry, b. in Paris, 1597, was a devout and zealous Jansenist; became Bishop of Angers, 1649; d. there June 8, 1692.

Arnault, aar-nō', VINCENT ANTOINE: French poet and dramatist; b. in Paris, Jan. 1, 1766. He produced a tragedy, *Marius at Minturnæ* (1791), which was warmly applauded, and other tragedies, entitled *Lucretia* (Lucrèce, 1792) and *Germanicus* (1816). He was appointed in 1808 secretary-general to the university. He was admitted in 1829 into the French Academy, of which he was chosen perpetual secretary in 1833. Among his works is *Souvenirs of a Sexagenarian* (4 vols., 1833). D. at Goderville, near Havre, Sept. 16, 1834.

Arnd, or Arndt, arnt, JOHANN, D. D.: German Lutheran divine; b. at Ballenstedt, Dec. 27, 1555. He became pastor in his native place, 1583, at Quedlinburg in 1590, at Brunswick in 1596, and at Eisleben, 1605. In 1611 he became general superintendent of Lüneberg. He published a very popular work on *True Christianity*, which was translated into many

languages. An English translation by Rev. A. W. Boehm, chaplain at the Court of St. James, was published in 1712, and thoroughly revised, with extended introduction, including sketch of Arnd's life, by C. F. Schaeffer, D. D., Philadelphia, 1868. D. at Celle, May 11, 1621.

Arndt, ERNST MORITZ: German patriot and popular political writer; b. at Schoritz, in the island of Rügen, Dec. 26, 1769. He traveled extensively in Europe after he left college, and was appointed Professor of History at Greifswald in 1806. He published a *History of Serfdom in Pomerania and Rügen*, and animated the Germans to resistance against Napoleon in his *Spirit of the Times* (*Geist der Zeit*, 1807). He also promoted the patriotic cause by many eloquent and spirited poems and prose-writings. His celebrated national song, *What is the German's Fatherland?* (*Was ist des Deutschen Vaterland?*), is, perhaps, the most popular of all the patriotic songs of Germany. He married in 1817 a daughter of the celebrated Schleiermacher. In 1818 he was appointed Professor of History at the University of Bonn. He was suspended in 1819 on account of his liberal opinions, but was restored to his chair in 1840. He was a member of the national assembly which met at Frankfort in 1848, but he seceded with the constitutional party in 1849. Among his works is *Souvenirs of my Outward Life* (*Erinnerungen aus dem äussern Leben*, 1840). D. at Bonn, Jan. 29, 1860. His statue at Bonn was unveiled July 29, 1865. See his biography by D. Schenkel (1866; 2d ed. 1869); W. Baur (Zurich, 1861; 5th ed. Hamburg, 1882). See Schenkel, *E. M. Arndt: eine Biographie* (1866).

Arue, THOMAS AUGUSTINE, Mns. Doc.: English musician; b. in London, Mar. 12, 1710. He was a skillful performer on the violin. He set to music Addison's *Rosamond* in 1731, and gained a high reputation by the music which he composed for Milton's *Comus* (1738). This formed an era in the history of English music. The national air *Rule Britannia* was his composition. Among his chief productions were *Artaxerxes*, an opera (1762), and *Eliza*, an opera. D. in London, Mar. 5, 1778.

Ar'nee, or Ar'na (*Bos arnee*): a large animal of the family



Arnee.

Bovidae; a native of India, nearly allied to the ox and bison. It is larger than an ox, and the horns are very long.

Arneth, ALFRED: See the Appendix.

Arn'hem, or Arn'heim (anc. *Arenacum*): a fortified town of Holland, capital of the province of Gelderland, on the right bank of the Rhine, 57 miles by rail S. E. of Amsterdam (see map of Holland, ref. 6-H). It is very ancient, well built, has a governor's palace, and a famous church containing the tombs of the Dukes of Gelderland; also manufactures of paper, cotton, and wool. Sir Philip Sidney died at Arnheim in 1586. It was taken in 1795 by the French, who were driven out by the Prussians in 1813. Pop. (1891) 50,194.

Arn'heim, or Arnim, JOHANN GEORG, von: German general and diplomatist; b. at Boitzenburg, in Brandenburg, in 1581. He gained the rank of field-marshal in 1628, and entered the service of Saxony in 1630. He commanded a wing of the army of Gustavus Adolphus at Leipzig in 1631, and was opposed to Wallenstein in 1633. In May, 1634, he

defeated the imperialists at Liegnitz. D. at Dresden, Apr. 18, 1641.

Ar'nica [a Mod. Latin term of unknown origin]: a plant of Switzerland and Germany, of which the flowers and root are used in medicine, generally in the form of the tincture or fluid extract. It contains an active principle, arnicin, and two peculiar volatile oils and various resins. The preparations from the flowers are said to be stronger than those made from the root. The use of arnica in medicine is very limited, and it possesses far less activity for good than is generally thought. It is used externally for bruises and sprains as a lotion, and internally as stimulant in typhoid and other low fevers. It has also been used in Germany for the treatment of such severe nervous troubles as paralysis, but is of no value in such cases. When it does good in the treatment of bruises a large part of the gain is through the effect of the alcohol which the tincture contains. The dose of the tincture of arnica flowers is ten to forty drops.

Arnim: See ARNHEIM, JOHANN GEORG, VON.

Arnim, ELISABETH OF BETTINA, VON: German authoress; b. at Frankfort-on-the-Main, Apr. 4, 1785; was a sister of Clemens Brentano. She had a very sensitive spirit and ardent imagination. In her youth she cherished a passionate admiration and platonic affection for Goethe, with whom she corresponded. She was married in 1811 to Ludwig Joachim von Arnim. Among her works are *The Correspondence of Goethe with a Child* (3 vols., 1835), which she translated into English, and *Die Gûnderode* (2 vols., 1840), which are commended as graceful and fascinating. D. in Berlin, Jan. 20, 1859.

Arnim, HARRY KARL KURT EDUARD, Count von: b. at Moitzelfitz, in Pomerania, Oct. 3, 1824. As envoy to Rome in 1864 he was noted for his attitude toward the Ecumenical Council, and was prominent in 1871 in the negotiations with the French resulting in the Treaty of Frankfort; was ambassador to Paris in 1872, and to Constantinople in 1874, but was dismissed from the service by Bismarck, who dreaded his influence with Emperor William. He had a controversy with Prince Bismarck, and was afterward prosecuted for stealing state documents from the German embassy at Paris. After he removed beyond the jurisdiction of the German courts he was sentenced to five years of penal servitude for treason and insults to the chancellor and the foreign office. D. at Nice, May 19, 1881.

Arnim, LUDWIG JOACHIM, VON (generally called ACHIM VON ARNIM): popular and fantastic German poet, distinguished for his originality; b. in Berlin, Jan. 26, 1781. He devoted some years to the study of the physical sciences, and published a *Theory of Electricity* (1799). He was one of the founders of the romantic school of German literature. In conjunction with Clemens Brentano, whose sister, Bettina, he married, he published a collection of popular songs entitled *The Boy's Wonder-horn* (3 vols., 1806). Among his works, which exhibit a rich imagination, are *The Poverty and Riches, Guilt and Repentance of the Countess of Dolores*, a novel (1810); *Angelica the Genoese and Cosmus the Rope-dancer*; and *The Crown Guardians* (1817). D. at Weipersdorf, near Dahme, 14 miles S. of Berlin, Jan. 21, 1831. See Diel's *Clemens Brentano* (1877); J. B. Heinrich's *Clemens Brentano* (1878).

Ar'no: celebrated river of Italy, which rises at Mt. Falterona in the Apennines, and falls into the sea 7 miles below Pisa, which city, like Florence, is intersected by this stream. Its valley (Val d'Arno) is one of the most beautiful regions in Italy. The banks of the river are partially dyked on account of the floods which sometimes occur, and ordinarily small vessels can ascend to Florence, but since the opening of the railway traffic it is not much navigated. Its length is 140 miles; basin, 3,300 sq. miles.

Arno'bins, AFER: Christian apologist; b. of pagan parentage; became a Professor of Rhetoric at Sicca, in Numidia, having among his pupils Lactantius. About 303 was converted, and wrote some time between then and 313 his *Disputationes adversus Gentes* (or *adversus Nationes*), in seven books (Eng. trans. *The Seven Books of Arnobius against the Heathen* [New York, Christian Literature Co., vol. vi., 1888]), of which the first two defend Christianity and the remainder expose the absurdities of paganism. It shows, however, an imperfect acquaintance with Christianity, and has its principal value as presenting the arguments which were then powerful in the conversion of educated heathens.

The best edition of the original Latin is by A. Reifferscheid (Vienna, 1875).
Revised by S. M. JACKSON.

Arnold, BENEDICT: general and traitor; b. at Norwich, Conn., Jan. 14, 1741. In his boyhood he was noted for his audacity and unruly disposition. He enlisted in the army, but soon deserted. He was employed in an apothecary's at Norwich till 1762, when he moved to New Haven and set up in the drug and bookselling business for himself. He acquired property, and became a general and the owner of several small vessels employed in trade with the West Indies. In this business he failed, and incurred a suspicion of fraudulent dealing. He obtained a commission as colonel in the service of Massachusetts soon after the war broke out, in April, 1775. In the autumn of that year he commanded a force of about 1,000 men sent to capture Quebec, and in the long march through the pathless forests of Maine proved himself well fitted for such a service. Having reached the St. Lawrence river, he effected a junction with Gen. Montgomery, who had the chief command. They attacked Quebec in Dec., 1775, but failed to take it, and Arnold was severely wounded. He was raised to the rank of brigadier-general for his service in this campaign. He commanded a small flotilla which encountered a superior force on Lake Champlain, Oct. 11, 1776, and displayed there such unflinching courage as well as skill that he gained much applause, although he was not victorious. He was deeply mortified by the action of Congress, which neglected him, while it gave the rank of major-general to five of his juniors in rank. In 1777 he was appointed a major-general, but as he remained below the other five he was still discontented. He took part in the battle of Bemis Heights, Sept. 19, 1777, where he was involved in a quarrel with Gen. Gates. At the battle of Stillwater, Oct. 7, he entered the field without permission from Gates, rushed into the hottest part of the action, rode about issuing orders in every direction, and acted like a madman. He received on that day a severe wound, which disabled him for some months, and Congress at last accorded him full rank. In June, 1778, he was appointed to the command of Philadelphia, where he lived in an extravagant style and ran into debt. His first wife, Margaret, daughter of Samuel Mansfield, whom he married Feb. 22, 1767, died June 19, 1775; while in Philadelphia he married Margaret, daughter of Edward Shippen (afterward chief justice of Pennsylvania). He made many enemies, who trumped up charges against him, from most of which he was cleared by a court martial, which, however, ordered him (Jan. 26, 1780) for some trifling offenses to be reprimanded by the general-in-chief. Washington turned the reprimand into a eulogy, as he believed that Arnold had been persecuted. Shortly after this Arnold committed his great crime for which he had made long preparation. He solicited and obtained (in July, 1780) command of West Point, the most important fortress in the U. S., which he offered to betray into the possession of Sir Henry Clinton. The agent chosen by the British general to conduct the negotiations with Arnold was Major John André. (See ANDRÉ, JOHN.) Arnold and André had an interview on Sept. 21, and made the final arrangements for the surrender of West Point, but in consequence of the capture of André, Sept. 23, 1780, the plot was detected and Arnold escaped in the British sloop *Vulture*, Sept. 25. He received about £6,300 from the British Government as a reward for his treachery. Having joined the British army and issued an address to the American people in vindication of his course, he obtained command of an expedition against Virginia, which sailed from New York in Dec., 1780, passed up the James river, and burned and pillaged a considerable amount of property. In the autumn of 1781 the troops under his command burned New London, Conn. He went to England about the end of the war, and passed many years in that country, where he was generally despised. He died in London, June 14, 1801. See his life by Sparks, *Library of American Biography*, vol. iii., and by I. N. Arnold (Chicago, 1880).
Revised by S. M. JACKSON.

Arnold, Sir EDWIN: journalist and poet; b. at Rochester, England, June 10, 1832; graduated at Oxford 1854, and was subsequently appointed principal of the Government Sanskrit College at Poona, in the Bombay Presidency, and fellow of the University of Bombay, which positions he resigned in 1861 and joined the editorial staff of the London *Daily Telegraph*. His epic *The Light of Asia* (1879) has run through many editions. He has also published *Hitopadesa*, the *Indian Song of Songs*, and other translations;

History of the Administration of India under the late Marquis of Dalhousie (1862-64); *India Revisited* (1886); *The Light of the World* (1891); and many other works, translations from the Sanskrit and the Persian, or otherwise relating to Eastern poetry and religion. An edition of his poetical writings was published in 1888 in 8 vols. He was made Knight Commander of the Indian Empire by Queen Victoria in 1888. In 1889 he visited the U. S. and lectured, and in the autumn he went to Japan. Just before this visit his wife, a daughter of W. H. CHANNING (q. v.), of Boston, died, and he dedicated a volume of poems, *In my Lady's Praise* (1889), to her. One of the poems was a curious *Casket of Gems*, in which an acrostic was made by selecting gems, the initials of whose names spelled out his wife's name in full. From Japan he wrote letters to the *London Daily Telegraph* which were published in book form; namely, *Seas and Lands* (London, 1891) and *Japonica* (N. Y., 1891). The same year he renewed his visit to the U. S. on a reading-tour. His *Azuma, or a Japanese Wife* (1892), is a drama of the East, and *Potiphar's Wife and other Poems* (1892) a collection of verse.

Arnold, FREDERICK: author and divine; b. at Cheltenham, England, in 1833; educated at Christ Church College, Oxford. Author of *Public Life of Lord Macaulay* (1862); *The Path on Earth to the Gate of Heaven* (1865); *History of Greece* (1861); *Christ Church Days* (1867); *Turning Points in Life* (2 vols., 1864); *Memorials of Oxford and Cambridge* (1874); *Our Bishops and Deans* (2 vols., 1875); *Three-cornered Essays* (1886); *Robertson of Brighton* (1887); *Clerical and Literary Reminiscences* (2 vols., 1890), etc.

WILLIAM S. PERRY.

Arnold, FRIEDRICH: Professor of Anatomy and Physiology in the University of Heidelberg; b. Jan. 8, 1803, at Edenkoben, near Landau; M. D., University of Heidelberg, 1825; assistant professor in medical faculty of Heidelberg 1834; professor and director of the Anatomical Institute, University of Zurich, 1835; Professor of Anatomy and Physiology, University of Freiburg, 1840-45, University of Tübingen 1845-52, and University of Heidelberg 1852-73, retiring from his professorship in 1873. Among his numerous important professional works are *Der Kopftheil des vegetativen Nervensystems beim Menschen in anatomischer und physiologischer Hinsicht*; *Lehrbuch der Physiologie des Menschen*; *Ueber die Athmungsgrösse der Menschen*, etc.

Arnold, GEORGE B., Mus. Doc.: musician; b. at Petworth, England, 1832; appointed organist of Winchester cathedral 1865; has composed much church music and several oratorios. His first oratorio, *Ahab*, was produced in London, at Exeter Hall, in April, 1864. *Sennacherib* was composed for the Gloucester meeting of the Three Choirs Festival in 1883. *The Song of the Redeemed* was composed for St. James' church choir, New York, and first brought out there April 12, 1891.

D. E. HERVEY.

Arnold, GEORGE: poet; b. in New York, June 24, 1834; lived at Alton, Ill., till 1849, and afterward at Strawberry Farms, Monmouth co., N. J. He enlisted in the Union army during the civil war, and his humorous war correspondence, *McArone Papers*, appeared mainly in *Vanity Fair* in 1860-65. *Drift: a Seashore Idyl*, and *Poems, Grave and Gay*, were published posthumously in 1866, with a memoir by William Winter. D. at Strawberry Farms, N. J., Nov. 3, 1865.

HENRY A. BEERS.

Arnold, GOTTFRIED: b. at Annaberg, Saxony, Sept. 5, 1666; d. at Perleberg, Prussia, May 30, 1714; became court preacher at Allstedt 1700; preacher at Werben 1705, then at Perleberg 1707, and published (1699-1700) his *Impartial History of the Church* (2 vols.; best ed. Schaffhausen, 1740-42, 3 vols.), written on the principle that no individual or sect shall be condemned by history because he was condemned by the Church of his time—a principle to which not only the Roman Catholics but also the Lutherans were strongly opposed. See his life by F. Dibelius, Berlin, 1873.

Arnold, JOHANN GEORG DANIEL: writer and jurist; b. in Strassburg, Feb. 18, 1780; became Professor of Roman Law in that city (1811). He published a work on Roman law (1812), and wrote in the Alsatian dialect a comedy of *Whitmonday*, which was praised by Goethe. D. in Strassburg, Feb. 18, 1829.

Arnold, JONATHAN: b. at Providence, R. I., Dec. 14, 1741; as a member of the Colonial Assembly brought forward in 1776 a bill repealing the oath of allegiance to Great Britain; was a surgeon in the Revolution, and a member of

Congress (1782-84). He was long a judge of the Orange County court, Vermont. D. Feb. 2, 1798.

Arnold, JURY: See the Appendix.

Arnold, LAUREN BRIGGS: agriculturist and dairyman; author of *American Dairying*; b. at Fairfield, N. Y., Aug. 13, 1814; d. at Rochester, Mar. 7, 1888. He was a prominent investigator of the processes of cheese-making, and was a frequent lecturer upon the subject in the U. S. and Canada. He was also lecturer upon dairy-husbandry in Cornell University in his later years.

Arnold, LEMUEL HASTINGS (son of Jonathan): b. at St. Johnsbury, Vt., Jan. 29, 1792; graduated at Dartmouth in 1811; became a lawyer and manufacturer in Rhode Island; was Governor of that State 1831-33, member of Congress 1845-47. D. at Kingston, R. I., June 27, 1852.

Arnold, LEWIS G.: general; b. in New Jersey, Dec., 1815; graduated at West Point in 1837; served gallantly in Mexico, and in 1862 became a brigadier-general of U. S. volunteers. Stricken with paralysis in that year while on duty, he was placed on the retired list in 1864. D. in South Boston, Sept. 22, 1871.

Arnold, MATTHEW: English poet, critic, and "apostle of culture"; eldest son of Thomas Arnold, of Rugby; b. at Laleham, Middlesex, Dec. 24, 1822; educated at Rugby; studied in Balliol College, Oxford; graduated in honors 1844; elected fellow of Oriel College (as his father had been) 1845; became private secretary to Lord Lansdowne in 1847; a lay inspector of schools in 1851; and was Professor of Poetry at Oxford (1857-87). The collected edition of his poems appeared in 1869, and was reprinted in 1877, 1881, and 1885. His prose-writings comprise *Essays in Criticism* (1865; second series in 1888); *On the Study of Celtic Literature* (1868); *Culture and Anarchy* (1869); *St. Paul and Protestantism* (1870); *Literature and Dogma* (1873); *Last Essays on Church and Religion* (1877); *Mixed Essays* (1879); *Irish Essays and Others* (1882). His educational writings, which have a high value, include *Report on Education in France, Germany, and Holland* (1861); *A French Eton or Middle-class Education and the State* (1864); *Schools and Universities of the Continent* (1868); and *Higher Schools and Universities in Germany* (1874). In June, 1882, he delivered the annual Bede lecture at Cambridge, on the subject *Literature and Science*, and in the winter of 1883-84 he made a lecturing tour through the U. S. See his *Discourses in America* (1885). He received the honorary degree of Doctor of Laws from Edinburgh 1869, Oxford 1870, and Cambridge 1883. He exerted a remarkable influence upon the young men in the universities and colleges of the English-speaking world by means of his essays, which are fresh in matter, peculiar in style (having the trick of repeating a phrase in many successive pages, yet so cleverly as not to produce weariness), and very independent in thought. He enriched the conversation of liberally educated persons by numerous expressive phrases, such as "sweetness and light" (borrowed from Swift); "conduct is three-fourths of life"; "The Eternal not ourselves which makes for righteousness," etc. He was skeptical and critical, discontented and unsettled, but his influence was on the whole good. His poems did not enjoy the popularity of his essays. He might have excelled in translating Greek had he chosen to do so, as he was a superior scholar and master of English in prose and verse. D. in Liverpool, England, Apr. 15, 1888.

Revised by S. M. JACKSON.

Arnold of Brescia: See ARNALDO.

Arnold, PELEG: b. at Smithfield, R. I., 1752; was a delegate to Congress from Rhode Island 1787-89, and afterward was long chief justice of the Supreme Court of Rhode Island. D. at Smithfield, R. I., Feb. 13, 1820.

Arnold, Gen. RICHARD (son of Lemuel H.): b. at Providence, R. I., Apr. 12, 1828, and graduated at West Point in 1850. He entered the artillery, and in 1862 became a brigadier-general of U. S. volunteers, serving chiefly in the Gulf States. In 1866 he was breveted major-general U. S. A. D. on Governor's island, New York harbor, Nov. 8., 1882.

Arnold, SAMUEL, Mns. Doc. (Oxford, 1773): an English musician; b. in London, Aug. 10, 1740. He became composer to the Covent Garden theater about 1762. His opera, *Maid of the Mill* (1765), was very popular; also *Rosamond*, (1767). He was appointed organist to the king in 1783, and composed four volumes of *Cathedral Music*. D. in London, Oct. 22, 1802.

Arnold, SAMUEL GREENE: b. at Providence, R. I., Apr. 12, 1821; graduated at Brown University in 1841, and at Cambridge Law School in 1845. He was several times Lieutenant-Governor of Rhode Island, served for a few weeks as a volunteer in the late civil war, and became U. S. Senator in 1863. He published a *History of Rhode Island* (7 vols., 1859-60), and numerous addresses, reviews, and articles for periodicals. D. at Providence, R. I., Feb. 13, 1880.

Arnold, THOMAS, D. D.: English teacher and historian; b. at Cowes, in the Isle of Wight, June 13, 1795. He entered the University of Oxford in 1811; graduated in 1814, and became a fellow of Oriel College in 1815. He gained the chancellor's prize for Latin and English essays in 1815 and 1817. He removed to Laleham, near Staines, in 1819, and married Mary, a daughter of Rev. John Penrose, in 1820. In 1828 he was ordained a priest, and became head-master of Rugby School, which he conducted with eminent wisdom and decided success, fulfilling the prophecy that he would regenerate public-school education in England. He did better than merely turn out clever scholars. He cultivated among the students a sense of duty and a high moral and religious tone. He set an example of Christian manliness which induced many followers, for to him religion was the dominant force, the very life. He was a Whig or Liberal in politics, and a strenuous opponent of the High Church and new school of theology represented by Pusey. In 1832 he purchased Fox How, a small estate between Rydal and Ambleside, where he afterward spent his vacations. He contributed to the *Quarterly Review* and *Edinburgh Review*, published a good edition of Thucydides (1830-35), and five volumes of sermons (1828-42). His capital work is a *History of Rome* (3 vols., 1838-42), which he did not live to finish. It terminates near the end of the second Punic war. In 1828 he became B. D. and D. D. at Oxford. He was appointed Regius Professor of Modern History at Oxford in 1841, and delivered there an introductory course of lectures which were published in 1842. He died at Rugby, of angina pectoris, June 12, 1842, leaving three sons, Matthew, Thomas, and William D., and a name of priceless value. See his life by Dean Stanley (2 vols., 1844, many editions and reprints), and the novel of Thomas Hughes, *Tom Brown at Rugby*; also Zinzow's *Thomas Arnold* (1869).
Revised by S. M. JACKSON.

Arnold, THOMAS KERCHEVER: English clergyman; b. at Stamford, 1800; educated at Cambridge, became fellow of Trinity College 1821; rector of Lyndon, Rutlandshire, where he died, Mar. 9, 1853. He published a number of popular text-books for schools, among which are manuals for the Greek, Latin, French, and German languages.

Arnolfo di Cambio: sculptor and architect; b. at Colle, 1232; d. at Florence, 1310. He was a master of that beautiful combination of building and sculpture peculiar to mediæval Italy. The rich west front of the Cathedral of Orvieto and a rich tomb in the same city, the tomb of Pope Honorius III. in Santa Maria Maggiore and that of Pope Bonifacio VIII. in St. Peter's, both at Rome, and other important works in Central Italy, are either wholly or in great part of his design. But his most important work was done in Florence, where there still remain for our admiration the Bargello (now the National Museum), the Church of Orsanmichele with its very elaborate shrine, the Church of Santa Croce, the marble exterior of the baptistery, the beginning and general design of the public palace (Palazzo Vecchio), and the great cathedral from almost its commencement up to the roof of the nave.
RUSSELL STURGIS.

Ar'not, WILLIAM: b. at Seone, Perthshire, Scotland, Nov. 6, 1808; educated at the University of Glasgow; ordained as a minister of the Established Church in 1839; subsequently joined the Free Church movement (1843), and was one of its ablest champions. In 1863 he removed to Edinburgh. He was a delegate to the meeting of the Evangelical Alliance in 1873 at New York. He declined the degree of D. D. from the universities of Glasgow and New York city. His best-known books are *Laws from Heaven for Life on Earth*; *Illustrations of the Book of Proverbs* (2 vols., 1857-58); and *The Parables of our Lord* (1865). See his autobiography and memoir (London, 1877). D. in Edinburgh, June 3, 1875.

Arnott, NEIL, M. D. (Aberdeen, 1814), F. R. S. (1838): b. at Arbroath, near Montrose, Scotland, 1788; was educated at Aberdeen, and in medicine in London; became a surgeon in the East India Company's service; settled in London in 1811 as a physician; published *Elements of Physics*

(1827); *Essay on Warming and Ventilating* (1832); a *Survey of Human Progress* (1861), etc. He was distinguished as an inventor, especially of a smokeless grate, known as "Arnott's stove," and as a benefactor of institutions of learning. D. in London, March 22, 1874.

Arnotto: See ANNOTTO.

Arnould, or Arnoult, aar-noo', SOPHIE: a popular French actress; b. in Paris, Feb. 14, 1744. She was very successful as an opera-singer, and was distinguished for her wit and conversational powers. Her society was sought by such men as D'Alembert and Diderot, and her beauty was praised by several eminent poets. D. in Paris, 1803. See her biography by Lamotte-Langon (2 vols., Paris, 1837), and by E. and J. de Goncourt (1857), and her *bon mots* in *Arnoldiana* (1813).

Arnprior: on Canadian Pacific Ry., Renfrew co., Ontario, Canada (for location of county, see map of Ontario, ref. 1-G); situated on Chats Lake, at the confluence of the Madawaska and Ottawa rivers, 52 miles W. of Ottawa; has saw-mills, woolen-mills, and marble-works. There are iron mines in the vicinity. Pop. (1881) 2,147; (1891) 3,341.

Arns'berg, or A'rensberg: a town of Prussia, in Westphalia; situated on the river Ruhr; 46 miles S. S. E. of Münster (see map of the German Empire, ref. 4-D). It contains several churches and a gymnasium; also manufactures of broadcloth, linen, etc. In the Middle Ages it was a seat of the Vehmic court. Pop. 6,733.

Arn'stadt: an old town of Germany; in Schwarzburg-Sondershausen; on the river Gera, 10 miles S. of Erfurt, with which it is connected by a railway (see map of the German Empire, ref. 5-E). It is one of the most ancient Thuringian towns. Here are manufactures of gloves, pottery, etc. In the vicinity are copper mines and saline springs used for bathing. Pop. 11,287.

Arnswalde, aarns'vaal-de: a town in the Prussian province of Brandenburg, 66 miles N. E. of Frankfort-on-the-Oder; has chemical manufactures, iron-foundries, and spinning-works. It is on the railroad from Stettin to Posen (see map of the German Empire, ref. 3-H). Pop. about 7,500.

Ar'nulf (in Lat. *Arnulphus*): Emperor of Germany; son of Carloman of Bavaria. The latter was a grandson of Charlemagne. Arnulf, b. about 850, was elected King of Germany in 887 A. D., invaded Italy about 894, and captured Rome in 896. He was crowned as emperor by the pope at Rome. He died at Regensburg, Dec. 8, 899, and was succeeded by his son, Louis IV. See Gagern, *Arnulfi Imperatoris Vita* (1837).

Aroids [from Lat. *arum* = Gr. *ἄρον*, a plant-name + Gr. *εἶδος*, form]: the *Araceæ*; a family of herbaceous monocotyledons, bearing small flowers upon a fleshy spike (spadix) which is commonly inclosed in a spathe. About 900 species are known, distributed mainly in warm climates.

CHARLES E. BESSEY.

A'rolsen: a town of Germany; capital and residence of the Prince of Waldeck; on the Aar, 23 miles N. N. W. of Cassel (see map of the German Empire, ref. 4-E). It has manufactures of woolen cloth. Here is a fine castle of the Prince of Waldeck, with a library of 30,000 volumes. Pop. (1890) 2,620.

Aro'ma [Lat. = Gr. *ἄρωμα*, spice, sweet herbs]: the principle in plants or other substances which constitutes their fragrance; the peculiar odor of aromatic plants, such as nutmeg, cloves, vanilla, and lavender. It is extremely subtle, and seems to be almost imponderable, as these substances diffuse their odors for a long time without sensible diminution of weight. The aroma of plants is imparted to fixed oils by maceration.

Aromatari, GIUSEPPE, degli (jyū-sep-pe dayl'-yēē ā-rō-mā-taa'reē): learned physician and naturalist; b. at Assisi, Italy, about 1586; practiced medicine with great success at Venice about fifty years. His fame reached England, and he received and declined invitations from James II., from the pope, and others. His principal work is *De Generatione Plantarum ex Seminibus*, a treatise on the reproduction of plants, showing the analogy between their seeds and the eggs of animals. D. in 1660.

Aromatic Hydrocarbons: See HYDROCARBONS.

Aromat'ies [Lat. *aromat'icus*, deriv. of *arō'ma*, a spice]: spicy plants or drugs; substances which emit aroma or agreeable perfumes, and are generally characterized by a

warm, pungent taste, as cloves, cinnamon, ginger. They often contain essential or volatile oils or resins. The term aromatic is also applied to several animal substances, as ambergris, musk, and castor. See AROMA.

Aromatic Vin'egar: a compound or mixture of ordinary vinegar with aromatic essential oils, and a powerful perfume. As it is very volatile, and is an excitant when snuffed in the nostrils, it is used as a remedy for fainting and nervous debility. It is often prepared by combining crystallizable acetic acid with the oils of cloves, lavender, rosemary, and *Acorus calamus*.

Aroo: See ARU.

Aroos'took: a river of the U. S.; rises in Piscataquis co., Me., flows northeastward through Aroostook County into New Brunswick, and enters the St. John's river. Length about 120 miles.

Arpád: the national hero of Hungary and the chief of the Magyars, who in 889 A. D. migrated from Galicia, and conquered the Slavonic people of Croatia and Transylvania. He is called the founder of the kingdom of Hungary. D. in 907 A. D. The dynasty of Arpád terminated in Andrew III., in 1301.

Ar'pe, PETER FRIEDRICH: b. at Kiel in Holstein in 1682; was Professor of Law (1717-22) at Kiel, and a learned jurisconsult and writer. He wrote *Themis Cimbrica* (1737), describing the institutions and manners of the Cimbric and other tribes. D. about 1745.

Arpeggio, ar-pej'ō [Ital., connected with *arpeggia're*, play on the *arpa*, or harp]: in music, a chord of which the notes are given in succession; or the sounding the notes of a chord in quick succession, so as to imitate the harp.

Arpent: a French land-measure nearly equivalent to an English acre. The French now measure land by the *hectare* instead of the *arpent*, which is obsolete.

Arpi'no (anc. *Arpi'num*): a town of Italy; province of Caserta; pleasantly situated on high ground, 5 miles S. of Sora (see map of Italy, ref. 6-E). It is surrounded by very beautiful scenery, has a royal college, several churches and convents; also manufactures of woolen cloth, paper, etc. Here is a cyclopean wall and other remains of Arpinum, which was founded by the Volsci, and became a Roman *municipium* about 188 B. C. It is celebrated as the native place of Caius Marius and of Cicero. Variegated and white marbles are quarried in the vicinity. Pop. 11,629.

Arraca'cha [native name]: an umbelliferous South American plant (*Arracacha esculenta*). It grows in Colombia, Jamaica, and other tropical regions, and is cultivated for its roots, which are large and sweet, and are eaten after being boiled or roasted. The taste is described as between that of a parsnip and a sweet chestnut. This plant was recommended as a substitute for the potato, and attempts were made to cultivate it in England, but that climate was found to be unfavorable.

Ar'rack', or **Rack**: an alcoholic liquor distilled from fermented rice; a common intoxicating drink in the East Indies and other Oriental countries. Also a strong drink obtained from the fermented sap of the palm-tree, and often called palm-wine or toddy. Among the species of palms which yield this drink are the cocoanut-palm and the date-palm. When new it has an oily and disagreeable taste, which is improved by age.

Arragon: See ARAGON.

Ar'rah: a town of British India; in the presidency of Bengal, 25 miles W. of Dinapoor (see map of N. India, ref. 6-G). The British here gained a victory over the mutinous Sepoys in 1857. Arrah was the scene of several exciting incidents of that mutiny. Pop. (1891) 42,998.

Ar'ran: an island of Scotland, in the Frith of Clyde, county of Bute, 13 miles W. of Ayrshire, and 4 miles E. of Cantyre (see map of Scotland, ref. 13-E). It is about 20 miles long, 12 miles wide, and has an area of 165 sq. miles. The surface is mountainous, the granite peaks of the northern part being remarkably grand. Goatfell, the highest peak, is 2,860 feet above the level of the sea. Here is a cavern in which Robert Bruce once hid himself. The geology of Arran, it is said, presents a greater succession of strata than any other equal portion of the British isles. The southeastern half consists of Devonian sandstone, trap-rock, and carboniferous strata. The northwestern half exhibits a central granite nucleus, bordered by mica-slate

on one side, and by lower Silurian rocks on the other sides. Pop. about 6,000.

Arran, SOUTH ISLES OF: three small islands lying across the entrance to Galway Bay, about 4 miles off the west coast of Ireland, and 27 miles S. W. of the city of Galway (see map of Ireland, ref. 10-B). They are named Inishmore, Inismain, and Inishere (or Innishere). Area, 18 sq. miles. They once contained twenty churches and monasteries, and St. Kenanach church, built in the seventh century, is still standing. Here are also remains of a cyclopean fort of unhewn stone, supposed to have been built in the first century, and described as among the most magnificent barbaric monuments of Europe. The old shrines and relics scattered through the islands attract many visitors.

Arrangement: the adaptation of a piece of music to an instrument different from that for which it was originally composed, as when orchestral compositions are adapted to the piano, or when a piece originally written for an instrument or instruments is adapted for a voice or voices.

Arras (anc. *Nemetacum*, afterward *Atreb'ates*): a fortified city of France, capital of the department of Pas-de-Calais, on the river Scarpe and on the Railway du Nord, 30 miles N. E. of Amiens, and 100 miles N. N. E. of Paris (see map of France, ref. 2-F). It was formerly the capital of Artois, and was the seat of a bishop as early as 390 A. D. It was fortified by Vauban, and ranks as a fortified town of the third class. The citadel is separated from the town by an esplanade, but it is inclosed within the same wall. Arras is well built, partly on a declivity and partly on flat ground, and is adorned by fine public buildings, among which are a cathedral, a town-hall, and a theater. It has a museum, a school of design, and a public library of about 36,000 volumes. Here are manufactures of hosiery, lace, woolen and cotton goods, etc. In the Middle Ages it was so famous for its tapestry that this article was commonly called *arras* by the English. It was the birthplace of Robespierre. The grain-market of Arras is said to be the most important in the N. of France. Pop. (1896) 26,144.

Arras'tre: a mill used in Spain and the Spanish colonies for grinding gold and silver ores. It is a circular basin of granite or other hard rock, in the center of which a vertical wooden shaft revolves, with four horizontal arms, to which large flat stones are attached by chains. The ore is broken into small fragments before it enters the arrastre. The revolution of the shaft is produced by two mules. See SILVER.

Ar'rawak Ind'ians: a race or collection of tribes in Guiana, remarkable for the euphony of their language and their mild and friendly disposition toward the whites. They were formerly very numerous and powerful. They have been much benefited by the labors of Moravian missionaries.

Ar'rebo, ANDERS CHRISTENSEN: Danish poet; b. at Årøskjøbing, Jan. 2, 1587; d. at Vordingborg, Mar. 12, 1637. His chief work is the *Hexæmeron*, on the creation of the world, an imitation of the *Divine Week* of Du Bartas. His main importance, however, is as the introducer of Renaissance influences into Danish poetry. G. L. KITTEDGE.

Arrest' [from Old Fr. *arest*, deriv. of *arester*, stop, check, ultimately from Lat. *ad*, to + *restare*, stay back]: the apprehension or seizure of a person by lawful authority, usually by the command or direction of some court or officer of justice. It may take place either in civil or criminal cases.

(1) *In Civil Cases*.—In this instance it may be either on *mesne* or final process. The object of the first is to make it certain that the defendant will answer the order of the court. He may either remain in custody or give bail, according to the rules of practice, as security for his appearance. On final process the arrest is in the nature of an execution. The defendant is to be kept in confinement, either in jail or within prescribed limits, until the judgment is satisfied, or until he is discharged by order of the court. In the early common law an arrest was allowed almost as a matter of course, imprisonment for debt being the regular practice. This rule is now greatly modified, and by a statute in Great Britain and in a number of the United States an arrest can only be had in special cases and upon a judge's order. The facts necessary to be shown as a basis for the order are presented on affidavit. There are certain persons privileged from arrest by rules of general prevalence, such as members of legislatures, or witnesses while attending the sessions of the legislatures or courts, and while

going to and returning from the same. The arrest in such cases is irregular, and the party arrested may be discharged on motion. This privilege is secured to members of Congress by the U. S. Constitution. An original arrest can not be made on Sunday, nor is it lawful to break into a house for this purpose, owing to the legal rule that "a man's house is his castle." This rule does not apply where the defendant has been rescued, and the officer is proceeding regularly to retake him. The common law permits an arrest by night as well as by day. This rule is sometimes affected by statute.

(2) *In Criminal Cases.*—The power to arrest in this class of cases is much less restricted. None are privileged (except ambassadors and their servants), outer doors may be broken open, Sunday is not regarded, and a warrant is not in all cases essential. Such an arrest is made either under a warrant, or by an officer without a warrant, or by a private person without a warrant. A warrant is granted by a magistrate on information in writing and supported by oath, and is executed by the person to whom it is addressed, usually a sheriff or constable. An arrest may be made without a warrant by a peace officer, such as a sheriff or constable, when a felony or breach of the peace is committed in his presence, or where a felony has been committed, or he has reasonable ground to suspect that it has been, though not in his presence, and he has also reasonable ground to suspect the party arrested. The right of a private person to make an arrest without a warrant is much more restricted. He must be prepared to show that a felony has been *actually* committed, as well as reasonable grounds of suspicion that the party arrested was the wrong-doer. A private person is bound to arrest for a felony committed in his presence. In making an arrest necessary force may be used, and in case of felony even life may be taken where arrest is enjoined. An arrest can only properly be made within the jurisdiction of the court. When a person charged with crime escapes from one State to another, his return may be demanded under the laws of Congress. Should he escape to a foreign country, he may in certain cases be retaken under an extradition treaty with that country. See EXTRADITION.

The word "arrest" is also used in law in connection with judgment. This means that judgment is not to be entered, although a verdict has been given, on account of some reason appearing upon the record, as where the allegations in the pleadings are not a sufficient basis for an action.

T. W. DWIGHT.

Arrhidaeus, PHILIP: a son of Philip II. of Macedon by a dancing-girl, Philinna of Larissa; accompanied his half-brother, Alexander the Great, in his campaigns in Asia, and was always kindly treated by him, but never held any civil or military command. He was imbecile, and it was said that he had become so from a potion administered to him while a boy by Olympias, his father's wife and Alexander's mother. He was present at Babylon when Alexander died, and was immediately proclaimed king by the army, though the son of Alexander by Roxana, born shortly after, was associated with him. He now married Eurydice, a granddaughter of Philip II., a daughter of Cynane, his own and Alexander's half-sister. Eurydice was, like her mother, a woman of thoroughly masculine education, of many masculine talents, and of an inordinate ambition. She wished to get rid of Roxana and her son, of Olympias, and of Alexander's generals; and after the death of Antipater (in 319) she collected an army and marched against Polysperchon. But in Polysperchon's army was Olympias, and the Macedonian soldiers declared that they would never fight against Alexander's mother. Eurydice was deserted, captured in her flight, and confined, together with her husband, in a narrow dungeon, whither Olympias sent to her a sword, a rope, and a cup of hemlock. She accepted the presents, made Arrhidaeus drink the hemlock, and then hanged herself (317 B. C.).

Ar'rian (Gr. Ἀρριανός; Lat. *Arria'nus Fla'vius*): Greek historian; b. at Nicomedia, in Bithynia, about 100 A. D.; was a pupil and friend of Epictetus. He was a Stoic in philosophy. From 131–137 A. D. he was governor of Cappadocia under Hadrian. He is said to have served in the army against the Goths and Alani. He spent the closing years of his life in Athens, and died before 180 A. D. In his life as in his writings he took Xenophon as his model, and Epictetus was to him what Socrates was to Xenophon. As Xenophon wrote the *Memoirs of Socrates*, so he composed

the *Discourses of Epictetus* (Διατριβαί Ἐπικτήτου), in eight books, of which four are extant, and edited his master's *Enchiridion* (Ἐγχειρίδιον), a manual of Stoic morals, which still enjoys great popularity. His principal historical work is the *Expedition of Alexander* (Ἀνάβασις Ἀλεξάνδρου), in seven books, title and number both being in imitation of Xenophon's *Anabasis*. The work is based on Ptolemy and Arrian's *Anabasis*. The work is based on Ptolemy and Arrian's *Anabasis*, and commends itself to the student of history by its simplicity and sobriety. The book on *India* (Ἰνδική), a geographical appendix to the *Anabasis*, is written in the Ionic dialect. An official report to Hadrian is preserved under the title *Περίπλους πόντου Εὐξείνου*, a narrative of a coasting voyage around the Euxine. A treatise *On Tactics* (Τακτική) and a slight tract *On Hunting* (Κυνηγετικός) have also come down to us under his name, with fragments of various historical works. In his language Arrian tries to revive the elegance of the classical period, but his speech betrays him, and his labored simplicity is lacking in charm. Ed. by Dübner and Müller (1846). Minor writings by Hercher in the Teubner Library. Annotated ed. of *Anabasis* by Krüger (1835–48), by Sintenis (1863), by Abicht (1879). For the philosophical works, see Schweighäuser, *Epicteteæ philosophicæ monumenta* (1799); for the geographical remains, Müller, *Geographi Græci minores*, i. pp. 257–402.

B. L. GILDERSLEEVE.

Arriaza, ā-rēe-aa'tha, JUAN BAUTISTA: Spanish poet, sometimes called ARRIAZA Y SUPERVIELA; b. at Madrid in 1770. He passed some years in London as secretary of legation, and published in 1803 *Emilia*, a poem on the influence of the fine arts. Having returned to Spain in 1807, he took an active part in politics, and wrote in support of absolute monarchy. He obtained an important position in the department of foreign affairs. In 1810 he produced *Poesias Patrioticas*. D. in Madrid, 1837.

Arrière Ban: See BAN.

Arri'ghi di Casanova, JEAN TOUSSAINT: Duke of Padua; a Corsican general; b. at Corte, Mar. 8, 1778. He entered the French army in early youth, and served with distinction at Marengo, Austerlitz, and Friedland, and was raised to the rank of general of division on the field of Esslingen, in 1809. He lived in exile from 1815 to 1820; was elected to the French Legislative Assembly in 1849. D. in Paris, Mar. 22, 1853. See his biography by A. Du Casse (2 vols., Paris, 1866).

Arro'ba: a Spanish weight and measure; used also in Brazil and the Spanish colonies. There are ten kinds of *arroba* for weight, ranging between $21\frac{8}{100}$ lb. avoirdupois and $32\frac{5}{100}$ lb. avoirdupois. Only two of the number are as great as 28 lb. There are eleven kinds of *arroba* for liquid measure, ranging from $2\frac{7}{100}$ gal. to $9\frac{9}{100}$ gal. The *arroba* for Spain generally is (or was, as it is abolished) $4\frac{2}{100}$ gal.

Arrondissement, ā-roii-dees'mon [Fr., a district or circuit]: a principal civil division of the departments of France. Each department is divided into arrondissements, each arrondissement into cantons, and each canton into communes. See FRANCE.

Arroo: See ARU.

Ar'rowhead: an aquatic plant of the genus *Sagittaria* and family *Alismaceæ*, natives of both cold and tropical climates. They have unisexual flowers, with many stamens and many carpels, which are compressed and one-seeded. The *Sagittaria sagittifolia*, a native of Europe, is a beautiful plant with arrow-shaped leaves, which rise above the surface of the water. The *Sagittaria variabilis* of the U. S. is very similar to it. The *Sagittaria sinensis* (Chinese arrowhead) is cultivated in China in ponds and ditches for the sake of its nutritious corns, which abound in starch.

Arrow-headed Characters: See CUNEIFORM INSCRIPTIONS.

Ar'rowroot: the starch or fecula from the root of the *Maranta arundinacea* and other species of *Maranta*. It is much esteemed as an easily digestible diet for infants and invalids. Large quantities of it are imported into the U. S. and Europe from Bermuda and Jamaica, where it is cultivated. It is also raised in Georgia and Florida. The roots, or rather rhizomes, yield about 25 per cent. of this starch, which is in the form of a light, opaque, white powder. It is often adulterated with potato-starch and other substances. The name arrowroot is said to refer to the use of the fresh roots as an application to wounds inflicted by poisoned arrows; and the expressed juice has been recommended as an

antidote to poisons, and a cure for the stings and bites of venomous insects and reptiles. Some think that the name



Arrowroot.

cloth or hair to separate the fibers, and the starch is allowed to settle. Albumen and salts are held in solution, while the starch settles down as an insoluble powder, which is finally dried in the sun. According to Benzon, the fresh rhizomes contain—

Starch.....	26.00
Cellular fibers.....	6.00
Albumen.....	1.58
Gummy substances.....	0.60
Volatile oil.....	0.07
Chloride of calcium.....	0.25
Water.....	65.50
Total.....	100.00

The prepared arrowroot is almost pure starch. It has a peculiar firm feel between the fingers, and when rubbed produces a peculiar crackling sound, like that of dry snow in very cold weather. Like starch from other sources, it is insoluble in cold water, but forms on boiling a gelatinous solution.

The purity of arrowroot is best determined by microscopic examination, as, while the starch granules of different plants (see STARCH) are almost identical in chemical composition and properties, they are often very peculiar in size, form, and structure. The granules of the genuine *Maranta* arrowroot are of a regular ovoid form, of nearly equal size, and smooth on their surface; while the granules of potato-starch, one of the most common adulterants, are irregularly ovoid, very variable in size, from $\frac{2}{1000}$ to $\frac{3}{100}$ of an inch in diameter, and streaked and furrowed on their surface. The fecula of many other plants is used either as a substitute or an adulterant for the true arrowroot. *Zamia integrifolia* yields an arrowroot in the West Indies and the neighborhood of St. Augustine, Fla. *Arum vulgare* (wake-robin) yields Portland arrowroot in the isle of Portland. *Curcuma angustifolia* yields East Indian arrowroot. *Jatropha Manihot*, the cassava or tapioca-plant, yields Brazilian arrowroot. *Tacca oceanica* yields Tahiti arrowroot. *Alstromeria pallida* yields Taleahuana arrowroot. The potato yields, by careful preparation, the English arrowroot. Starch similar to arrowroot is also prepared in the West Indies from the roots of *Dioscorea sativa* or yam, of *Colocasia esculenta*, and from the fruit of *Artocarpus incisa* or breadfruit-tree.

For use, arrowroot should be rubbed to a paste with a little cold water, and while this is stirred a considerable quantity of boiling water should be added. It may be sweetened with sugar and flavored with lemon-juice or with wines and spices. For infants it may be prepared with milk. A tablespoonful is sufficient for a pint of water or milk.

C. F. CHANDLER.

Arrowsmith, AARON: an English geographer; b. at Winston, Durham, July 14, 1750; became distinguished as a publisher of excellent maps, over 100 in number. D. in

London, April 23, 1823.—His son AARON, and his nephew JOHN, were also noted for the excellence of their maps.

Arrowsmith, JOHN, D. D.: b. at Gateshead, near Newcastle-on-Tyne, England, Mar. 29, 1602. He was educated at Cambridge, and was one of the ablest Puritan divines of his time; became member of Westminster Assembly 1643, D. D. and Regius Professor of Divinity at Cambridge, and master of St. Catharine's Hall, all in 1644; vice-chancellor 1647, and master of Trinity College from 1653 till his death in Feb., 1659. Wrote *Tactica Sacra* (1657); *Armilla Catechetica*, in English (1659), etc.

Arsaces I. (in Gr. Ἀρσάκης): the founder of the Arsacidae and of the kingdom of Parthia; lived about 250 B. C. His origin and history are involved in much obscurity. He is said to have been the chief of a nomadic tribe of Seythians or Baetrians. All his successors assumed the name of Arsaces.

Arsaces III.: King of Armenia; was a son of Tiridates III., whom he succeeded about 340 A. D. He waged war against Sapor, King of Persia, and formed an alliance with Julian the Apostate about 360. The defeat and death of Julian are ascribed to the treachery of Arsaces, who deserted him in the campaign of 363 A. D.

Arsaces VI., or Mithridates I.: King of Parthia; enlarged his dominions by the conquest of Bactria, and extended his conquests to the Indus. He defeated Demetrius Nicator of Syria. After a reign of twenty-five years or more, he died about 135 B. C.

Arsacidae: a dynasty of Parthian kings which was founded by Arsaces in 256 B. C., and continued to reign until 226 A. D. The last king of this dynasty was Artabanus IV. (Arsaces XXIX.).

Arsenal [through Italian and French, from Arab. *dār agginā'ah*, literally, house of construction]: a storehouse or magazine of arms and military stores, or a manufactory of arms, equipments, etc.

The arsenals of ancient castles and strongholds were located in their keeps, and served as repositories of arms, etc.

The TOWER OF LONDON (*q. v.*) remains as a type of this class, and contains a collection of antique arms, armor, etc. Corresponding collections exist at Vienna, Delft, Berlin, Paris, and Madrid.

Great modern arsenals are located at Cherbourg, Brest, and Toulon, France, with lesser ones at the centers of military districts. Similar repositories of arms, supplies, etc., usually known as "dépôts," are established in each of the military districts of Germany, Russia, Austria, and the other European states, at which are collected everything necessary for the immediate mobilization of the troops of the district.

In Great Britain there is the great arsenal of Woolwich, which has given employment to more than 10,000 men at one time, and at which immense quantities of all kinds of warlike material are manufactured and stored (see WOOLWICH). Besides this arsenal there are the great dockyards of Chatham, Sheerness, Portsmouth, Plymouth, Pembroke, etc.

In the U. S., at the beginning of the Revolution, neither arsenals nor armories existed; but in 1776 the manufacture of powder was commenced in Virginia, and in 1777 brass cannon were cast in Philadelphia. An arsenal was established at Carlisle, Pa., and a foundry and laboratory were, on the recommendation of Gen. Washington, established at Springfield, Mass., which was the origin of the present National armory. Supplies were furnished Gen. Schuyler from here in July, 1777, and before 1787 the manufacture of small arms had commenced. The arsenal at Harper's Ferry was commenced in 1795. These two arsenals furnished small arms and supplies during the war of 1812, and the former is now the principal manufacturing arsenal of the U. S. The arsenal at Harper's Ferry continued in use until the civil war, when it was destroyed, and has not since been rebuilt. See HARPER'S FERRY.

In 1838 the Ordnance Department was placed in charge of the arsenals and armories. Under its direction grew up the system of making arms by machinery with such accuracy and adherence to established patterns that all the parts of similar arms are interchangeable. This system has given great facility in repair of arms in the field, and is now universally adopted.

At the beginning of the civil war there were twenty-three arsenals and armories in the U. S., nine of which, besides

the Springfield armory, were converted into arsenals of construction. The Springfield armory became capable of turning out 1,000 rifles a day, and a large number of private armories manufactured an equal number under the direction and inspection of ordnance officers. These arms were so made that the corresponding parts could be interchanged with those of the Springfield.

Recently the number of arsenals has been still further reduced, and of those which remain the greater number are used only as dépôts and for repairs.

Small arms are manufactured at Springfield, ammunition at Frankford, and the Rock Island arsenal is designed for extensive manufactures when needed. The arsenal at Watervliet, N. Y., has been equipped as a gun foundry for the manufacture of modern high-powered cannon, etc.

The following is a list of arsenals, armories, and dépôts now occupied:

Allegheny arsenal, Pittsburg, Pa.; Augusta arsenal, Augusta, Ga.; Benicia arsenal, Benicia, Cal.; Columbia arsenal, Columbia, Tenn.; Fort Monroe arsenal, Fort Monroe, Va.; Fort Snelling ordnance dépôt, St. Paul, Minn.; Frankford arsenal, Philadelphia, Pa.; Indianapolis arsenal, Indianapolis, Ind.; Kennebec arsenal, Augusta, Me.; National armory, Springfield, Mass.; New York arsenal, Governor's island, New York city; Omaha ordnance dépôt, Omaha, Neb.; Rock Island arsenal, Rock Island, Ill.; St. Louis powder dépôt, Jefferson Barracks, Mo.; San Antonio arsenal, San Antonio, Tex.; U. S. powder dépôt, Dover, N. J.; Vancouver barracks ordnance dépôt, Vancouver Barracks, Wash.; Watertown arsenal, Watertown, Mass.; Watervliet arsenal, Watervliet, N. Y.

Ar'senic, as an adj. pronounced *ar-sen'-ik* [from Gr. *ἀρσενικόν*, deriv. of *ἀρσην*, masculine; said to be so named from its strength as a poison]; chem. symbol, *As*; atomic weight, 75; the common name of arsenious acid or white oxide of arsenic, a virulent poison. (See ARSENIOUS OXIDE.) The name arsenic is limited in scientific language to the metal. Arsenic is found native to a limited extent, but occurs usually in combination with metals or with sulphur, or both. The most important arsenical minerals are those in which arsenic is combined with iron, cobalt, and nickel, as, for example, *mispickel*, or *arsenical pyrites*, FeAsS ; *cobalt glance*, CoAsS ; *nickel glance*, NiAsS ; *arsenolite* or *arsenite*, As_2O_3 , etc. Arsenic also occurs in small quantities in many other minerals, specially in antimony ores, iron pyrites, etc., hematite iron ores, the soil, mineral waters, etc. Arsenic is, in fact, one of the most widely diffused elements in nature.

Owing to its occurrence in antimony ores and iron pyrites, it is liable to find its way into the various preparations of antimony, into sulphuric acid, and the various chemical products of which this acid is the basis, as sodic sulphate and carbonate, hydrochloric acid, superphosphates, etc. In the chemical examination of the bodies of persons supposed to have been poisoned the greatest care is necessary to procure reagents entirely free from arsenic.

Metallic arsenic is prepared by sublimation: (1) from arsenical pyrites; (2) from a mixture of arsenious acid and charcoal.

Arsenic is a brittle metal, of a steel-gray color. On the fresh fracture it exhibits a bright metallic luster, which soon tarnishes. Its specific gravity varies from 5.62 to 5.96. Its atomic weight is 75. It crystallizes in rhombohedra. It volatilizes at a dull red heat without previous fusion, with a peculiar odor, described as resembling that of garlic. When heated in the open air it burns with a bluish flame.

(For the detection of arsenic see ARSENIOUS OXIDE.) With oxygen, arsenic forms two important compounds—arsenious oxide, As_2O_3 , and arsenic oxide, As_2O_5 , which give rise to arsenious acid, HAsO_2 , and arsenic acid, H_3AsO_4 . With sulphur, arsenic forms three important compounds—realgar, AsS , orpiment, As_2S_3 , and As_2S_5 . Arsenic combines with metals in the same manner as sulphur and phosphorus, which it resembles, especially the latter, in many respects. Its compound with hydrogen, arsine, AsH_3 , is analogous to ammonia, NH_3 .

Metallic arsenic is rarely used in the arts. Lead containing a small proportion of arsenic is used for the manufacture of shot, and iron containing a little arsenic is very fluid when melted, and better adapted for fine castings for which strength is not essential.

Revised by IRA REMSEN.

Arse'nious Oxide (or **Anhydride**): As_2O_3 ; the substance commonly called *arsenic* or *white arsenic*. It is also frequently spoken of as *arsenious acid*.

Occurrence.—It is found native, as the mineral arsenolite, in silky, crystalline crusts on ores of silver, lead, nickel, antimony, etc., in the Hartz Mountains and other localities.

Preparation.—At Reichenstein, in Silesia, arsenious oxide is prepared by roasting arsenical pyrites (*mispickel*), FeAsS , in a muffle furnace. At Ribas, in Catalonia, *mispickel* is roasted in reverberatory furnaces without muffles, the crude product being subsequently purified as at Reichenstein. At Andreasberg, in the Hartz, native arsenic is roasted for the silver it contains, the arsenious oxide being obtained as an incidental product. Much arsenious oxide is produced in the roasting of tin and cobalt ores at Altenberg, in Saxony, and of tin ores in Cornwall.

Arsenious oxide usually appears as a very heavy, white, gritty, crystalline powder. It has no decided taste. At 218°C . it volatilizes to a heavy, colorless, odorless vapor, which condenses to octahedral crystals on cool surfaces. When heated with charcoal it is reduced to metallic arsenic. In its common octahedral form it is soluble in about 30 parts of cold or 10 parts of boiling water. When thrown into water, a portion floats like wheat flour, while the portion which sinks rolls itself into little round pellets, dry within. It is nearly insoluble in alcohol, absolutely insoluble in ether. It is soluble in hot dilute acids to a greater extent than in water, but it mostly separates on cooling. It dissolves readily in alkalies, forming *arsenites*.

Effect of Arsenious Oxide on the Animal Economy.—Arsenious oxide when taken into the stomach is soon absorbed into the blood, and circulates with that fluid, exhibiting power over certain diseases, especially intermittent fever and skin diseases, as psoriasis, lepra, eczema, etc. It is also classed among the tonics, and is given for nervous disorders, especially those which are periodic. Among the remedies for chorea (St. Vitus's dance) it holds a prominent place.

The quantity necessary to destroy life varies considerably. Under circumstances favorable for its operation the fatal dose for an adult is from 2 to 3 grains. Death from a poisonous dose of arsenic may occur in a few hours, or after the lapse of many days. Arsenic has been used as a slow poison, the symptoms being attributed to inflammation of the bowels from natural causes. In most cases its detection is easy. Arsenic is used by anatomists as an antiseptic; but is dangerous, as it is apt to get into cuts on the hands and cause disagreeable symptoms. In some countries, especially in Styria, arsenic is taken by the inhabitants to increase their endurance. When used habitually it can be taken in comparatively large doses. Cases are recorded by good authorities in which 6 grains and more have been taken at a time.

The most effective chemical antidote for arsenic is ferric hydroxide, prepared by the rapid precipitation of a solution of a per-salt of iron (as the persulphate or trichloride) by an alkali (as ammonia). The mixture of ferric hydroxide with magnesia, obtained by precipitating the iron solution with an excess of calcined magnesia, is still more efficacious. In case of an overdose or of intentional poisoning the following treatment is recommended: Evacuate the stomach by the stomach-pump, using lime-water; administer large draughts of tepid sugar and water, magnesia and water, or lime-water; avoid the use of alkalies, but administer charcoal and ferric hydroxide. If the fatal symptoms be averted, let the patient for a long time subsist wholly on farinaceous food, milk, and demulcents.

It is an easy matter for the chemist to detect arsenic, the method most commonly used being that known as *Marsh's test*. This consists in pouring a little of the solution of the suspected substance into a vessel containing pure zinc, water, and sulphuric acid, and from which hydrogen gas is being given off. This gas acts upon the compound of arsenic, forming the compound arsine, AsH_3 , which is a gas, and is therefore given off mixed with the hydrogen. When set fire to, this mixture burns with a peculiar livid flame, which deposits a black spot on a piece of white porcelain introduced into it. So also, if the gases are passed through a tube, and the tube heated, metallic arsenic is deposited in the tube in front of the part heated. Antimony acts much like arsenic, but it is not difficult for the chemist to distinguish between them.

Arsenites.—Arsenious acid forms with bases a series of salts, which are not very stable and have been but little studied. "Fowler's Solution" is a solution of equal weights of arsenious oxide and potassic bicarbonate, boiled with water and flavored with spirits of lavender. It contains 64 grains of arsenious oxide in 1 pint. The sheep-dipping

mixtures commonly employed are composed of arsenious acid, soda, sulphur, and soap, which, when used, are dissolved in a large quantity of water, and thus constitute essentially dilute solutions of arsenite of soda. Arsenite of copper, or Scheele's green, is a pigment largely used as a pretty and cheap green paint. The same substance is extensively employed in the manufacture of green paper-hangings for the walls of rooms; and recent inquiries would lead to the belief that rooms covered with paper coated with this green arsenite of copper are detrimental to health, from the readiness with which minute particles of the poisonous pigment are detached from the walls by the slightest friction, are diffused through the room, and ultimately pass into the animal system. It is also said that arsine, H_3As , a very poisonous gas, is generated in damp weather. Another green pigment is named Schweinfurth's green: it contains arsenious acid, oxide of copper, and acetic acid, and is a double arsenite and acetate of copper.

Revised by IRA REMSEN.

Arsin'oë: daughter of Ptolemy I., King of Egypt; b. about 316 B. C. About 300 B. C. she was married to Lysimachus, King of Thrace. She instigated Lysimachus to put to death his son Agathocles (born before her marriage), in order to promote the succession of her own son. By this crime Lysimachus was involved in war with Seleucus, King of Syria, and was killed in 281 B. C. Her sons having been murdered by Ptolemy Ceraurus, she fled to Egypt, and became the wife of her brother, Ptolemy Philadelphus.

Arsinoë: an Egyptian princess; daughter of Ptolemy Auletes, and sister of the famous Cleopatra. Caesar, having conquered Egypt (48 B. C.), took her as a captive to Rome, but soon released her. She was assassinated by Mark Antony in 41 B. C.

Arsinoë: an ancient city of Egypt; capital of a nome; situated near Lake Mœris, about 50 miles S. S. W. of Cairo. It was originally called Crocodilopolis (the city of crocodiles) because it had a temple devoted to the worship of those reptiles. Ptolemy Philadelphus gave it the name of Arsinoë in honor of his queen. The site is now occupied by the town of Medinet-el-Fainm.—Arsinoë was the name of another city of Egypt, situated at the N. W. extremity of the Red Sea, near the modern Suez. It was an important emporium, connected with the Nile by a canal.

Ar'sis and **The'sis**: two Greek words (*ἄρσις, θέσις*) signifying raising up and setting down. This musical term denotes the rising and falling of the foot in beating time. It is also applied to the elevation and depression of the voice, and to the accentuation of syllables in the scansion of poetry, *thesis* being the stress of voice given to the strongly accented syllables, and *arsis* being the withdrawal of stress in the other syllables.

BENJ. IDE WHEELER.

Ar'son [from Lat. *arde're, ar'sum*, burn]: the willful and malicious burning of the house of another. There must be an actual burning—an unexecuted attempt to fire a house does not constitute the offense. If the act be negligent instead of willful, the crime is not committed, and the wrong-doer is only liable to a civil action. The English law on this subject has been modified in this country. Arson is in some instances divided into degrees, and cases included in it which were not offenses at common law. It is made a crime by statute law to set fire to one's own house with intent to injure another—as, for example, to defraud insurers. The punishment of arson is severe, and in some of its degrees capital.

Art [through Fr., from Lat. *ars, artem*]: (1) the systematic application of knowledge in producing a desired result. (2) A systematic collection of principles and rules for attaining a desired end. Under this last head the arts are divided scientifically into (1) those which are intended to produce material results, termed the useful arts (those useful arts in which the effects are produced entirely or mostly by machinery or by mechanical contrivances are termed **MECHANIC ARTS**, *q. v.*); and (2) those intended to produce æsthetic results, termed the **FINE ARTS** (*q. v.*). The application of æsthetic principles, or the laws of taste to works which are intended to produce a religious effect, is termed religious art; the application of the laws of taste to works of a material nature is termed industrial art. (See **FINE ARTS**.) The word *art* is often used as a collective term for any or all of the fine arts (as the "study of art," a "patron of art"): as relating to the fine arts are also used various derivatives and compounds of the word art (as "artist," "ar-

tistic," "art-museum"). For formative arts, arts of design, etc., see **FINE ARTS**.

The term "liberal arts" (*artes liberales*) was applied by the Romans to the higher studies, which only freemen could pursue. They were summed up in the following verse:

Lingua, Tropus, Ratio, Numerus, Tonus, Angulus, Astra.

The term "servile arts" (*artes serviles*) they applied to trades practiced only by slaves, and summed up as:

Rus, Nemus, Arma, Faber, Vulnere, Lana, Rates.

In modern times, the term "liberal arts" is applied to the collection of studies in philosophy, science, art, and history which compose the academic and collegiate (ante-professional) course of study; hence to graduate in the arts. bachelor of arts (A. B.), master of arts (A. M.).

G. F. COMFORT.

Art, Psychology and Philosophy of: See the Appendix.

Ar'ta: a nomarchy or province of Thessaly, Greece. It is the extreme northwestern province, adjoining Albania, along the river Arta, and forming part of the northern coast of the Gulf of Arta. Capital, Arta (anc. *Ambracia*). Area, 395 sq. miles. Pop. (1889) 32,090. See **AMBRACIA**.

Arta, Gulf of (the ancient *Si'nus Ambrac'ius*): a gulf of the Ionian Sea, in the N. W. of Greece; lies between Acarnania and Albania, and is nearly landlocked. It is about 25 miles long and about 10 miles wide. The naval battle of Actium was fought near this gulf.

Artaba'nus (in Gr. *Ἀρτάβανος*), written also **Ardavan** and **Ardoan**: King of Parthia, and the last of the dynasty of the Arsacidæ. He began to reign about 216 A. D., and waged war against the Roman Emperor Macrinus. He was defeated and taken prisoner by the Persians under Ardshir, who put him to death in 226 A. D.

Artaba'zus (in Gr. *Ἀρτάβαζος*): Persian general; a favorite of Xerxes; commanded a large division of the army which invaded Greece in 480 B. C. He took part in the battle of Platea (479 B. C.), after which he retreated with his division by forced marches to Byzantium, and thence crossed into Asia.

Artabazus: Persian general and satrap; revolted against Artaxerxes III. in 356 B. C. Having been defeated in battle, he took refuge at the court of Philip of Macedon. He was pardoned, returned to Persia, and fought for Darius at Arbela. He was satrap of Bactria under Alexander after 330 B. C.

Artapher'nes (in Gr. *Ἀρταφέρνης*): Persian satrap and a half-brother of King Darius Hystaspis. He was appointed satrap of the western part of Asia Minor in 506 B. C. He used his power to restore Hippias, who had been expelled from Athens. About 498 B. C. he subdued the Ionians, who had revolted against the King of Persia.

Artaphernes: general; son of the preceding; was associated with Datis in the command of the Persian army which invaded Greece in 490 B. C., and was defeated at Marathon. He also served in the army of Xerxes in Greece in 480.

Artaud, *āar-tō'*, **NICOLAS LOUIS**: French writer; noted as a Greek scholar; b. in Paris, Dec. 6, 1794. He became inspector of the Academy of Paris soon after the revolution of 1830. He translated the dramas of Sophocles (3 vols., 1827); the comedies of Aristophanes (6 vols., 1830); and the tragedies of Euripides (1832). He obtained the office of inspector-general. D. in Paris, Nov. 9, 1861.

Artaxerx'es I., **LONGIMANUS** (Gr. *Ἀρταξέρξης Μακρόχειρ*; Pers. *Ardsheer Darāzdāst*): a King of Persia; son of Xerxes I., whom he succeeded in 465 B. C. He was called Longimanus ("long-handed") because his right hand was longer than his left. The Egyptians revolted against him about 460, but they were reduced to subjection about 455 B. C. In 449 the Persians were defeated by the Athenian forces of Cimon, near Salamis, in Cyprus. Artaxerxes died in 425 B. C., and left the throne to his son, Xerxes II.

Artaxerxes II. (surnamed **MNEMON**, because he had a good memory): the eldest son of Darius II. of Persia. He became king in 405 B. C. His younger brother, Cyrus, who was Governor of Asia Minor, revolted and raised a large army, in which were 10,000 Greeks. The king, commanding in person, defeated the army of Cyrus at Cunaxa in 401. Cyrus was killed in this action, which was followed by the famous retreat of the Ten Thousand. (See **TEN THOUSAND, RETREAT OF**.) Agesilaus, the Spartan, invaded the dominions of Artaxerxes, and gained several victories, but this

war was ended by the peace of Antalcidas (387 B. C.). He put to death Darius, his eldest son, for a conspiracy. He died in 362 B. C., aged about ninety-four, and was succeeded by his son, Artaxerxes III. See Plutarch, *Life of Artaxerxes*; Diodorus Siculus; Thirlwall, *History of Greece*.

Artaxerxes III. (or Ochus): King of Persia; a son of the preceding; began to reign in 361 B. C., and disgraced himself by his cruelty and sensuality. Among the important events of his reign was the subjugation of Egypt, which he effected about 350 B. C. D. in 338 B. C. It is supposed that he was poisoned by his eunuch, Bagoas.

Arte'di, PETER: Swedish naturalist; b. at Anund, Feb. 22, 1705; educated at Upsal, where he formed an intimate friendship with Linnæus. They co-operated on the principle of a division of labor in the field of natural history, and Artedi chose the department of ichthyology, in addition to physiology and mineralogy, which they both cultivated. He visited England in 1734. Soon after his return he was drowned in a canal at Amsterdam, Sept. 27, 1735. He left a Latin work on fishes, which Linnæus published in 1738, and which is highly commended. See Linnæus, *Life of Artedi*, prefix to the work mentioned above.

Artemido'rus (Gr. Ἀρτεμίδωρος): a famous interpreter of dreams; lived under Hadrian. His *Dream-book* (Ὀνειροκριτικά) was edited by Hercher (Leipzig, 1864); Ger. trans. by Krauss (Vienna, 1881).

Ar'temis (Gr. Ἄρτεμις): a Greek goddess corresponding to the Roman DIANA (*q. v.*).

Artemis'ia (Gr. Ἀρτεμισία): a martial Queen of Halicarnassus; a tributary or ally of Xerxes I., King of Persia. She commanded in person her fleet, which fought for Xerxes against the Greeks, and she displayed skill and courage at the battle of Salamis (480 B. C.). According to tradition, the gods compelled her to jump from the Leucadian rock, the famous *lover's leap*, into the sea, wherein she was drowned, because she put out the eyes of a youth who did not return her affection.

Artemisia: an Oriental princess celebrated for her conjugal affection and her grief for the loss of her husband, Mausolus, Prince of Caria, who died in 352 B. C. She erected to his memory at Halicarnassus a magnificent mausoleum (so called in honor of Mausolus), which was considered one of the seven wonders of the world. Remains of it still exist. According to tradition, she mingled his ashes with her wine and died of grief. See J. C. Avenarius, *Dissertatio de Artemisia et Mausoleo* (1714).

Artemisia: a genus of plants of the family *Compositæ*; comprises numerous species of herbs and shrubs, natives of the temperate regions of Asia and Europe. They generally have an aromatic odor, and a warm or acrid and bitter taste. The *Artemisia absinthium* (or wormwood) grows wild in Great Britain and the U. S., is perennial, and has bipinnatifid leaves. Containing a bitter principle and an essential oil, both very strong, it is used in medicine as an anthelmintic or vermifuge. Among the other species which have medicinal properties are the *Artemisia santonica* (Tartarian wormwood or southern-wood), a native of Tartary; *Artemisia indica* (Indian wormwood), which grows on the Himalaya Mountains; *Artemisia arborescens* (tree wormwood), which is a native of the Levant; and *Artemisia vulgaris* (mugwort), which is a native of Great Britain. The dried flower-buds of several species of *Artemisia* are sold under the name of wormseed. On the Western plains and the dry table-lands of the Rocky Mountains several species are known as "sage-brush," the largest of which is *A. tridentata*. See WORMWOOD.
Revised by CHARLES E. BESSEY.

Artemus Ward: See BROWNE, CHARLES FARRAR.

Ar'tery [Lat. *artēria*, from Gr. ἀρτηρία; probably connected with ἀρτέειν, hang]: any one of the vessels which convey the blood passing from the heart to the various parts of the body. With the exception of the pulmonary, arteries derive their blood, which has been oxygenated in the lungs, from the left side of the heart. The pulmonary arteries, however, carry venous blood from the right heart to the lungs. The arterial walls consist of three coats—an inner, lined with endothelial cells; a middle, principally muscular

and elastic tissue coat; and an outer fibrous tunic. It will thus be seen that the arteries are not rigid, like metal tubes, but capable of distension and contraction. This power is most important in the maintenance of proper circulation, and when it is disordered by rigidity or excessive elasticity untoward results are occasioned. The former happens in old people and in younger persons who have been subjected to a life of exposure and hard work or addicted to the excessive use of alcohol; the latter in many debilitating affections, particularly fevers in which general as well as arterial relaxation occurs. The condition of the arteries therefore is most important to the physician in indicating general bodily affections, and also in warranting the suspicion of various diseases which follow as a result of the arterial disease and failing circulation. This test is of all the more value because the arteries are in several places, particularly at the wrist, accessible to careful examination. (See PULSE.)

Arteries are liable to various other diseased conditions, such as inflammation and aneurism. In wounds of arteries bright-red blood issues in spurts, whereas dark blood flows from injured veins and in continuous stream. The arteries are usually deep-seated, the veins near the surface.

WILLIAM PEPPER.

Artesian Wells: drill-holes sunk into the earth, usually to depths of several hundred feet, through which water from pervious strata rises to the surface. Compared with their depth, the diameter of these holes is very small, being in general from 3 to 6 inches, though sometimes as small as an inch. In the U. S. the tendency is to apply the epithet "artesian" to any deep-drilled well, even though the water obtained is brought to the surface by pumps. The name is



FIG. 1.—Ideal section illustrating the chief requisite conditions of artesian wells. A, a porous stratum; B and C, impervious beds below and above A, acting as confining strata; F, the height of the water-level in the porous bed A, or, in other words, the height of the reservoir or fountain-head; D and E, flowing wells springing from the porous water-filled bed, A. (According to T. C. Chamberlin.)

derived from Artois (ancient *Artesium*) in France, where such wells have long been used, but wells of this character were probably in use in other countries at earlier dates, as they are mentioned by ancient writers.

The principal conditions upon which artesian flows depend are the existence of pervious strata, such as sandstone, inclined at a gentle angle to the horizontal, and inclosed between less pervious layers, as, for example, shales or clays. Also the higher edge of a pervious bed thus conditioned must receive an abundant supply of water either directly from rainfall or from the drainage of the adjacent country, and there must be little or no escape at lower levels. When this bed is full of water, and the water is not in motion, the pressure at the lowest part of the bed is equivalent to that exerted by a column of water of the height to which complete saturation extends. If, however, there is a small outlet and the water moves toward this, the pressure at the lowest point of the saturated rock will be reduced, and will be less and less, according as the place of escape is made larger or is lower down. When water thus under pressure finds for itself a natural outlet a spring is formed, but when the bed is tapped artificially by a drill-hole, and the water rises to the surface, an artesian well is the result. In all cases the water has come from higher ground by working its way gradually down through the minute interstices or crevices in the inclined rock, and, pressed by the other particles behind, rises through the easiest outlet.

Occurrence of Artesian Water.—In many places where the surface of the ground slopes so gently that to the eye the country appears to be nearly level, and the underlying rocks dip at the rate of only a few feet to the mile, the difference in elevation between the top of the well and the catchment or drainage-area from which the water comes may not be apparent. In such localities the discharge of the water seems to be at variance with the laws of gravity, but in all instances the necessary difference in elevation can be found by examination of topographic maps, or, in absence of these, by leveling. In order, therefore, to investigate the possibilities as to the occurrence of artesian water it is essential to have at hand a map showing the elevation of all parts of the country under examination, and to acquire by thorough observation all available facts concerning its geologic

structure. By this means the probability of success in experimental tests of this character can be determined.

By far the greater number of artesian flows come from stratified porous rocks, and especially from those but partially consolidated. In rare instances water in large quantities is found in close-textured crystalline or slaty rocks where these are greatly fissured or traversed by numerous

obstructions caused by sand it discharged in 1889 only about one-third as much. A third well at Paris has been completed to a depth of 2,360 feet, the temperature of the water obtained being 94° F.

Probably the deepest bore-hole in the world is at Schladebach, near Köttschau, on the railway between Corbetha and Leipzig, undertaken by the Prussian Government in search for coal. The apparatus used was a diamond drill, and the total depth reached is 5,740 feet. There are several other wells in Germany over 4,000 feet deep. In the U. S. deep wells have been put down mainly in the search for petroleum, and, not being

successful, have been continued for exploration purposes to depths of nearly 5,000 feet. One drill-hole at Wheeling, W. Va., driven to a depth of 4,500 feet, did not encounter water below 1,600 feet. In nearly all civilized countries artesian wells of 1,000 feet and upward are to be found, and their frequency is such that little comment is necessary. In Southern Algeria and out upon the desert of Sahara flowing wells have become of great importance, since they make possible the development of agriculture at oases formed by their presence, and also furnish water at points along routes of trade and military roads. The few thousand acres brought under cultivation by these wells have become important centers in the vast desert areas.

Throughout the U. S. artesian wells are numerous, being found on the Atlantic coast, in the valley of the Mississippi, along the Gulf of Mexico, in the northern plains region, in valleys among the Rocky Mountains, and those near and along the Pacific coast. They furnish in the aggregate a large amount of water for municipal and domestic supply, for cattle, and to some extent for cultivating the soil. In Western New York and Pennsylvania, Ohio, Indiana, West Virginia, Kentucky and Tennessee are probably over 50,000 wells of from 1,000 to 2,000 feet in depth, drilled for the purpose of obtaining petroleum or the inflammable gas which usually accompanies this fluid. From many of these wells



FIG. 2.—Section illustrating the thinning out of a porous water-bearing bed, A, inclosed between impermeable beds, B and C, thus furnishing the necessary conditions for an artesian fountain, D. (According to T. C. Chamberlin.)

jointing-planes. The chief structural conditions of stratified rocks giving rise to flowing wells are found, as shown in the figures, first, when the water-bearing layers between inclosing strata, and extending unchanged over wide areas, have been gently curved into the form of a basin, or, second, when a pervious bed, gently dipping, thins out or becomes relatively close-grained or water-tight.

How Located.—The location of artesian wells has been in the past left largely to chance, experimental holes being drilled at points where water was desired, but with little or no reference to the structure of the rocks. A notion has prevailed that if a well were drilled deep enough water would ultimately be obtained. Experience has at last taught the folly of spending large sums of money without some definite information concerning the probability of reaching a rock of porous nature which presents the conditions requisite for supplying water, for without such knowledge the chances of success are small. There are regions, however, in which, in the absence of specific knowledge of the underlying strata, as obtained by the usual methods of geological inquiry, it is necessary to sink a deep well as a test, but these are comparatively rare.

With the acquisition of knowledge concerning the geologic structure of a region and the completion of maps showing the elevation of the surface, it becomes possible to outline areas in which artesian success may be anticipated, and to mark off the localities where it is useless to bore. There will then remain doubtful areas of considerable size where local conditions decide success or failure. The necessity of bringing together all available information and plotting it upon maps, in order to forbid useless expenditure or to teach caution, should not need argument. With increase of depth beyond a few hundred feet the chances of encountering porous strata filled with fresh waters become less and less, from the fact that the rocks are less apt to be pervious at great depths, and the waters are more likely to be heavily charged with saline matter, since the temperature is higher and they have presumably been longer exposed to soluble minerals.

As a general rule, it may be said that artesian waters are more impregnated with mineral salts than surface waters, notable exceptions being in cases in which rain-water falls upon sandy soil, and passes at once into an open stratum of quartzose sandstone free from impurities, from which it is soon brought again to the surface. If petroleum or gas is present in the rocks, this, under suitable conditions, will be forced to the surface, water following only when the lighter fluids have been displaced. The manner of sinking a bore for artesian water varies with the depth and with the nature and inclination of the rocks to be penetrated. The methods by which deep wells are bored or drilled are described in the article WELL-DRILLING (*q. v.*).

Noted Wells.—Among the most noted of deep flowing wells is the Grenelle well at Paris. This city is situated in the lowest portion of a rock basin, so that the strata slope toward it. The well was begun in 1833 under the auspices of the Government and completed in 1841, having reached a depth of 1,795 feet. At first it yielded over 700,000 gal. a day, but in 1852 the tube, originally 6.7 inches in diameter, was crushed by the pressure of the surrounding beds of clay, and was replaced by a new tube 4 inches in diameter, the supply then being 200,000 gal. per day. On the completion of a neighboring well at Passy in 1861 the discharge sank over 10 per cent. At the summit of the delivery pipe, 125 feet above ground, the daily yield was in 1889 a little over 70,000 gal. The water is excellent, but must be cooled for drinking purposes, since the temperature is 82° F., or about 32° above the mean annual temperature of Paris. The well at Passy at first yielded 4,400,000 gal. per day, but owing to

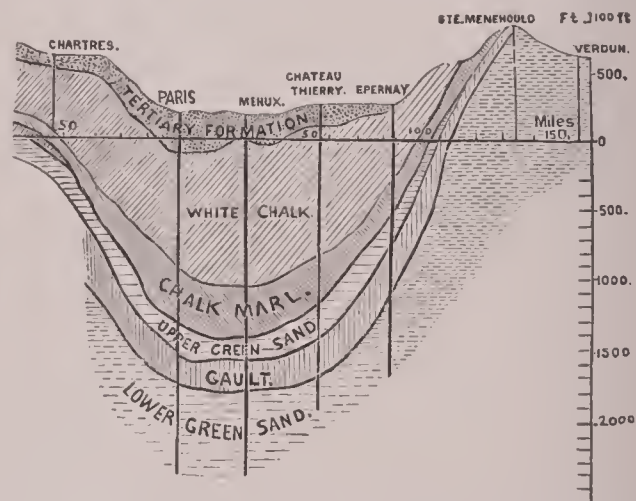


FIG. 3.—Geological section from Chartres to Verdun through the Paris basin. Horizontal scale, 90 miles to the inch; vertical scale, 1,500 feet to the inch.

salt water would flow if not prevented by suitable devices, and in nearly every respect as to structure, method of drilling, and other circumstances, these may be classed as artesian wells. See PETROLEUM.

In nearly every large city of the U. S. deep wells have been drilled to obtain water for industrial purposes, and in many instances with success. In New York good water has been found at moderate depths in large quantities, although the structure was apparently unfavorable. At Chicago, St. Louis, New Orleans, Charleston, S. C., Denver, and many other localities are notable wells. The water of some of these is clear, pure, and suitable for all general purposes. In other cases it is somewhat or quite saline, there being every degree of impurity to the strongest brine. Many waters, notably those from deep wells in Indiana, are characterized by sulphurated hydrogen, rendering them disagreeable to the taste, but not necessarily worthless for manufacturing purposes. On low lands along the coast, for instance, that of New Jersey, or in the lower Mississippi valley, where the surface water is not suitable for drinking, the flowing wells have proved of incalculable benefit, enabling on the one hand a large population to remain safely at the summer

resorts, and on the other permitting the utilization of rich agricultural lands without great risk to health from impure water.

In the western half of the U. S., where the rainfall is insufficient for the needs of agriculture, artesian wells have proved of great value, since they furnish in many localities a perennial supply in quantities sufficient for household use, and occasionally for the cultivation of small areas. There were in June, 1890, as shown by the census, over 8,000 artesian wells upon the farms of the western half of the country. Of these, nearly 4,000 were employed in irrigation, watering about 52,000 acres. Of these over 2,000 were in the State of California, irrigating over 38,000 acres. The average depth of these flowing wells was 210 feet, average cost \$245, and average discharge over 54 gal. per minute, or about 78,000 gal. per day. Comparatively few have been put down for irrigation alone, the greater number being drilled primarily for the purpose of obtaining drinking-water; but since the amount consumed in this way is small, a large surplus is available for other uses. The temperature of the water from these comparatively shallow artesian wells is usually low, from 40° to 50° F., varying slightly throughout the year. From the deeper wells, 1,000 feet or more, the water is warmer, and thus is of more value for irrigation if not impregnated with earthy salts.

Most of the artesian wells show a gradual decrease in the amount of water discharged, this resulting either from the well being gradually filled with fine sand or from increasing leakage into pervious strata. Sometimes, however, the diminished flow is due to a gradual exhaustion of the basin or rocks containing the water, due to the fact that the discharge from the wells nearly equals the amount entering from the catchment area or gathering grounds. Artesian areas in California, Colorado, Utah, and other localities have been so completely developed, and so many outlets provided, that the wells on the higher grounds have ceased to flow, or discharged only after heavy rains. As settlement advances it seems probable that all artesian areas will gradually approach this condition unless protected by efficient legislation. Already in many States laws against the wasting of artesian waters have been enacted, and the attempt has been made to compel owners of wells to stop the flow at times when water is not needed. By this means draining of the saturated beds can be in part prevented, and the wells will be less apt to interfere with each other. F. H. NEWELL.

Ar'teveld' (or **Artevelde**), JACOB, van: Flemish demagogue; b. at Ghent, 1285; became a rich brewer, and by his talents and eloquence acquired much influence and popularity. The people of Ghent, who had revolted against the Count of Flanders, chose Arteveld as their commander. He banished a number of Flemish nobles and knights, and adopted a despotic and arbitrary policy. As an ally of Edward III. of England, he waged war against France. Having formed a design to give the sovereignty of Flanders to the English Black Prince, he provoked a revolt of the Flemings, who killed him in Ghent, July 9, 1345. See Froissart, *Chronicles*; biographies by J. de Winter, *J. van Artevelde* (1846); J. Hutton (London, 1882); and W. J. Ashley (London, 1883).

Arteveld, PHILIP, van: a son of the preceding; b. at Ghent in 1340. He was also a popular favorite, but passed many years of his mature life as a private citizen. When Ghent was besieged by the Count of Flanders in 1381, and reduced to a desperate condition, Arteveld was appointed to the chief command. May 3, 1382, he defeated the count, and then assumed the title of regent. Charles VI. of France intervened in favor of the Count of Flanders with an army, and Arteveld was defeated and killed at Roosenbeeke, Nov. 27, 1382. See Froissart, *Chronicles*.

Arthri'tis [Gr. ἀρθρίτις, deriv. of ἄρθρον, joint]: literally, inflammation of a joint; a term inclusive of gout and rheumatism, though properly applicable to inflammations of the joints of whatever character.

Arthro'dia [Gr. ἀρθρωδία, from ἀρθρώδης, well-jointed; ἄρθρον, joint + εἶδος, form]: a connection of bones, in which the head of one is received into a very superficial cavity in another, so as to admit of motion in almost all directions, as in the joint between the humerus and the scapula.

Arthrop'oda [from Gr. ἄρθρον, a joint + πούς, ποδός, foot]: one of the great divisions or branches of the animal kingdom, formerly included by Cuvier in his *Articulata*. They are characterized by having the bilaterally symmetrical

body made up of a series of essentially similar joints or segments, each of which may bear a pair of jointed feet, whence the name of the group. The mouth is near the anterior end, upon the lower surface; the intestine terminates below, near the posterior end. The heart is dorsal and propels the blood forward. The nervous system consists of a "brain" above and in front of the mouth, and a series of secondary nerve centers on the lower surface behind the mouth, there being a pair of these centers in each segment. These centers or ganglia are connected together by two longitudinal nerve cords, which also connect them with the brain, one cord going on either side of the throat, so that the alimentary canal may be described as passing through the nervous system. From the brain nerves go to the eyes and other sense organs of the head; from the other centers to the appendages and muscles of the corresponding segments. The outer wall of the body is usually hardened by a peculiar chemical substance known as chitine, and the external jointing which is so evident is produced by a thinning of this integument to form a hinge, allowing one part to move upon another. As this external crust can not increase in size, provision is made for the growth of the animal by periodical castings of the skin. The appendages show much variation in size and function. Thus some may become supporters of sense organs, some are modified to form jaws to chew the food, some are for walking, some for breathing, while not infrequently they disappear in the adult from more or fewer of the segments on which they occurred in the young. The Arthropods reproduce exclusively by eggs, but both *Crustacea* and *Hexapoda* afford numerous instances of PARTHENOGENESIS (*q. v.*).

Three great divisions of *Arthropoda* are recognized: (1) The *Crustacea*, breathing by gills; (2) the *Arachnida*, breathing by gills, lungs, or air-tubes (trachea); and (3) the *Antennata* or true insects, breathing by air-tubes and provided with antennæ. The species are very numerous, there being about 10,000 *Crustacea*, 2,000 *Arachnida*, and 500,000 true insects. Yet in all the similarities of structure are plainly marked. J. S. KINGSLEY.

Ar'thur, Ar'tur, or Ar'tus: a semi-fabulous British hero and King of the Britons; supposed to have flourished about 500 or 550 A. D., after the Romans evacuated the island. He is celebrated as the hero of the romances of the Round Table, and his exploits were favorite themes of mediæval romancers. According to the usual form of the story, he defeated the Saxon invaders in several engagements, but was finally killed in a battle against his rebellious nephew Modred. See ROMANCES. Revised by G. L. KITTEDGE.

Arthur, ALFRED: See the Appendix.

Arthur, CHESTER ALAN: twenty-first President of the U. S.; b. at Fairfield, in Franklin co., Vt., Oct. 5, 1830; graduated at Union College, New York, in 1848; studied law in Vermont, supporting himself by teaching, then came to New York city in 1853, and was that year admitted to the bar; was delegate to the first Republican State convention at Saratoga (1856). Before the civil war he was judge-advocate of the second brigade of New York State militia, and afterward engineer-in-chief on staff of Gov. Morgan, of New York. In 1861 he was inspector-general of New York, and subsequently quartermaster-general of New York until the expiration of Gov. Morgan's term of office. He was collector of the port of New York under President Grant from 1871 to July 12, 1878, and was chairman of the Republican State committee of New York. He was nominated for Vice-President of the U. S. by the Republican convention at Chicago, Ill., June 8, 1880, and elected Nov. 2, 1880. Upon the death of President Garfield, Sept. 19, 1881, he became the twenty-first President of the U. S. His accession was viewed with considerable apprehension by the independent men of all parties because of his affiliations with mere politicians; but he quickly showed his appreciation of the duties and responsibilities of his office, threw off his former unworthy associates, chose an excellent cabinet, and gave the country a clean and able administration. D. in New York city, Nov. 18, 1886. Revised by C. K. ADAMS.

Arthur, JOSEPH CHARLES, D. Sc.: botanist; b. in Lowville, N. Y., Jan. 11, 1850; educated in Iowa Agricultural College, the Johns Hopkins, Harvard, and Cornell universities; botanist to New York Agricultural Experiment Station 1884-87; Professor of Vegetable Physiology and Pathology in Purdue University 1887 to present. He has written many papers on plant-diseases, notably *History and*

Biology of Pear-blight (1886). He is one of the editors of the *Botanical Gazette*, and in conjunction with Dr. Coulter and Dr. Barnes published a *Handbook of Plant Dissection* (1886).

Arthur, TIMOTHY SHAY: novelist; b. near Newburgh, N. Y., in 1809. He removed to Philadelphia, Pa., 1841, and there founded *Arthur's Home Magazine* in 1852. He published some fifty stories, which have proved popular as domestic and Sunday-school books—*Ten Nights in a Bar-room*, *Tales of Married Life*, *Woman's Trials*, *Fireside Angel*, *Tom Blinn's Temperance Society*, etc. D. in Philadelphia, Mar. 6, 1885. H. A. B.

Arthur, WILLIAM: b. at Kells, Ireland, in 1819; educated at Hoxton College, and went to India in 1839 as a Wesleyan missionary, where he was engaged for some two years. He resided in France 1846–48. He became secretary to the Wesleyan Missionary Society 1851; became honorary secretary 1868, and was president of the Methodist College at Belfast, Ireland, 1868–71. Among his works are *A Mission to the Mysore* (London, 1847); *The Successful Merchant* (sketches of the life of Mr. Samuel Budgett, 1852); *The Tongue of Fire, or True Power of Christianity* (1856; 40th ed. 1885, many reprints); *The Pope, the Kings, and the Peoples* (1877, 2 vols); *The Difference between Moral and Physical Law* (1883); and *Religion without God and God without Religion* (1885–87, 2 parts).

Arthur, WILLIAM PATRICK ALBERT: prince of the United Kingdom, Duke of Connaught and Strathearn and Earl of Sussex, Duke of Saxony, Prince of Coburg and Gotha, son of Queen Victoria of England; was b. in Buckingham Palace, London, May 1, 1850, and married Mar. 13, 1879, to Princess Margaret Louise of Prussia, third daughter of Prince Frederick Charles, and grandniece of the Emperor William I.

Arthur's Seat: a rocky hill which rises in the environs of Edinburgh to the height of 822 feet above the level of the sea, and commands a prospect of great extent and superlative beauty. It is supposed to derive its name from King Arthur. It is formed of several varieties of trap-rock upheaved through the carboniferous strata, and presents on the southern and western sides perpendicular precipices.

Ar'tichoke [viâ Ital. *articiocco*, and Span. *alcarchofa*, from Arab. *al-kharshûf*]: a perennial herbaceous plant (*Cynara Scolymus*) of the natural order *Compositæ*; is nearly allied to the thistle. It is a native of the Mediterranean region, and is cultivated for food. The genus is distinguished by the bracts of the involuere being fleshy at the base, and emarginate with a hard point. The part which is eaten is the succulent flower-head, gathered before the flowers expand, and boiled or made into a salad. The Jerusalem artichoke (*Helianthus tuberosus*) is an entirely different plant, a native of North America, which is sometimes cultivated for its potato-like tubers.

Ar'ticle [Lat. *articulus*, little joint; deriv. of *artus*, joint. In grammar, a formal translation of Gr. *ἄρθρον*]: a word used in various senses, usually denoting a distinct part of a systematic work. It may signify a single clause in a contract, treaty, or other written document, a particular, separate charge or item in an account, or a point of faith. In grammar it is a part of speech, usually the shortest and simplest of all; in mercantile language, a particular commodity; in journalism, the principal editorials are called *leading articles*.

Articles: in law, various kinds of instruments drawn up under distinct heads or divisions. Instances of the use of the word are a libel in admiralty, where the libellant (or plaintiff) is said to "articulately propound"; "articles of agreement," "articles of impeachment," "articles of partnership," or of peace or of war. "Articles of Confederation" is a phrase employed to designate the compact made between the original thirteen States of the U. S., forming a general government before the present Constitution, and which, having gone into effect Mar. 1, 1781, continued in force until the first Wednesday of Mar., 1789.

Articles of Faith: the particular points of doctrine which together make up the sum of Christian belief. The various churches of Christendom, not being agreed upon all these points, have for the most part set forth their own expositions of belief; and it is to these creeds, symbols, or confessions that the term Articles is most commonly applied. The Articles of the English Church, which are not, strictly speaking, Articles of Faith, or a creed, but "Articles of Religion," though formerly forty-two in number, are now re-

duced to thirty-nine. (See THIRTY-NINE ARTICLES.) In the Episcopal Church in the U. S. Article XXI. *Of the Authority of General Councils* is omitted, "because it is partly of a local and civil nature, and is provided for, as to the remaining parts of it, in other Articles." In the Standard American Prayer-book of 1892 the Articles appear with a separate title-page, indicating that they are not to be regarded as a part of the Prayer-book. The Methodist Episcopal Church in the U. S. has reduced these Articles in its *Book of Discipline* to twenty-five. Revised by W. S. PERRY.

Articles of War: an act of Congress approved Apr. 10, 1806, to establish rules for the government of the U. S. army. Separate articles (those now in force, approved in 1864, to supersede the old articles of 1802) establish rules for the government of the navy. Also the code of military law embodied in the Mutiny Act annually passed in the British Parliament. For the enforcement of such Articles of War power is given to the crown to establish courts martial to try and punish offenses according to the Articles themselves. Another annual Mutiny Act embodies "Articles of War for the Marine Forces," which relates exclusively to the royal marine forces *while employed on shore*. The navy is not controlled by any annual Mutiny Act, but the Articles of War relating to it are contained in an old act of Parliament, the 22d Geo. II. c. 33.

Articles, The Six: were set forth by King Henry VIII. and accepted by Parliament in 1539. They asserted the doctrine of transubstantiation, condemned the marriage of priests, enjoined the continued observance of vows of chastity, and sanctioned private masses and auricular confession. These articles were imposed on the people solely by the king and Parliament without any authority of the convocation of the clergy. They were repealed by 1 Edward VI., cap. 12, sections 1 and 3.

Articula'ta [neuter plur. of Lat. *articulatus*, jointed]: the *articulated animals*; one of the four primary or grand divisions of the animal kingdom according to the system of Cuvier. The group has now been dismembered, the species included in it being usually distributed into the two primary groups or sub-kingdoms of Arthropods and Vermes.

Articulation: (in speech) see ELOCUTION; (in anatomy) see JOINT.

Artific'ial Butter: See BUTTER.

Artificial Horizon: a horizontal mirror, usually the surface of a basin of mercury, used to determine the altitude of a star or other object when the sensible horizon is ill defined.

Artificial Limbs: See LIMBS, ARTIFICIAL.

Artificial Stone: See CEMENT and ARTIFICIAL STONE, under STONE.

Arti'gas, José: a South American general; b. at Montevideo, Uruguay, in 1755; became in early life a leader of the gauchos, a class of outlaws. In 1811 he entered the service of the Junta of Buenos Ayres, for which he fought against the Spaniards or royalists. He defeated the latter in several battles, and became in 1814 master of Uruguay. He attempted to conquer Buenos Ayres, but was finally defeated in 1820. D. in Paraguay, 1851.

Artil'ery [Old Fr. *artillerie*, deriv. of *artillier*, fortify; deriv. of Late Lat. *artícula*, dimin. of *ars*, art]: in early times, all kinds of missile employed in warfare, and the machines by which they were propelled.

The artillery engines in use by the ancients were chiefly the ballista and catapult, for throwing stones and heavy darts, and the battering-ram, for effecting breaches or demolishing walls. These engines were rude, bulky, heavy, clumsily constructed, and required many men and much time and labor for their transportation, placing in position, and manœuvring; but for the period and purpose they were doubtless of great power and sufficiently destructive. The effective range of the ballista and catapult did not exceed 100 or 150 paces, but at this distance they were capable of discharging missiles of 300 lb. weight. In the Middle Ages the cross-bow came into military use, and gradually supplanted the catapult. It is probable that an engine of similar construction took the place of the ballista. These engines were constructed of tough, fibrous wood, and in some instances of steel. By their introduction greater portability and some increase of range were obtained.

Since the introduction of gunpowder the term "artillery" is understood to denote all firearms other than those used as

hand-weapons. It therefore includes all guns, howitzers, mortars, and machine-guns, and excludes muskets, rifles, and pistols. It is synonymous with *ordnance*, and is generally used in a plural sense; when in the singular, it is usual to say *a piece of artillery*. Carriages upon which pieces are mounted or transported, together with the ammunition, implements, equipments, etc., employed in the service of pieces, are called *artillery material*, and are always mentioned with the prefix "artillery" or its equivalent. Troops employed in artillery service are called *artillery troops*. In speaking of artillery, the term "cannon" is frequently used, signifying always the piece, and nothing more. See **ORDNANCE**.

Previous to 1846 all cannon were made with smooth cylindrical bores; their sizes were then designated by the weight of their solid shot, in pounds, or by the diameter of the bore, expressed in inches or centimeters. This latter method is now used for all rifled cannon, except in England, where the size is often, but very imperfectly, expressed by the weight of the piece in tons or hundredweights.

The birth of artillery, as we to-day understand it, dates from the introduction of gunpowder into Europe. The earliest record of the construction of cannon is about the middle of the fourteenth century, but contemporaneous mention is obscure, and refers to cannon more as curiosities than as engines of war. The first well-authenticated use of cannon in battle was by Edward III. of England in the battle of Cressy, A. D. 1346. Even on this occasion it would appear that their effect upon the French was due more to astonishment than to any inherent power of the novelty itself. From this date, however, the construction and use of cannon increased with great rapidity. At the very first they were of small caliber, throwing stone or leaden balls of only 3 or 4 lb. weight, but before the close of the century they were capable of throwing stone projectiles of 40 or 50 lb. for field-guns, and of 200 lb. for siege or fortification guns. In fact, their excessive size and weight not only seriously interfered with but actually prevented their general use. The earliest cannon were constructed of iron bars joined together longitudinally and strengthened by exterior hoops of iron. Wood wound with rope, and sometimes with wire, was also used upon the exterior to strengthen them. One of the most interesting of ancient *monster* cannon still extant is the "Mons Meg," made in 1486 at Mons, Brittany, and now in the castle of Edinburgh. An inscription on the carriage

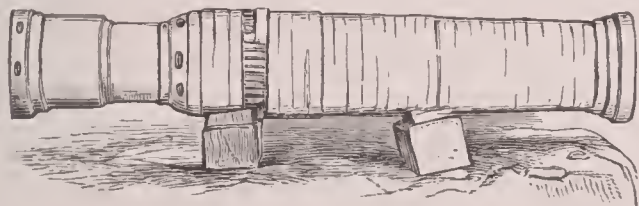


FIG. 1.—"Mons" Meg.

states that it was employed at the siege of Norham Castle, in 1513. It burst in 1682 in firing a salute. It is made of iron bars hooped together, and its bore is 20 inches in diameter. Another superb specimen of early cannon—of much later date than the preceding—is the "Tsar Cannon" (or "King of Cannon"), in the arsenal of the Kremlin, Moscow. It was made early in the seventeenth century under the Emperor Theodore. It is of bronze, with a caliber of about 30 inches. The carriage upon which it stands is merely an ornamental support. Cast without trunnions, it

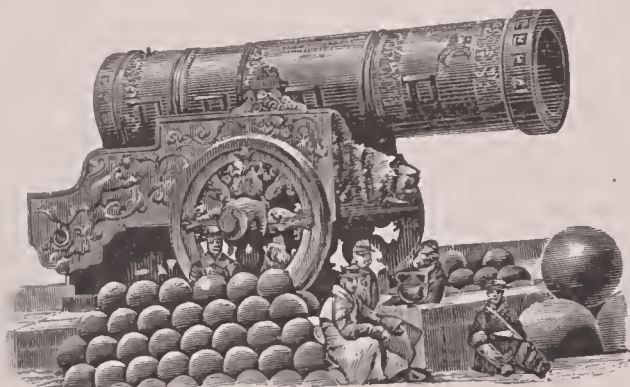


FIG. 2.—The Tsar cannon.

was probably laid in permanent position for firing. Still more curious are the famous Turkish guns defending the

Dardanelles. The diameter of the shot is 36 inches; length of gun, 15 feet. These pieces likewise were without trunnions, and also without means for lateral motion. It was impossible, therefore, to train them upon moving objects; consequently, after being loaded they awaited the arrival of the hostile vessel at the spot where the shot would strike before being fired. So recently as 1807 these clumsy weapons were brought into requisition against the British fleet under Admiral Duckworth in its passage up the Dardanelles. Gustavus Adolphus introduced the so-called "leather" cannon, consisting of a thin metal tube strengthened with bands and cords and inclosed in a tightly-fitting cover of boiled and varnished leather.

In the very infancy of cannon-construction the breech-loading principle suggested itself, and was made use of in a crude manner; but the low state of the mechanic arts forbade the exact mechanism necessary to perfect the idea. About the middle of the fifteenth century cannon began to be cast in iron, and toward the latter portion in various alloys. A. D. 1477, Louis XI. of France caused many cast-iron cannon to be fabricated for use against the cities of Picardy and of Flanders. About this period the projectiles for large cannon, which had hitherto been of stone, were made of cast iron; but to some extent stone balls continued in use for a number of years afterward. Shells were also introduced at this time, and we have a record of their use by Charles VIII. of France at the siege of Naples, A. D. 1494. Brass cannon were first cast in England by John Owen, 1535, and a few years later in Scotland by order of James IV. During the last half of the sixteenth century mortars for throwing shells were introduced in Germany, and in the first half of the seventeenth century in France. Mortars were at first discharged by igniting the shell before it was introduced, and then igniting the charge in the mortar. The great danger of such a practice caused its abandonment, but not until it had been followed for half a century. Toward the latter part of the seventeenth century a short cannon, a howitzer (German *Haubitze*), was introduced for the purpose of using large shells by direct fire. In 1799 there was introduced a short cannon of large relative caliber called a *carronade*, named from the Carron iron-works, where it was first cast. No long guns for firing hollow projectiles at long range by direct fire were known until 1812, when Col. Bomford, of the U. S. Ordnance Department, invented a gun for that purpose, which he improved in 1814 and called a *columbiad*. Some years afterward this invention was introduced into France by Gen. Paixhans, and was generally called in Europe by his name. In 1841 a gun of this character, but of somewhat different model, and called a *seacoast howitzer*, was introduced into the U. S. service, and three years later these were followed by columbiads of altered model, increased weight, and greater power.

After a long series of experiments for the purpose of determining the best form and distribution of metal in guns, Admiral (then Lieut.) Dahlgren, U. S. navy, produced in 1856 the gun bearing his name. These pieces are of cast iron, cast solid and cooled from the exterior; they are of great thickness at the breech and as far forward as the trunnions, and from thence to the muzzle rapidly diminishing in thickness, so that their external configuration is not unlike that of a champagne bottle. They are adapted exclusively for hollow projectiles, and are chiefly of 9-inch and 11-inch caliber. Previous to the introduction of rifled cannon they were considered a most serviceable gun.

For several years previous to 1860, Gen. (then Capt.) Rodman, U. S. army, was engaged upon investigations for the improvement of gunpowder and for the better casting of heavy ordnance. In that year he produced the gun now bearing his name. These guns are of cast iron, and his invention was the process by which heavy ordnance is cast hollow and cooled from the inside by means of a stream of cold water flowing through a hollow core occupying the place of the bore of the gun, the exterior being, in the meanwhile, kept from rapid cooling by fires around the gun in the casting-pit. Rodman guns are further distinguished by great thickness of metal at the breech, by graceful curves of their exterior lines, and by the absence of all exterior ornamentation, sharp angles, or edges, and of the cascabel and swell of the muzzle, and by having the trunnions at the center of gravity, thus doing away with preponderance and greatly facilitating the service of the gun. With the exception of the "siege" 4.5-inch rifle, all the Rodman pattern are smooth-bore guns, having calibers of 8, 10, and 15 inches respectively. A couple, for experimental purposes, were

cast having a caliber of 20 inches. All Rodman guns are adapted to the use of solid as well as hollow projectiles. The 15-inch gun (Fig. 3) weighs 25 tons, the solid shot 450 lb. and the charge is 100 lb. of mammoth powder. The piece

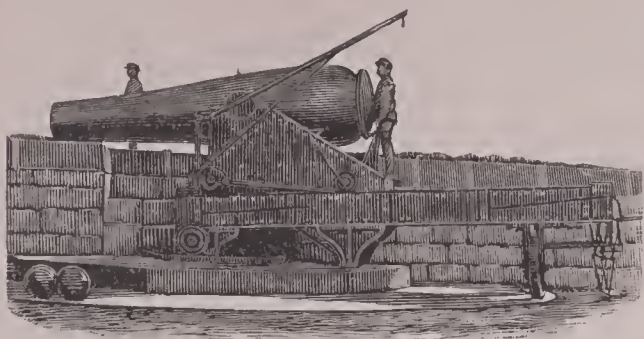


FIG. 3.—15-inch Rodman gun.

is mounted on an iron carriage provided with two pneumatic buffers for checking recoil. At the time of the adoption of the Rodman 15-inch gun it was the most powerful piece of artillery in existence. In its employment against iron-clad vessels its shots were intended to have a racking effect, in contradistinction to the punching effect of rifle projectiles. By many it is still considered a serviceable gun, capable of great execution against the powerful armor of modern ships. Improvements are now in progress whereby a more powerful charge can be used and a still greater efficiency secured. All nations are now, however, replacing their smooth-bore guns with rifles, as rapidly as possible.

Soon after the rifle-principle had been applied to small arms, experiments commenced to be made with a view to applying it to cannon; and in 1846 cast-iron rifled pieces, loaded at the breech, were invented by Col. Cavalli, of the Sardinian service, and Baron Wahrendorf, of Sweden, for the purpose of firing elongated projectiles. After two or three years of successive improvements, this invention proved the practicability of applying the rifle-principle to cannon and demonstrated the great advantages to be derived from such application. From that period up to the present time the minds of military inventors and constructors have been actively alive to the subject of rifled ordnance. A great variety of guns have been produced, and long and exhaustive experiments made to determine the best form and construction of piece, number and twist of grooves, character of breech-mechanism, and form of projectile. Each year has added its improvements, and enormous strides have been made during the last twenty-five years in gun-construction, and in that of carriages and projectiles and the manufacture of steel and of gunpowder. More is due, probably, to the improvements made in the two last named than to any other cause.

The history of modern artillery may be divided into three epochs—the first, the introduction of rifled cannon in the Italian campaign of 1859, which showed the advantages of the new weapons; the second, their general adoption by all European powers, and their employment in the campaigns of 1866 and of 1870-71; the third, the introduction of the present armaments by the different European powers after the Franco-German war, which showed the necessity for improved and more powerful guns. The increased power, accuracy, and range of the modern rifle-musket called for a corresponding improvement in field-artillery, while the progress made in armor-plating for ships of war demanded that heavy ordnance should be constructed with power sufficient to pierce their armor. Passing over the various stages of improvement—which, to a great degree, was that of experiment—the following is the present status of gun-construction among the principal nations of Europe.

First, as regards *Field-artillery*. Commencing with the German guns, as the pioneers along the path of progress, these are made of crucible steel of low carbon hooped around the breech with a jacket of the same material. The breech-closing apparatus is that known as the “round-wedge breech-block”—i. e. a cylindro-prismatic wedge tightened in the breech of the gun by means of an interrupted screw acting perpendicularly to the axis of the piece. The breech-block is perpendicular to the axis of the bore, and works horizontally in a mortise cut through the breech of the piece immediately in rear of the cartridge-chamber. The breech-block being withdrawn, the projectile and cartridge are inserted from the rear; the block is shoved in and tightened by means of the screw just mentioned. The piece is fired

in the ordinary way, by friction-primers. The gas-check is composed of a ring of soft steel abutting against the steel plate in the surface of the wedge. The ring is fitted into a recess cut into the rear of the cartridge-chamber; and when the gun is discharged, the ring, being instantaneously expanded, and at the same time pressed rearward with tremendous force, hermetically closes the tube of the piece and prevents all escape of gas. A single ring endures a vast amount of firing and seldom has to be renewed. The gun just described is known throughout the world as the “Krupp gun.” (A general idea of the field-piece is given in Fig. 4.)

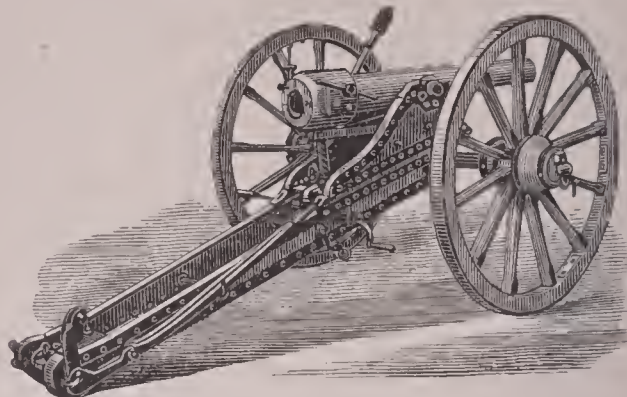


FIG. 4.—Field-piece.

The most important detail in the construction of a breech-loading gun is an efficient and durable gas-check; and this was the great desideratum until Broadwell, of the U. S., invented the ring just mentioned, and which is known by his name. There being no demand for his invention in the U. S., he patented it in Great Britain, and soon after it was adopted by Krupp, the great gun-manufacturer, of Essen in Germany.

The Russian guns and the Italian 3.43-inch gun are of similar construction, and they, as well as the German guns, are supplied to the various governments by Krupp. Their breech-loading mechanism, as well as that of the Italian 2.95-inch, is similar to that employed in the German guns. The French guns are also of steel, and are strengthened around the breech by six mild-steel rings, which, as in Great Britain, are put on hot. The Italian 2.95-inch gun is of bronze; the Austrian guns are made of the so-called steel bronze, composed of an alloy of 92 parts copper and 8 tin. The guns are chill-cast in iron molds, and the bore is hardened and compressed by forcing coned steel mandrels through it with tremendous pressure. By this means the material is brought into such a state that from the inside of the bore to the external surface of the gun the metal is brought into the most favorable condition for resisting the explosive force of the powder-charge. The breech-action of the Austrian field-piece is similar to that of the German guns, except that the breech-block has not a round back; but the edges of the rear surface are chamfered off.

The breech-closing mechanism of the French guns presents several peculiarities. It consists of a solid interrupted screw. The surface of the thread of both the male and the female screws being divided into six equal parts, the threads of the alternate parts are removed, so that one-sixth of a turn disengages the thread and allows the breech-screw to be removed. The axis of the screw is coincident with the axis of the bore, and the screw has a diameter greater than that of the bore, so that the square face of the screw abuts against and closes the cartridge-chamber. The screw, having been turned until the threads are disengaged, is withdrawn by hand and swung to one side upon hinges, after the manner of a door. The charge is then inserted, the screw swung back, shoved in, and secured by giving it a slight turn, thereby engaging the threads. This method of closing the breech is known as the “Reffye,” or French, system. The interrupted-screw principle was a U. S. invention, patented in 1853 by J. P. Schenkel and A. S. Savoni. Six guns upon this plan were cast at Boston for the British Government in 1855. The gas-check of the French gun consists of two parts—viz., a steel mushroom-shaped plate, the long stalk of which projects through the breech-screw and is allowed a certain amount of play backward and forward, and an elastic gas-check, composed of a thick cake of a mixture of asbestos and mutton-fat wrapped in canvas and secured by tin cups and brass rings. This gas-check is strung on the stalk of the mushroom, rests between the posterior surface of the latter and the anterior face of the breech-screw, and serves by its elasticity to close the breech

when the charge is fired. The guns are vented through the stalk of the mushroom. The German and Russian guns and the Italian 3.45-inch are vented through the breech-piece, and the vent is so arranged that the charge can not be ignited till the former is screwed home. The Austrian guns and the Italian 2.95-inch are vented through the metal of the gun.

The British were among the first to adopt a breech-loading field-gun, but after a time dropped it and returned to the muzzle-loader. This was in consequence of the undue importance attached to their East Indian service, where it was feared the breech-mechanism, if out of order, could not be repaired. The breech-loading system which they adopted was that of Sir William Armstrong. The body of the piece was made by welding together several wrought-iron tubes at their ends; these tubes are formed by twisting square bars of iron around a mandrel and welding the edges together, after the manner of a fowling-piece. The part of the gun in rear of the trunnions was strengthened by two additional tubes. The breech was closed with a block slipped by hand into a vertical mortise in the breech of the piece, directly behind the cartridge-chamber, and was held in its place by a breech-screw abutting against it from behind. The axis of this screw was coincident with that of the bore of the gun, and was bored out so as to constitute a prolongation of the bore. The vent was through the breech-block, which worked with a vertical action instead of horizontally, as in the Krupp system. The British have returned to breech-loaders, using, as before, the Armstrong system, but employing steel instead of iron. The breech-fermeture is a modification of the French Reffye mechanism.

With regard to rifling, a diversity of practices obtain concerning the number and the depth of the grooves. But with the adoption of breech-loaders and an increasing twist the number of grooves has been increased, their depth and width diminished, and the projectiles are generally made to take the rifling by the use of copper rings. All use elongated projectiles, solid shot, shell, and case-shot, or shrapnel. The muzzle-velocities of guns of the different services vary from about 1,300 to 2,000 feet for field-guns. The weight of piece also varies, but averages 800 lb. for light guns, and 1,100 lb. for the heavier class of field-pieces.

The carriages and limbers of most modern guns are of steel, or of a combination of steel and wood, and the ammunition-chests open to the rear like a cupboard instead of chest fashion.

The field-guns and carriages are driven by pole-draught, except in the British service, where shafts are used. All the wheels have naves after the pattern known in the U. S. as the "Archibald wheel." Fifty-five inches is the average diameter of the wheels, and the average track is 60 inches. The weight of a piece on its carriage, fully equipped, with ammunition-chests filled, varies from 4,784 lb. for the Russian heavy gun to 2,744 lb. for the light Italian piece; the average, however, is about 3,600 for light guns and 4,500 for heavy. The light Italian gun is drawn by four horses, all other nations use six, except for the English heavy piece, where eight are used. All caissons have six horses, except for that of the light Italian piece, for which four are used. The Austrians and the Italians have, when on a war footing, eight pieces to a battery, and so likewise do the Russians, except for their horse-batteries, in which six are used. All other nations have six pieces to a battery.

The Armstrong breech-loader, now introduced into the British service, consists of a steel tube with a wrought-iron jacket. Its breech is closed somewhat after the French plan—viz., by an interrupted screw. The gas-check is a shallow steel cup attached to the face of the breech-screw.

Previous to the civil war the field-artillery of the U. S., in common with that of other nations, was smooth-bore 6 and 12 pounder guns and 12-pounder howitzers, all of bronze, mounted on wooden carriages of excellent pattern. At the outbreak of the civil war rifled muzzle-loading pieces were introduced. Mr. Parrott, of the West Point foundry, introduced a 10 and a 20 pounder—3-inch and 3.67-inch respectively. These guns had a cast-iron body, of the usual form and dimensions of guns, strengthened by shrinking a band of wrought iron over that portion of the piece surrounding the charge. The grooves had an increasing twist. The projectiles were solid shot, shell, and case-shot, all of a pattern devised by the inventor of the gun. A malleable cup or ring attached to the bottom of the projectile, and expanding by the effect of discharge, caused the projectile

to take the grooves. The smaller of these two guns proved to be an excellent weapon, and did good service; the larger gun, from some occult cause, was a failure. At the same period another rifled gun was introduced by the U. S. Ordnance Department. This piece had a bore of 3 inches and was of wrought iron, constructed by wrapping boiler-plate around an iron bar, so as to form a cylindrical mass, which, being brought to a welding heat, was passed through rollers, so as to unite it solidly; the trunnions were afterward welded on and the piece bored, rifled, and turned to its proper size and shape. The method originated at the Phoenixville iron-works, Pennsylvania. This gun fired solid shot, shell, and case, and both it and the Parrott used canister for close quarters. A variety of patterns of projectiles were used, but that which proved most serviceable was the Schenkel, which consisted of a cast-iron body with a *papier-maché* sabot surrounding the rear part of it. The force of discharge swaged this sabot into the grooves and caused the projectile to rotate. This also proved a most excellent gun, and was extensively used during the war. The carriage for both this and the Parrott 10-pounder was that of the old smooth-bore 6-pounder. In addition to these two rifles a bronze smooth-bore 12-pounder of the Napoleon pattern was also much used, and did good service.

A 4.5-inch rifle-gun (known in the U. S. classification as a siege-piece) was to some extent used as a heavy field-piece, and, although somewhat cumbersome for bad roads, proved a useful weapon. Its use in this manner corresponded to that of the heavy field-batteries of European armies. It is of cast iron, and in exterior form is of the Rodman model.

A limited number of steel breech-loading guns of 3.2-inch caliber, with an interrupted screw fermeture, have been made, and are now used for field-guns. A 3.6-inch gun of similar construction is in process of manufacture, with which it is proposed to arm the mounted batteries, using the 3.2 for the horse-batteries. The carriages are of steel and iron, except the wheels, which are of wood, with the Archibald nave. These are the approved models of field-guns of to-day.

Certain patterns of machine-guns were taken into the field during the civil war, but were little used. One of these—called, in derision, the "coffee-mill"—had a hopper, in which the cartridges were dropped, and from which they were fired through a single barrel by means of a hand-crank. Another pattern of machine-gun was an improved form of the vibaudequin, or organ-gun, of the fifteenth century, known during the war as the "Requa rifle-battery." This piece received favorable notice at the siege of Charleston in 1863. It consisted of twenty-five barrels arranged side by side in a horizontal plane and secured by an iron frame, a sliding-bar in the rear worked by two levers forcing the cartridges into the chambers. The Gatling gun was adopted just too late to be used in this war, and the French mitrailleuse saw its first service in the Franco-German war of 1870-71.

The GATLING GUN (*q. v.*) is a machine-gun, invented by R. J. Gatling, of Indiana, in 1861. The first gun was made by him in 1862; in the following year he caused it to be brought to the notice of the French Artillery Committee. This was before the invention of the French, or the Montigny, mitrailleuse, and may therefore be considered the first practical military machine-gun. The perfection to which it has been brought in all its mechanical appliances has caused it to be introduced into the military service of most nations, and it has proved the forerunner of the Gardiner, the Lowell, and the Hotchkiss—all invented in the U. S.; as the Requa battery has of the Nordenfeldt, of Swedish invention.

In the civil war the armies of the Confederate States used rifled cannon (obtained chiefly from Great Britain) of the Armstrong, Whitworth, and Blakely patterns. The Whitworth field-piece is forged solid from low steel; the larger guns are built up with coils or hoops forced on by hydraulic pressure. The cross-section of the Whitworth bore is a hexagon with rounded corners, and the twist is very rapid. The projectiles are quite long, those intended for armor-punching being made of hardened iron or steel, with very thick flat heads, to prevent glancing. The projectiles are manufactured hexagonal, of the form and dimensions of the bore, and are thus made to take a rotary motion when fired. This gun had an extraordinary range and great accuracy, being in these respects far ahead of other guns of its date, and approximating closely to the most modern forms. The Blakely gun is also a built-up gun, combining in its con-

struction the principles of initial tension and varying elasticity, the object being to bring the strength of all the metal of the piece into simultaneous play to resist the explosion of the powder-charge. The inner tube is of low steel, and the rings, also of steel, are of varying quality. The piece is rifled with one-sided grooves and fired with projectiles having an expanding base-ring. The Confederates also used a rifle known as the "Brooke gun," made after the plan of Capt. Brooke of the Confederate service. It somewhat resembles the Parrott in shape and construction; the rifling is similar to that of the Blakely. See RIFLING OF ORDNANCE.

Rifled guns have entirely superseded smooth-bores for field-service, and breech-loaders have taken the place of muzzle-loaders. This class of artillery has now stood the test of three great wars—viz., the Austro-Prussian, the Franco-German, and the Russo-Turkish; to which may be added the recent Anglo-Egyptian and many other minor struggles. It is estimated that four-fifths of all breech-loading field-pieces in existence are upon the Krupp plan. The French, for obvious reasons, were compelled to adopt another system, and the British adhere to the Armstrong, somewhat modified. Armstrong has produced a 2.5-inch gun, and Krupp one a trifle larger, intended for use in mountain-warfare; it is constructed in two parts screwed together. By this means the piece is divided into two lengths convenient for mule-packing. When the parts are screwed together—which can be done with great facility and quickness—a gun is obtained far surpassing in power anything that can be obtained from a mountain-gun of ordinary construction, limited, as it must be, in weight to the mode of transportation on mule-back. The Armstrong gun, just mentioned, has been used with considerable effect in Afghanistan.

The tendency of modern warfare has been to give greater value to a more powerful field-artillery. Infantry-fire has become so terrible, and its range has been so much prolonged, as to make necessary a like increase of the power of field-artillery fire. To this end inventive energy has been directed toward the production of guns of much larger caliber, but of such improved pattern, both of piece and of carriage, as to secure the desired end without increasing the weight to be drawn by the teams or impeding the mobility of batteries on the field.

In the early stages of artillery the *personnel* of it consisted of mechanics and laborers hired for the handling of the pieces and the management of the trains. These persons served a regular apprenticeship and had a guild of their own; when war broke out the different monarchs hired as many as they required or could get. Their pay was considerably greater than that of an enlisted soldier. Guns were hauled to the field on cumbersome carriages and placed in position as best they could be; here they remained stationary, and, in case of disaster, nearly always fell into the hands of the enemy. At this period there were no tactical manœuvres. A step in advance of this system consisted in attaching one or more pieces to each regiment of infantry, from which men were detailed to serve the guns. During the Thirty Years war the cannoneers, with regularly appointed officers, became recognized in Germany as a component part of the army. For a long period, however, after this, artillery-drivers were hired as before. The horses were strung out in single file, and the drivers walked by their side. A great variety of calibers existed, producing infinite confusion in ammunition and equipments. In the early part of the seventeenth century Maurice and Henry Frederick of Nassau made many improvements, among which was a reduction in the number of calibers, restricting them to 6, 12, and 24 pounders for field-service. The dimensions of these pieces were fixed, while handles and cascabels, shaped for the attachment of ropes, facilitated mechanical manœuvres. The gun-carriages, which had limbers, and the ammunition-wagons were similarly reduced to four varieties, and their dimensions made so uniform that wheels and other parts were interchangeable. About the same time Gustavus Adolphus, perceiving the advantage that would result from field-guns capable of quick motion and rapid fire, introduced light pieces made of thin copper wrapped with rope and leather; these, not proving durable, were replaced by iron 4-pounders weighing 650 lb. and drawn by a single pair of horses. Rapidity of fire was attained by the use of cartridges, the slow process of inserting the powder with a ladle being thus got rid of. Two of these guns were

attached to each regiment of infantry. Gustavus did much, also, toward developing the tactical powers of the arm by massing the heavy guns in strong batteries on the wings and center, and doing away with the old fashion of stringing them along the line at regular intervals. As guns have improved in range and power this principle of massing them has proved more and more advantageous, and has led to the abandonment of attaching batteries to small subdivisions of an army. In France, toward the end of this century, artillery material was modified and improved, much attention being paid to the character of the gun-metal, to the form of the chamber, and to the proper length and weight of the piece. The calibers for field-service were restricted to 4, 8, 12, and 16 pounders, which calibers were retained until the change to rifles. Gun-carriages were also changed for the better and provided with limbers, while trains of wagons or carts were organized for carrying ammunition; some of the carriages were made of wrought iron. Louis XIV. was the first sovereign to create a special artillery-force; he raised, in 1671, a regiment for artillery-duty, and in 1690 founded the first artillery-school. To his age belong also the important inventions of the elevating-screw, the prolonge, and the priming-tube filled with powder, the old method being to work powder into the vent from a horn.

During the first part of the eighteenth century artillery was generally recognized as an arm, had its regularly incorporated troops, and in consequence made very marked progress. Field-artillery performed an important part in the campaigns of Marlborough. In 1747 the French began to fire howitzers in siege-operations without first igniting the shell, it having been found that the flash from the charge would light the fuse if there was no tamping. The gun-carriages and ammunition-wagons were still of various patterns, each arsenal having its own way of constructing them; the axletrees were of wood and the limbers very low, with horses attached in single file. After the Seven Years war field-guns began to be assigned permanently to brigades in batteries of five to ten guns. In Prussia, Frederick the Great introduced short, light regimental guns of 3, 6, and 12 pound caliber; his example was followed by Austria and other countries. He also established howitzer-batteries. Frederick at first looked upon artillery with disfavor, and permitted it to run into a state of great confusion with reference to the models for each caliber. After Rossbach, where it did excellent service, he seems to have got over his prejudice, and we are indebted to him for the first horse-artillery, in 1759. It consisted of a battery of ten light 6-pounders, and, though long in a very inefficient condition, and destroyed at Kunersdorf and again at Maxen, was always reorganized. The Seven Years war opened the eyes of the Austrians to the importance of the artillery arm, which was carefully reorganized and improved under the direction of Prince Liechtenstein, who was created chief of artillery, with rank and authority commensurate with the importance of his position; this gave their artillery an immense advantage and assured its constant superiority to that of most of the contemporary powers. The Russians always attached great importance to their artillery. When they entered Germany in 1758 they had 425 guns to 104,000 men; three light howitzers were attached as horse-artillery to each dragoon regiment. Artillery in that century consisted of guns attached in pairs to each infantry battalion, of guns of position organized into large batteries, and of siege-guns. The number of guns was usually four or five to a thousand men. The regimental guns advanced with the battalions, unlimbered at musket range, and thence were moved forward by hand. The position-guns were posted at the most favorable points along the line, and generally remained stationary throughout the battle. The bronze cannon of this age were elaborately ornamented with carvings and with the ciphers and crests of arms of the reigning monarchs, the early custom of giving a special name to each piece being retained.

Such was the condition of artillery when Gribeauval appeared upon the stage. This celebrated Frenchman, having served in the Austrian artillery under Prince Liechtenstein during the Seven Years war, returned to France with a thorough knowledge of all the improvements suggested by the experience of that struggle, and was intrusted in 1765 with the reorganization of the French artillery, then in a very poor condition. He began by creating a distinct material for each service, field, siege, and seacoast. His field-guns were 4, 6, and 8 pounders. By reducing windage and improving the powder he was enabled greatly to reduce the length and weight of field-guns. To these were added a 6-inch howitzer, still re-

taining a small charge, though proportionately larger than that before used. These pieces were without ornaments, and were cast solid and then bored out, which made their dimensions much more exact than the old hollow-cast cannon; the trunnions were strengthened by rimbases, and copper vent-pieces enabled the guns to be rebushed. The horses were hitched in double file, which greatly facilitated the movements of the carriage, and the draught was made easier by iron axletrees, higher limbers, and traveling trunnion-beds. Fixed ammunition, elevating-screws, and tangent-scales, together with bricoles and prolonges, facilitated the service and increased the mobility of the piece. Stronger carriages were made for the lighter guns, and uniformity was established in all new constructions by requiring the arsenals to make every part of the carriages, limbers, and caissons after certain fixed dimensions, so that parts could be interchangeable and spare material carried into the field exactly corresponding to those in use. An equipment was thus obtained which could be moved and repaired with a facility hitherto unknown. These reforms were so excellent as to secure the permanency of many of them as the basis of the system of the present day.

Gribeauval's reforms did not stop at the material, the *personnel* of the French artillery being completely reorganized in 1765 through his efforts. Two guns were still assigned to each infantry battalion, which were served by detachments from a company of artillery attached to each brigade of four regiments. The rest of the artillery was organized into two or three reserves, each reserve consisting of divisions of eight pieces, to each of which was assigned a company of artillery. Here we have the creation of the artillery unit—the company organization, afterward merged into that of the battery with its horses and drivers, for the first time inseparably joined to its munitions and guns.

The French introduced horse-artillery in 1792 and cut down their batteries to six pieces, eight being found too unwieldy. In 1799 they entirely abandoned battalion-guns, as impairing the mobility of the infantry, one or two batteries attached to divisions taking their places. An artillery-train or corps of drivers, composed of enlisted men, was organized in 1800 and distributed among the French batteries; they had previously depended upon civilian drivers hired with their teams by contractors, the result being that drivers, horses, and harness were always in bad condition. The use of artillery in mass dates from the French camp at Boulogne in 1805, where this important tactical improvement was conceived and taught. The great value of it was made manifest in the battles subsequently fought by Napoleon. In 1827 the French replaced the two flasks which formed the trail of the Gribeauval system by a single piece, called the "stock," which permitted the carriage to turn in a smaller circle than before. The mode of connecting the limber with the gun-carriage was simplified by employing a hook-shaped pintle to the axletree instead of an upright bolt; this greatly facilitated the manœuvres of limbering and unlimbering, and admitted of an ammunition-chest being placed on the limber, the wheels of which were made interchangeable with those of the gun-carriage. A caisson provided with chests for the transportation of ammunition, constructed upon the general principles of the limber and gun-carriage, admitted of such mobility as to allow it to accompany its piece in all manœuvres. These improvements were soon adopted by all European nations, and in 1832 were introduced into the U. S. service and were the carriages used during the civil war. Within the last twenty years iron and steel have gradually replaced wood in the construction of field-carriages in most European services, and are now used in the U. S.

The systems of field and siege artillery in the U. S. were chiefly derived from those of France. After the war of 1812 with Great Britain the artillery arm was almost entirely neglected; no field-batteries were kept up, and the heaviest gun mounted on the seacoast in 1820 was a 24-pounder. The four regiments of artillery, though mostly garrisoning the forts of the Atlantic coast, performed little other than infantry duty; artillery as a science was not thought of, and as an art was scarcely at all practiced.

The British artillery, about the beginning of the French Revolution, had been greatly neglected, and was behind that of other nations. There was no reserve artillery, each regiment having two guns, whose horses and drivers were hired. As late as 1799 there were only two 6-pounders to a brigade of infantry; each piece was drawn by three horses tandem, the driver on foot with a long wagoner's whip.

Horse-artillery was, however, introduced in 1793, and a drivers' corps established the following year. In 1802 the battalion-guns were abandoned, and were replaced by field-brigades of mounted batteries and troop, or horse, batteries. The detachment of drivers with a field-brigade was an independent organization under its own lieutenant, who had no authority over the cannoneers and took rank after all the artillery officers proper. The drivers' corps was abolished in 1822, and men were enlisted for the Royal Artillery both as cannoneers and as drivers. The troop, or horse, artillery, however, continued to have drivers especially enlisted for that purpose, and to this faulty system the other batteries reverted after the Crimean war.

The proportion which field-artillery should bear to other troops in campaign depends upon the nature of the country and of the projected campaign, and the character of the troops comprising the army. In a wooded and broken country less artillery can be advantageously employed than in an open country with good communications, and more is required when the field of operations is limited than where long and rapid marches, made more for purposes of invasion than for fighting, are intended. More also is required when the army is composed of raw and inexperienced troops than when of well-instructed veterans. In the Crimean war the proportion of artillery was a fraction less than three guns per 1,000 infantry; in the Italian campaign of France and Sardinia against Austria, the proportion was between three and four pieces per 1,000; in the Seven Weeks war, the proportion was about the same; in the Franco-German war, the proportion was three guns per 1,000; and in the Russo-Turkish war it was a little greater. During the civil war in the U. S. the proportion was at first a little over three pieces for 1,000 infantry, but as the latter became more veteranized this was reduced to about two pieces. Much of this reduction, however, was due to the superior organization given toward the close of the war to the artillery, as hereafter mentioned. The proportion of artillery serving with cavalry is generally a fraction less than that for infantry. Improvements in small-arms have had a tendency to increase the value of artillery-fire, and nations that have had most recent experience are increasing the proportion of their field-guns.

In the U. S. the field-artillery of the army consists at present of ten mounted batteries, two to each regiment of artillery. The other ten batteries of each regiment are armed and equipped as infantry, and serve mostly in forts and garrisons on the seaboard.

During the war of 1812 with Great Britain, field-batteries were created by mounting foot-batteries from the artillery regiments. At the close of the war all these batteries reverted to the status of foot "companies," and none were mounted until 1836, when Capt. Ringgold succeeded in having his company organized into a field-battery. This was soon followed by three others—one from each of the regiments of artillery. The pieces for each battery were four 6-pounder bronze guns and two 12-pounder howitzers. The carriages and equipments were of the best-known pattern, and, under selected officers, these batteries soon acquired an astonishing degree of efficiency. One field-battery for each regiment was then the legal number. During the war with Mexico (1846–48) an additional field-battery to each regiment was authorized. These were all mounted during that war, but at the close of it were dismounted, and remained so until a short time before the outbreak of the civil war. When that war broke out (1861), a regiment of *light* artillery was added to the regular establishment, and a vast number of volunteer batteries were called into existence. During the Mexican war the field-batteries were attached, as a rule, to infantry divisions. There were no corps organizations during the war.

During the first year of the civil war a division of infantry of about 5,000 men was the highest organization, and to each division (in the Army of the Potomac, where the organization of all arms was the most complete) were attached three field-batteries, one of regulars and two of volunteers. By thus mingling the instructed batteries with those freshly raised, the latter acquired a knowledge of their duties with marvelous rapidity, and in the battles that ensued the field-artillery proved itself the strong point of reliance for the other arms. For a couple of years after the formation of army-corps during that struggle, the assignment of batteries to divisions continued. It was soon perceived, however, that this arrangement was faulty in the extreme. The batteries, by being attached to an arm of a

different nature, were badly provided for, and soon ran down in material. Their services were confined to the operations of the particular division to which they were attached, and frequently, from the nature of the ground or other causes, their full effectiveness was impaired or entirely misdirected, whereas if they had not been thus trammelled they could have been more advantageously used in other parts of the field. To a great degree it prevented the massing of artillery and the crushing effect of concentrated fire, and a large division of reserve batteries had therefore to be maintained for this purpose, and also for affording a recuperating place for the deteriorated divisional batteries. Toward the close of the war the divisional batteries of each corps were united and formed an artillery brigade, which was a distinct command, under a field-officer of suitable rank. Each of these brigades had its own staff and supply organization, and was thus enabled to maintain the batteries in the highest state of efficiency. This organization admitted of the most effective use of artillery on the field of battle, and consequently the proportion of artillery, which before had been three guns to a thousand infantry, was considerably reduced and reserves almost entirely dispensed with. The horse-artillery portion of the field-artillery was organized upon the same principle. These batteries operated, of course, with the cavalry, opened and maintained the actions for them in regular fields of battle, accompanied that body even on those rapid, and sometimes remote, "cavalry raids" upon the communications of the enemy which constituted so extraordinary a feature of that war. The services of this body of artillery could not possibly be excelled in brilliancy and *élan*.

During peace the mounted batteries of each regiment constitute a school for the purpose of diffusing throughout the regiment instruction in field-artillery service. The captains are changed when desirable, and the lieutenants after a tour of two years. In the event of war, all the batteries of a regiment can be mounted at the shortest notice and supplied with instructed officers.

The personal arms of an artilleryman of the field-batteries consist of a saber and a revolver for the officers and the non-commissioned officers, and a saber only for the drivers and the cannoners. During the civil war it was found that the saber was an encumbrance worse than useless, and it was therefore dispensed with in the field. The artilleryman of batteries not mounted is armed and equipped as an infantry soldier. The facings of the uniform for artillery are scarlet, otherwise the dress is the same as that for other troops. The pay of mounted batteries is the same as for cavalry; for all others it is the same as for infantry.

The *Drill Regulations* for field-artillery were originally adopted in 1844 from the French, and, although since revised a number of times, are essentially the same now, but, together with those for heavy guns and foot-batteries, have recently been modernized and simplified.

Heavy Artillery.—In 1862 Capt. Palliser introduced into England a method of converting smooth-bore cast-iron guns into rifles. This he did by inserting a tube of wrought iron or steel into the bore of the piece and rifling the tube. The rifled piece thus formed has a less caliber than the original gun, and in order to secure the requisite thickness of tube the original bore of the piece is reamed out to a greater diameter. The tube consists of two parts, called the A and B tubes. The former extends the entire length of the bore, and contains the rifling; the latter, or B, tube is shorter, envelops the rear part of the long tube, and is shrunk upon the latter, which is cut away for that purpose. The two tubes thus united have the same exterior diameter from end to end, and are made to fit accurately the bore of the cast-iron casing. The bottom of the tube is closed by a steel or iron cup-shaped plug screwed into the A tube. The tube is secured from slipping forward by a muzzle-collar screwed into the face of the piece, and from turning by a steel pin tapped through the casing into the tube. Formerly the tubes were inserted from the muzzle, but more recently the gun has been bored through the breech and the tube or tubes inserted from that end and closed by a screw breech-plug. This system of conversion worked so favorably in England that soon after its adoption there it was taken up in the U. S., with a view to utilizing the large stock on hand of smooth-bores. A number of 10-inch smooth-bores were converted into 8-inch muzzle-loading rifles, which, for their length, were very efficient guns, and which are still retained in service.

At the commencement of the civil war (1861), Mr. R. P.

Parrott, proprietor of the West Point foundry, New York, produced his system of guns. These guns are of cast iron, of about the usual dimensions, strengthened by a band or ring of coiled wrought iron shrunk over that portion of the breech surrounding the charge. The bodies of the larger Parrott guns are cast hollow, on the Rodman plan. Parrott guns consist of 300, 200, 100, 30, 20, and 10 pounders, the diameters of the bores being respectively 10, 8, 6, 4, 4.2, 3.67, and 3 inches, and weights of projectile 200, 150, 86, 28, 19, and 10 lb. A large number of these guns were used during the civil war, on both sea and land, and the amount of work done by them was very great. They were, in fact, the first rifles used in any country for bombardments and the breaching of masonry. The Lancaster gun at Sebastopol was scarcely an exception to this. Large numbers of Parrott guns were employed in the siege of Charleston (1863). These pieces successfully bombarded the city at a distance of 7,000 yards, and demolished the walls of Fort Sumter at distances varying from 3,500 up to 4,300 yards.

In the hasty preparation for hostilities consequent upon the outbreak of the civil war a number of old-pattern 24, 32, and 42 pounders were rifled, but proved of little service. At the siege of Fort Pulaski, Ga., in 1862, five of these, together with five 4.2-inch Parrotts, effected a breach in the heavy masonry of that fort in a few hours, firing from a distance of 1,650 yards. The Parrott guns, although in many instances showing wonderful endurance, are, nevertheless, liable to burst; especially was this the case with those supplied to the navy. This fact has caused them to be omitted from the system of artillery established for the U. S. service. There are, however, many of them still mounted in works.

In the matter of modern heavy guns it may be said that all civilized nations which attempt to keep their armaments up to a modern standard have adopted high-power steel breech-loading guns, and are replacing their older guns with them as rapidly as possible. There still remain in service, however, in nearly all nations a greater or less number of the older patterns, which are still efficient against all but the most heavily armored ships, and will probably be retained for a number of years in important places, and then be transferred for further use to those of less importance. Among these are the large muzzle-loading, smooth-bore, and converted rifled guns of the U. S., Turkey, and a few other nations; the muzzle-loading Armstrong guns of England, Italy, and Turkey; and the cast-iron, steel-hooped rifles of Italy and France.

Germany was the pioneer in the manufacture of steel cannon, and with the magnificent works of Krupp at Essen still leads the world in capacity for their manufacture. Krupp, besides supplying Germany, has furnished large numbers of guns to other governments. The calibers made at these works vary from light mountain-guns to the 120-ton gun of 15.75 inches. The standard calibers of Germany are 15.75, 13.97, 12, 9.45, and 5.87 inches.

Italy purchases her most powerful guns from Germany and England; she has mounted a number of 100-ton 17-inch Armstrong muzzle-loaders, and has purchased from Krupp a 119-ton, 40 cm. (= 15.75-inch) rifle capable of piercing 24 inches of steel at a mile. Great Britain has her Royal gun-foundry at Woolwich and Armstrong's and Whitworth's establishments to draw upon. She has 110-ton, 16.25-inch Armstrong guns mounted on some of her ships, and lesser calibers down to 4 inches, including certain wire-wound guns of 6 inches and 9.2 inches which have passed successful tests, but which have not yet been placed in service. Her modern rifles have the interrupted screw ferreture.

France has developed in a wonderful degree her gun-producing capacity, and at the factory of the Société des Forges et Chantiers de la Méditerranée, of which M. Canet is the director and originator of the system used, is turning out a large number of guns remarkable for their finish, beauty of manufacture, high initial velocity, and accuracy of fire. The calibers made range from 3.6 inches up to 16.8 inches, and the lengths of bore between 20 and 50 calibers. Besides the large number furnished to the French Government, this factory has also sold heavy guns in greater or less numbers to Greece, Spain, Portugal, Chili, and Japan.

The muzzle velocities obtained with the Canet guns vary between 1,605 feet per second for the 20 caliber up to 2,624 for the 50 caliber guns. A velocity of 2,661 feet per second has been obtained with a 36 caliber gun in actual trials.

Messrs. Schneider & Co., of the Creusot works, also man-

ufacture guns giving corresponding velocities; they guarantee with 6-inch 40 caliber guns 2,674, and with 9.6 and 12 inch 40 calibers 2,625, feet per second.

The U. S., although late in entering into the manufacture of modern steel rifles, has now (1893) made a fair beginning, and has established gun factories at Washington under the navy, and at Watervliet, N. Y., under the army. Both have made high-power rifles up to 12 inches caliber, which compare favorably with any made abroad.

The Bethlehem iron-works at Bethlehem, Pa., have built an extensive plant for the manufacture of iron, steel, and guns, and are now engaged in making both for the use of the Government.

The failure of several of the largest guns, and the difficulty of handling such large weights, together with the greatly increased power of the smaller guns, have led many of the best informed artillerists to think that no advantage results from the use of guns of more than 12 or 13 inches caliber; and this opinion seems to be rapidly gaining ground, although able men still advocate the use of 16-inch guns on land, even if they are not to be carried on ships.

The unceasing changes in calibers, lengths, and details of construction of heavy guns make it useless to try to give the detailed armament of any nation. It will not be attempted. Information upon these points may be obtained from the annual reports of the bureaus of intelligence of the War and Navy departments, and from the *Almanach de Gotha*.

The siege of Paris by the Germans in 1871, and the bombardment of Alexandria by the British in 1882, are instances of the work of which rifled ordnance is capable.

Following closely upon the introduction of rifled guns was that of rifled howitzers and mortars, and the results obtained were no less wonderful than for guns. So far as now known, the mortar was the first form in which artillery of a large size was used. At first they were employed to throw stone balls at great angles of elevation, which produced effect merely by their crushing force. Cast-iron shells were invented about 1480, and first used by the Turks at the siege of Rhodes. Since their first introduction as engines of war mortars have had various forms, chiefly as to shape and dimensions of the powder-chamber. Until 1861 all mortars had their trunnions cast upon the breech, and the elevation was given by means of a wooden quoin under the muzzle; since the above date all mortars made for the U. S. service, excepting the small cohorn, have been cast with their trunnions at the center of gravity, thus greatly facilitating their service. Mortars of very large caliber have from time to time been fabricated, but the largest is that now at Woolwich, England, constructed in 1857 by Mr. Mallet. It is

made in six sections (so as to be transported), which are fitted gas-tight and bound together by six staves; the breech is a solid forging set in a cast-iron base. This mortar has fired shells weighing 2,481 lb., containing a bursting-charge of 480 lb., to a distance of 2 miles. A small mortar (called the "cohorn," after its inventor), of such lightness as to be readily carried by a couple of men, has proved of great service in the field and in siege operations. A similar mortar has been devised for mountain-service, arranged so as to have the piece carried by one mule, while another carries the bed. Smooth-bore mortars have inherent defects as to accuracy of fire; it was to overcome these, and also to secure greater range for curved fire, that rifled mortars were devised (Fig. 5). Armstrong in 1864 constructed one—a

muzzle-loader—of 6.4-inch caliber which gave such good results that other nations were encouraged to take up the subject. Breech-loading methods were soon introduced, and rifled mortars upon this plan are now everywhere taking the

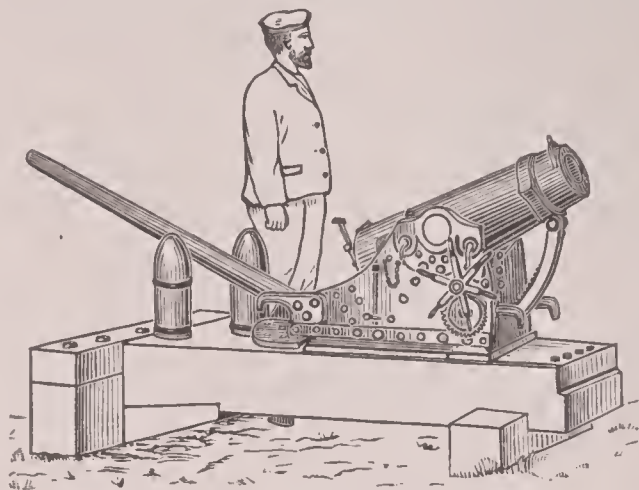


FIG. 5.—9-inch Krupp rifled mortar.

place of the old style smooth-bore muzzle-loaders. The calibers used are approximately 6, 8, 10, and 11 inches, and the lighter are in some instances mounted on carriages for field service (Fig. 6). For seacoast defense the U. S. is now building a large number of 12-inch rifled mortars which fire elongated projectiles, and are effective for ranges varying from 1 mile to 6 miles, and some up to 8 miles. There is every indication that they will be used for firing high explosives.

Wrought iron, and in some instances steel, have entirely superseded wood in the construction of carriages for heavy

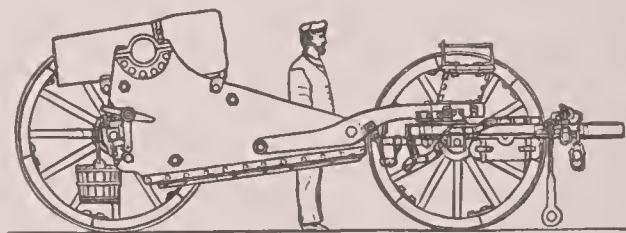


FIG. 6.—6-inch Krupp rifled mortar.

ordnance. Various plans for checking recoil have been invented, but that most generally adopted is what is known as the "hydraulic buffer," but which in reality works with oil, glycerin, or some other non-freezing or corroding fluid,

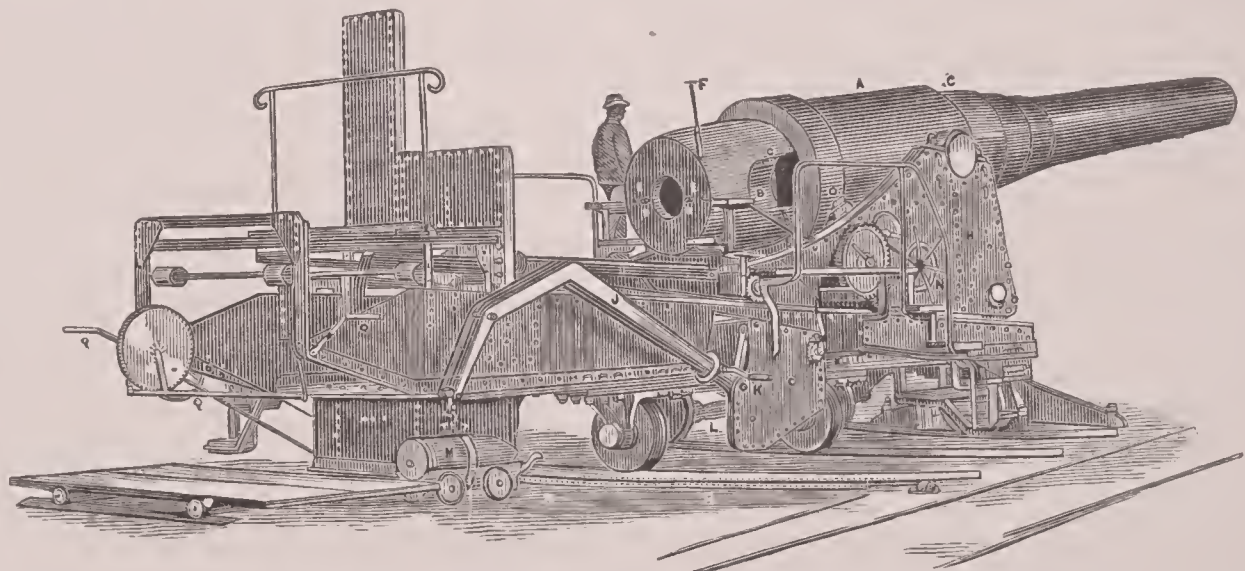


FIG. 7.—16-inch (71 tons) Krupp gun, mounted on coast-carriage.

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|---|---|--|
| A, 40-centimeter (15.75 in.) gun; length, 32 ft. 10 in. | F and G, Tangent and trunnion sights. | N, Hand-wheel for elevation, with train of wheels working on toothed elevating-arc O. |
| B, Breech-closer, showing (C) end of driving-screw. | H, Carriage, wrought iron. | P, Graduated disk, showing quadrant elevation, being set by reverse (inner) edge of elevating arc. |
| D, D, Studs for hooking on shot-guide. | I, Loading-platform. | Q, Q, Q, Handles for working traversing-gear. |
| E, E, Rings for rammer-pulley blocks. | J, Crane, pivoting vertically on pillar hinged horizontally at K with counterspring on arm L, beneath the carriage. | |
| | M, Chilled iron projectile. | |

contained in a cylinder similar to that of a steam-engine. A piston attached to the moving part of the carriage works back and forth in the cylinder, and is so arranged that the

rate of flow of the liquid from its front to its rear may be regulated. When the piece is fired, the sudden jar of recoil is taken up by the action of the fluid, and the top-carriage glides back with an easy motion. Pneumatic buffers upon the same principle are used in the U. S. for the 15-inch gun.

Fig. 7 is given to illustrate the necessary complications introduced into the construction of gun-carriages of heavy guns when worked by hand.

Various plans have been proposed of late years to secure a practicable disappearing gun-carriage—i. e. a carriage so constructed that the piece can be raised to a height sufficient to fire over a parapet, and then lowered so as to be loaded in a secure position behind the parapet. The Moncrieff "counterpoise gun-carriage," designed to effect this object, having given satisfactory results upon trial with short muzzle-loading guns, was extensively adopted by the English. In the U. S., Major King, of the Engineers, invented a "depressing-carriage" which upon trial also gave good results. This carriage consists of a chassis with an inclination to the rear of about 30 degrees. The top-carriage is attached to a counterpoise by a band composed of wire ropes. The counterpoise is a heavy mass of metal descending into a well in front of the chassis. When the piece is fired from the usual position the top-carriage slides back and downward, where it is caught by a brake and held until the piece is reloaded. A slight movement of the lever of the brake releases the top-carriage, and the gun ascends to the firing position. The great length of modern guns has rendered necessary the use of disappearing carriages and platforms worked by steam or hydraulic power. A number of these are still in the experimental stage, not having stood the test of war service, although introduced to a limited degree in seacoast works. Disappearing-carriages are intended to protect the piece and carriage as well as the cannoneers. The accuracy of modern artillery-fire increases the danger to the guns with which a work is armed, and the disabling of a piece is of greater moment now than formerly, when works were garnished with a great number of pieces, but of such small size as to be readily replaced when injured.

The artillery troops of the regular army of the U. S. consist of five regiments, each composed of 1 colonel, 1 lieutenant-colonel, 3 majors, 1 adjutant, 1 quartermaster, 1 sergeant-major, 1 quartermaster-sergeant, 2 principal musicians, and 12 batteries. Each battery consists of 1 captain, 2 first lieutenants, 2 second lieutenants, and 150 enlisted men (sergeants, corporals, artificers, musicians, and privates). In time of peace the President is authorized to reduce the battery organization to 1 captain, 1 first lieutenant, 1 second lieutenant, and 60 privates; practically, this number is but about 35. The law requires that one battery in each regiment shall be "mounted"—i. e. equipped with guns, horses, etc.—and gives the President discretion to mount as many of the others as the exigency of the public service may seem to him to demand. When not thus mounted the remaining batteries of artillery serve as heavy or garrison artillery, principally in the seacoast fortifications. See EXPLOSIVES, GUNPOWDER, ORDNANCE, PROJECTILES, MACHINE AND RAPID-FIRE GUNS, RIFLING OF ORDNANCE, etc.

JOHN C. TIDBALL.

Artillery, Schools of: Special schools for instruction in artillery have for many years been organized and maintained by the various nations of the civilized world as a component part of their military establishment. As early as A. D. 1515 such a school was organized by the Venetians. A few years later Charles V. established a school of artillery in Spain and another in Sicily. Toward the end of the next century (1679) a school of application for artillery was founded at Douai by Louis XIV. The engineers had a school at Mézières. Both of these schools passed through many vicissitudes and removals until 1802, when the two were combined at Metz, and continued there until that place passed into the hands of the Germans. After the close of the Franco-German war this school was reopened at Fontainebleau, where it now is. An artillery school was organized in Saxony at about the same date as that at Metz, and some years afterward similar schools were established by other states of Germany. The Artillery and Engineering School in Berlin is a technical school, and has a course of two years. In Sweden, Austria, and Russia artillery schools were in existence before the close of the seventeenth century. About the middle of the eighteenth century the artillery school at Woolwich was established in Great Britain.

In some nations the school is a joint one for artillerists and engineers, but this is exceptional, the general rule being to keep the instruction of these two scientific corps separate and distinct. In the U. S. an artillery school for practice was established at Fort Monroe, Virginia, in 1824, and it continued in existence for about six years, and as a practical school solely, when the exigencies of the military service (due chiefly to Indian wars) caused its discontinuance. In May, 1858, a school for practical and theoretical instruction was organized at the same place. This school languished after the first year and a half of its existence, and was finally brought to an end in 1861 by the great civil war. In Nov., 1867, an artillery school for theoretical as well as practical instruction was again established at Fort Monroe, and has since continued uninterruptedly up to the present date—1893. This school was organized under the command of Brevet Maj.-Gen. Barry, who remained at the head of it until 1877, when he was succeeded by Gen. Getty, 1877-83; Gen. Tidball, 1883-89; and Col. R. T. Frank, 1889.

The organization of the U. S. Artillery School, adopted in 1867, contemplates a course of studies and practical training not limited to what is necessary for merely expert artillerists, but one which aims to qualify officers for any duty they may be called upon to perform, or for any position, however high in rank or command, to which they may aspire in service. Such an advance is demanded by the progress made in the methods of warfare during the last twenty years, particularly as regards artillery, wherein improvement has been from almost primitive rudeness to the requirements of an exact science, combining with it many cognate branches heretofore considered of but little importance to a military man. With reference to the U. S. Military Academy, the artillery school is a post-graduate institution.

The *personnel* of the school consists of the commandant (both of the post and school), the directors of instruction, instructors and assistant instructors, and such other officers and troops as may be assigned to it for duty or instruction. The commandant, the two other field-officers of artillery on duty with it—who shall be directors of instruction—and the commanding officer of the Fort Monroe arsenal constitute the staff of the school. The adjutant of the post is *ex-officio* secretary of the staff and custodian of all records. The troops usually at the school are five foot-batteries of artillery (one from each regiment) and such officers and enlisted men as may be ordered to the school for instruction. The batteries are permanently assigned, and are called "instruction batteries." The officers for instruction are lieutenants, four to each battery, attached thereto for a tour of two years, commencing Sept. 1 of each alternate year. Prior to 1875 the course of instruction was for one year only. Experience proved this to be too short a period in which to accomplish all that was desired. The additional time allows of much more thorough and extended instruction.

In addition to the drawback arising, as just mentioned, from want of time, the school was greatly crippled during the first years of its existence for want of proper facilities for instruction. Aside from a few old and worn-out instruments obtained from the Engineer Bureau, there was nothing in that line. Text-books even were limited in number, and supplied from small sums received from time to time from the contingent fund of the War Department. In 1878 a small appropriation was granted by Congress. This has been continued annually since that time. By a judicious management of these appropriations the school facilities have been increased, until now they may be considered upon a very respectable footing. In the meanwhile other improvements were made, adding greatly to the convenience and comfort of the post and school. Among these may be mentioned new barracks for the soldiers, additional quarters for officers, and buildings for library, school-rooms, laboratories, etc.

The course of instruction is divided into six departments, as follows, viz.:

1. Engineering. Embracing land and topographical surveying and reconnoissance, field-works, permanent fortification, and siege-works.
- Steam and mechanical engineering. To include an elementary course on the steam-engine, mechanism, hydraulic power, and machinery.
2. Artillery. To include exterior and interior ballistics, the employment of artillery, artillery material, munitions, armor, etc.
3. Electricity and submarine mining. Consisting of a course of instruction upon theoretical and practical electric-

ity, and the theory and practical construction and use of submarine mines.

4. Chemistry and high explosives. Including lectures, laboratory work, and experimental work upon the different branches.

5. Military science. Including minor tactics, logistics, battle tactics, strategy, and military geography.

6. Practical military exercises. Including practical use of all classes of field, siege, garrison, and seacoast guns, howitzers and mortars, and machine-guns.

These departments are supplemented by instruction in photography, telegraphy, cordage, etc.

Students who pass successfully through the entire course of instruction are awarded a certificate of proficiency, and special reports are made in all cases of failure.

The military policy of the U. S. demands, above that of most other nations, that her means for military instruction should be of the most efficient nature. Unlike the states of Europe, she is not required to stand constantly in an offensive and defensive attitude toward contiguous neighbors. Her wars of magnitude are comparatively rare; those educated in the school of experience by one war pass beyond the period of active service before another occurs, and fresh armies have to be raised from the civil population and compelled to learn the practice of war under the most adverse circumstances. Particularly is this the case with artillery instruction, which, from the very nature of artillery service and material, can not, like that of other arms, be disseminated among the people by either the militia or the volunteer system. In consequence of the smallness of the regular army, the only means of securing efficient preparation for the use of artillery in war lie in providing for a corps of thoroughly trained artillery officers; consequently, the necessity of maintaining an artillery school of theory and practical application. See MILITARY ACADEMIES.

JOHN C. TIDBALL.

Artiodac'tyl [from Gr. *ἄρτιος*, complete, even + *δάκτυλος*, finger, toe]: a member of that division or sub-order of ungulates or hoofed mammals in which the number of toes is even, either two or four in all the existing forms. The axis of the foot passes between the third and fourth toes, which are equal in size and have their hoofs flattened on the inner side. In the perissodactyls the axis passes down the center of the third digit, and the number of toes is odd in all existing forms save the tapir. The artiodactyls contain two principal groups—the *Pecora* or ruminants, in which the stomach is compound, and the *Suina* or allies of the hog and hippopotamus, in which it is simple. D. S. JORDAN.

Artocarpa'ceæ [from Gr. *ἄρτος*, bread + *καρπός*, fruit]: a natural order of exogenous plants, of which the *Artocarpus incisa*, or breadfruit, is the type; it is regarded by some botanists as a sub-order of *Urticaceæ*. This order comprises more than fifty species, nearly all natives of tropical countries. See JACK-TREE.

Artois, aar-twaw' (anc. *Atreba'tes*): a former province of France, bordering on Flanders, in the department of Pas-de-Calais (see map of France, ref. 2-F). The capital of Artois was Arras. Artesian wells were named from Artois (in Latin, *Arte'sia*). Charles X. of France before his accession was Count of Artois.

Artotype: See PHOTOGRAPHY.

Arts, BACHELOR OF and MASTER OF: See DEGREES.

A'ru: a group of islands situated between lat. 5° 20' and 6° 55' S., and between lon. 134° 10' and 134° 45' E.; S. of New Guinea, nominally in the Dutch government of the Moluccas. There are five principal islands and many small ones. Total area about 3,000 sq. miles (see map of East Indies, ref. 8-K). The largest island is 70 miles long and 20 miles wide. Some of the natives have adopted Christianity. Here is a town called Dobbo, into which British goods are imported annually to the amount of about \$15,000. The exports are pearls, trepang, and birds of paradise. Pop. of islands, 7,750.

Arn'ba: an island of the Dutch West Indies; W. of Curaçoa and 20 miles N. of Cape St. Roman; peninsula of Paraguana (see map of West Indies, ref. 9-H). The capital is Oranjestad, with a fort named Zoutman (lat. 12° 28' N., lon. 70° 11' W.). Area, 69 sq. miles. Pop. (1891) 7,743.

A'rum [Lat. *a'rum*, Gr. *ἄρον*, wake-robin]: a genus of dicotyledonous herbaceous plants of the family *Araceæ*. This genus has a convolute spathe, the spadix naked at the point. In some of its species a stench like that of carrion is pro-

duced during flowering, and in some a remarkable degree of heat.

Arum Family: See AROIDS.

Ar'undel, THOMAS: Archbishop of Canterbury; b. at Arundel, 1353; became Bishop of Ely at the age of twenty-one; was at different times Lord High Chancellor of England (1386-89; 1391-96; 1399; 1407; 1412); Archbishop of York, 1388; Archbishop of Canterbury, 1396; was banished for complicity in the insurrection against Richard II., 1397; returned with Henry of Lancaster (Henry IV.), 1399, and took possession of his see; persecuted the Lollards and followers of Wiclif. D. at Canterbury, Feb. 19, 1413.

Arundel, THOMAS HOWARD: Earl of Arundel and Surrey; art collector; b. in London, 1592; made a famous collection of ancient sculptures bearing the name of the *Arundel Marbles*, which was presented to the University of Oxford in 1667. The principal portion of it is the *Parian Chronicle*, originally chronological tables of Greek history, from 1582-264 B. C. (interpreted by Boeckh in *Corpus Inscript.*, vol. ii.). D. in Padua, 1646. The Arundel Society, London, is named after him.

Arns'pices, or **Harus'pices** [Lat., literally entrail examiners, from *haru-*; cf. *hira*, entrails; Gr. *χορδή*]: Roman soothsayers, who foretold future events from the inspection of the entrails of the victims offered at the altars of the gods.

Aruwimi, aar-roo-wee'mee: a tributary of the Congo, rising to the N. W. of Albert Nyanza. Its general course is westward, and it empties into the Congo at the village or station of Aruwimi, or Basoko, in lat. 2° 40' N., after a course of about 600 miles. It receives various names in its course, as the Luhali, Novelli, Ituri. The name of the river is sometimes applied to the district of the Congo Free State through which it flows.

Ar'vad: ancient city of Phœnicia, on small island near mouth of the river Eleutherus; said to have been founded by the Sidonians and noted for the seafaring skill of the inhabitants.

Arval Brethren (in Lat. *Fratres Arvales*): a very ancient college of priests, at Rome, twelve in number, chosen by co-optation for life, from the highest families, and under the empire, including the emperors. They celebrated a yearly festival for three days in the latter half of May, offering sacrifices for the fertility of the fields. To their cult there are but few allusions in literature, but the minute details of their ceremonial are contained in a series of inscriptional records dating from 14-241 A. D., which have been found from time to time in the grove of the Dea Dia, 5 miles from Rome on the Via Campana. These were published under the title *Acta fratrum Arvalium*, by G. Henzen (Berlin, 1874). Since then other fragments have been discovered. See also *Birt* under Dea Dia in Roscher's *Lexikon der Griechischen und Römischen Mythologie* (columns, 966-975). M. WARREN.

Arvic'ola [from Lat. *arvum*, field + *-cola*, inhabitant]: a genus of small animals of the order *Rodentia*, allied to the rat and mouse. They are distinguished by the prismatic form and fangless structure of the molar teeth. The *Arvicola agrestis* (field campagnol) and the *Arvicola riparia* (bank campagnol) are natives of England. There are over twenty species, called field-mice, in the U. S.

Arvieux, LAURENT CHEVALIER, d': French traveler and Orientalist; b. at Marseilles in 1635. He negotiated a treaty with the Dey of Tunis in 1668, and was consul at Aleppo from 1679 to 1686. He wrote a *Treatise on the Manners and Customs of the Arabs* (1717). From his papers Labat compiled *Memoirs of Chevalier d'Arvieux, Containing his Travels in Asia* (6 vols., 1735). His works are commended by Niebuhr. D. in 1702.

Arivaipa: See ATHAPASCAN INDIANS.

Ar'widsson, ADOLF IWAR: b. at Padasjoki, Finland, Aug. 7, 1791; studied at the University of Åbo, and was appointed docent in history there in 1817. A periodical which he founded in 1821 was suppressed in the same year by the Russian Government, and in 1822 he was exiled. He went to Stockholm, where he was made director of the royal library. D. at Wiborg, Finland, June 21, 1858. He published, among other works, *Svenska Fornsänger* (3 vols., 1834-42); *Stockholm förr och nu* (1837-40); and a translation of the Icelandic *Saga of Frithjof* (*Frithjofs Saga*).

Revised by G. L. KITTEDGE.

Arx: in Roman archæology, a stronghold within, or closely connected with a city. The term is applied to the citadels of the towns of Italy, and those where the Roman civilization prevailed; thus we speak of the arx of Tusculum. The term is nearly equivalent to *acropolis* in a Greek city. The arx of Rome was one of the two high points of the capitoline hill, the other being the capitolium; it is not entirely certain which of the two was the arx, but it is generally thought to be where the Church of S. Maria in Ara Cœli, or, shorter, the Ara Cœli, stands.

RUSSELL STURGIS.

Ar'yan (also spelled *Arian*): a term which the stricter usage among modern philologists limits in application to the Indo-Iranians and the Indo-Iranian speech-family, i. e. the family whose chief ancient representatives are the Sanskrit and Zend. It represents a name which this people applied to itself in distinction to the darker-skinned peoples about it, and of which the Sanskrit form was *āria-* or *ārya-*. The etymology of the word is uncertain, as is usually the case with proper names, but it may perhaps signify "the band of the loyal." Many philologists, and especially anthropologists, have used the term in a broader sense to denote the whole family which is by others called the Indo-European or Indo-Germanic. Such is particularly the case in England, where, however, of late the term Indo-European has been gaining ground. Indo-Germanic is commonly used in Germany, Indo-European in France and the U. S. See **INDO-EUROPEANS** and **LANGUAGE**. BENJ. IDE WHEELER.

Ar'zachel: Jewish astronomer; b. in Spain, and lived about 1050–1100. He ascertained the obliquity of the ecliptic, and prepared astronomical tables, called *Toledo Tables*.

As (gen. **As'sis**): a Roman weight; also called **Libra**; nearly equal to the modern pound. It was divided into twelve uncia, "ounces," and was equal to 10 oz. 18 dwts. 13½ grs. Troy. *As* was also the name of a brass Roman coin which originally weighed a pound, but in consequence of the increase of the value of metal, compared with that of food and other commodities, it was gradually reduced to half an ounce. During the second Punic war the value of the *as* was about two farthings, but its weight and prices in Rome were so variable that its value can not be accurately fixed. See **SESTERTIUS**.

Asa'ba: the capital of the Niger territories in West Africa, and the seat of the government of the Royal Niger Company—a company controlling the greater part of the Niger basin. Asaba is on the Niger, 150 miles from the coast and 75 above the delta, in lat. 6° 20' N., lon. 7° E. (see map of Africa, ref. 5-C). Here resides the chief justice of the supreme court, and here are also the central prison, the civil and military hospitals, and other public buildings.

A'sa Du'eis (i. e. sweet asa): a drug highly prized by the ancients as an antispasmodic and diuretic. It was worth its weight in gold, and was obtained from a plant of the genus *Thapsia*, a native of Barbary and Southern Europe.

Asafœtida: See **ASSAFŒTIDA**.

Asagra'a [named in honor of Asa Gray, the botanist]: a Mexican plant which has bulbous stems, linear, grass-like leaves, and spikes of whitish flowers. The *Asagraea officinalis*, which is said to be the only species of this genus, produces the cebadilla-seeds from which the poison veratrine is prepared.

Asan'der (in Gr. Ἀσανδρος): Macedonian general; brother of Parmenio; appointed governor of Lydia by Alexander the Great in 334 B. C. After the death of that king he was satrap of Caria, an ally of Ptolemy, and an enemy of Antigonus, against whom he waged war about 314 B. C.

As'aph, Saint: cathedral city in the northwest of Flintshire, Wales (see map of England, ref. 8-E). The cathedral, one of the smallest in Great Britain, was built in 1284 on the site of a wooden structure founded before 596. Pop. (1891) 14,000.

Asarabac'ca: See **ASARUM**.

As'arum (Gr. ἄσαρον): a genus of herbaceous plants of the family *Aristolochiaceæ*; is distinguished by kidney-shaped leaves, twelve-horned stamens, distinct from each other and from the style, and by a bell-shaped, three-lobed perianth. *Asarum europeum* is a native of Europe. The roots and leaves are stimulant, purgative, and emetic, and contain a bitter principle or crystalline substance called *asarin*. *A. canadense*, a native of North America, called wild ginger, is

a stimulant and diaphoretic. Two other species grow in the Atlantic States. Also called *Asarabacca*.

As'ben, called also **A'ir**: a kingdom of the Southern Sahara, bordering on the Sudan, of considerable but ill-defined area, now within the French sphere of influence. It is in the Niger drainage-basin, but its rivers are usually dry. It is on a great caravan route from the north to Sokoto. It includes a large tract of desert, and some fertile land which produces dates. The climate is hot and dry. Capital, Agades, with a population of about 7,000.

Asbes'tos, or **Asbestos** [Gr. ἄσβεστος, unquenchable; ἀ-, not + σβεννύναι, quench. Originally applied by the Greeks to unslaked quicklime; Pliny, to whom the present perverse use of the term is due, probably applied it in the sense of "inconsumable"]; a fibrous mineral composed of fine, flexible, and easily separable filaments of a silky luster. It is a variety of actinolite and tremolite, and consists chiefly of silica, magnesia, and lime, or pyroxene. The fibers of a very silky variety of asbestos are called amianthus. Asbestos may be woven into cloth which is incombustible, and if soiled may be cleansed by fire. The ancients wrapped the bodies of the dead in such cloth, in order that when they were burned on the funeral pyre their ashes might be kept separate. It was also used for the wicks of the lamps in the temples. Mountain-cork and mountain-leather are varieties of asbestos. It is now employed as a material for roofing, boiler-felting, night-lamp wicks, steam-packing, and paper-stock. Asbestos is abundant in Canada, Corsica, Savoy, the Valtelline, and the Tyrol. Seventy-one tons were mined and marketed in the U. S. in 1890.

Asbjörn'sen, aās-byörn'sen, PETER CHRISTEN: b. in Christiania, Norway, Jan. 15, 1812; studied botany and zoölogy; visited Asia Minor and Egypt in 1849–50; spent two years at the academy of Tharand, Saxony, 1856–58, and on his return was appointed inspector-general of the forests of Norway. Besides a number of popular books on natural history and essays on forest culture, he published *Norske Folke-Eventyr* (1842–43) in connection with Jorgen Moe; an additional collection of the same in 1871 (2d ed. 1876); and *Norske Huldreeventyr og Folkesagn* (1845–48; 3d ed. 1870). D. in Christiania, Jan. 6, 1885.

Revised by G. L. KITTEDGE.

As'boline [from Gr. ἄσβολος, soot]: a nitrogenous substance found in soot.

As'both, ALEXANDER SANDOR: Hungarian officer; b. at Keszthely, Hungary, Dec. 18, 1811; fought under Kossuth in the revolution of 1848, and in 1851 removed to the U. S. He entered the Union army on the breaking out of the war in 1861, distinguished himself in various engagements, and was made a major-general in 1865. He was minister to the Argentine Republic in 1866, and died at Buenos Ayres, Jan. 21, 1868.

As'bury, FRANCIS: Methodist bishop; b. at Handsworth, Staffordshire, England, Aug. 20, 1745, of Methodist parents; was converted at the age of thirteen; became a local preacher at sixteen; an itinerant under Wesley at twenty-two; removed to America in 1771 as missionary; in 1772 became Wesley's "general assistant" in America. In 1784 he was elected bishop of the new Methodist Episcopal Church, and was consecrated by Bishop Coke. His labors and success in establishing his Church (chiefly in fields where churches were almost unknown) are among the most remarkable of which history bears record. D. at Spottsylvania, Va., Mar. 31, 1816. See *Asbury's Journals* (New York, 1852), and life by W. P. Strickland (1858).

Asbury Park: a noted summer resort on Atlantic coast of Monmouth co., N. J. (for location, see map of New Jersey, ref. 4-E); about 5 miles S. of Long Branch; has seven churches, a fine opera-house, electric street-railway, artesian water-works, and complete sewer-system. Pop. (1880) 1,640; (1890) 3,815; (1900) 4,148. EDITOR OF "JOURNAL."

As'calon (in Gr. Ἀσκάλων), called *Ash'kelon* in the Bible: one of the five capital cities of the Philistines, a former seaport of Palestine, 10 miles N. of Gaza, 12 S. by W. of Ashdod or Azotus, and 42 W. S. W. of Jerusalem. It was a place of much importance; the seat of the Philistine licentious Astarte worship; its temple was plundered by the Seythians, B. C. 625. Herod the Great was born there. It was taken by the crusaders, A. D. 1099; partially destroyed by the Saracens, but rebuilt by Richard Cœur de Lion. Its first fall came when its small and insecure harbor was filled with

stones by the Sultan Bibars, A. D. 1270. It is now a small village called *Asculan*, and has extensive ruins.

Revised by S. M. JACKSON.

As'caris (Gr. *ἀσκαρίς*): a genus of intestinal parasites, of which the most common is the roundworm, *Ascaris lumbricoides*, found in the intestines of man. Children frequently have them, principally in the small intestines. The body of this worm is round, elastic, with a smooth surface, of a reddish or yellowish color; it tapers especially toward the anterior extremity, which commences abruptly by three tubercles which surround the mouth. The body is transversely furrowed with numerous fine lines, and marked also with four lines from head to tail. In the female there is usually a constriction of the body at the distance of about one-third of its length from the mouth. Sometimes, especially in young and weakly children, their accumulation may cause serious reflex disturbances; even convulsions may be thus produced. There are no symptoms (apart from the passage of the worms from the bowels) invariably connected with their presence. Itching of the nose, capricious appetite, swelling of the abdomen, and grinding the teeth when asleep may all occur, but they may also be produced by other causes. *Oxyuris vermicularis*, the small white threadworm or seatworm, was formerly classed as an *Ascaris*, but is better called *Oxyuris*. Its length is from two-twelfths to five-twelfths of an inch, the female being larger than the male. The head is blunt, widening on each side; the body tapers (at least in the female) to a point. Seatworms, by the itching they produce, often distress children very much; they are less frequently met with in adults. For *treatment* of worms, see ANTHELMINTICS. As a common name *Ascarides* is the plural of *Ascaris*. Revised by WILLIAM PEPPER.

Ascawa'na Lake: a beautiful sheet of water, 2 miles long and 1 mile wide, in Putnam valley township, Putnam co., N. Y. It is a place of summer resort.

Ascension: an island in the Atlantic Ocean, 750 miles N. W. of St. Helena; belongs to Great Britain (see map of World, ref. 6-I). It has an area of 35 sq. miles. It is volcanic and mountainous, one peak rising to the height of 2,870 feet. It has a fort in lat. 7° 55' 55" S. and lon. 14° 25' 5" W. Turtles, vegetables, and birds' eggs are procured here. It was discovered in 1501 by the Portuguese on Ascension Day, but was uninhabited till Oct. 15, 1815, when the English took possession of it, and established a military station there after the arrival of Napoleon Bonaparte at St. Helena. It is used as a coaling, victualing, and store dépôt for British ships on the west coast of Africa. Chief town, Georgetown, a British naval station. The island is a sanatorium for the Europeans of West Africa. Pop. about 360.

Ascension [from Lat. *ascensio*, an ascent]: in astronomy, see RIGHT ASCENSION.

Ascension Day, or **Holy Thursday**: one of the great religious festivals of the Roman Catholic and Anglican Churches, held on the fortieth day after Easter, to commemorate the ascension of Christ into heaven. Ascension Day has been observed at least since 68 A. D., and perhaps earlier. St. Augustine speaks of it as universally observed in the Church, and contends that it must have been instituted either by the apostles themselves or the bishops immediately succeeding them. This feast concludes the cycle of festivals of our Lord, and is marked out in the English and American Prayer-books, by the proper preface provided for it in the communion office, as one of the great festivals to be observed with the administration of the Eucharist daily during the octave.

Asect'icism [from Gr. *ἀσκητής*, hermit, one who disciplines himself; deriv. of *ἀσκειν*, practice, discipline]: a voluntary retirement from the world and the practice of acts tending to mortify the body; so called from the rigid discipline to which the devotee subjects himself, the object of the ascetic being to advance the spiritual interest of himself or others. Asecticism was practiced among Jewish and pagan nations long before the time of Christ, especially in India. The Essenes in Judæa and the Therapeutæ in Egypt were bodies of Jewish asectics. At the present day asecticism is most prevalent among Brahmaus, Buddhists, and Christians of the Armenian, Coptic, Greek, and Roman Catholic Churches. Early in the second century zealous members of the Christian Church devoted themselves to lives of poverty, celibacy, and abstinence from all sensual gratification. Some of these remained among men, others dwelt apart as hermits. The union of numbers of hermits

into one body was first made by Pachomius, 340 A. D. This was the virtual origin of MONASTICISM (*q. v.*).

Ascet'ies: those who practice ASCETICISM (*q. v.*).

Asch: a town of Austria; in Bohemia; 100 miles W. of Prague (see map of Austria-Hungary, ref. 3-C). It has factories of linen, calico, paper, hosiery, and leather goods, and many dyeing establishments and breweries. Pop. 15,557.

Aschaffenburg: a town of Bavaria; in the circle of Lower Franconia; on the right bank of the Main, 24 miles by rail E. S. E. of Frankfort (see map of the German Empire, ref. 6-D.) It has a royal castle, a Gothic church, a library of about 22,000 volumes, a hospital, a gymnasium; also manufactures of woolen goods, paper, straw goods, etc. It belonged to the Elector of Mentz for many centuries, and was ceded to Bavaria in 1814. A victory of the Prussians over the Austrians was gained here July 14, 1866. Pop. (1890) 13,275.

As'cham, ROGER: English scholar and writer; b. at Kirby Wiske, near Northallerton, in Yorkshire, in 1515. He graduated at St. John's College, Cambridge, in 1534, became a fellow, and distinguished himself as a classical scholar. In 1544 he published a work in defense of archery, entitled *Toxophilus*, which is remarkable as a specimen of pure English style. He was appointed in 1548 tutor to the Princess Elizabeth, whom he instructed in Greek and Latin, but he resigned that position in 1550. Soon after this event he was sent as secretary of embassy to the court of the Emperor Charles V., and passed three years in Germany. Although he was a Protestant, he was appointed Latin secretary to Queen Mary in 1553, and after her death (in 1558) he was retained at court in the double capacity of secretary and tutor to Queen Elizabeth, who again took lessons in Greek and Latin. He remained at her court until his death in London, Dec. 30, 1568, having by his prudence or good fortune passed through very perilous times without persecution or dishonorable temporizing. His chief work, *The Schole-Master* (1570), contains excellent advice on the subject of teaching Latin. His complete works were edited by J. A. Giles (London, 1864-65, 3 vols.). See Dr. Johnson's *Life of R. Ascham*, prefixed to his works (1767); E. Grant, *De Vita Rogeri Ascham* (1576) is the original source, but the best life is in German by A. Katterfeld (Strassburg, 1876).

Asch'bach, JOSEPH: German historian; b. at Höchst, near Frankfort-on-the-Main, April 29, 1801. He became Professor of History at Bonn 1842, and in 1853 at Vienna. He was ennobled 1870, retired 1872. D. in Vienna, April 25, 1882. His most important works are a *History of the Emperor Sigismund* (4 vols., 1838-45); *Allgemeines Kirchenlexicon* (4 vols., 1846-50); and *Roswitha und Conrad Celtes* (1867). He also wrote a *History of the Visigoths* (1827); a *History of the Omeyyades in Spain* (2 vols., 1829-30); and a *History of Vienna University* (3 vols., 1865-88).

Asch'ersle'ben: a town of Prussia; province of Saxony; on the river Eine; 18 miles W. S. W. of Magdeburg (see map of German Empire, ref. 4-F). It has about seven churches, one synagogue, and a gymnasium, and is surrounded by a strong wall. Here are manufactures of flannel, frieze, linens, pottery, and brandy. Pop. (1890) 22,893.

As'cians, or **As'cii** [from Gr. *ἄσκιος*, shadowless; *ἄ-*, not + *σκιά*, shadow]: the people of the torrid zone, who twice in the year have the sun perpendicularly above their heads, and hence are without shadow.

Ascid'ia, or **Ascid'ians** [from Gr. *ἀσκίδιον*, dimin. of *ἀσκός*, leathern bottle]: a sub-class of animals belonging to the class *Tunicata*. The words ascidian and tunicate have often been used as synonyms. They are flask-shaped, attached by one end, and inclosed in a gelatinous or leathery tunic, and have the mouth and the anal orifice usually close together. This external tunic was formerly regarded as corresponding to the mantle of the mollusks, with which the tunicates were associated. The greater part of the cavity of the mantle is occupied by the branchial sac, which has numerous slit-like perforations, and serves at once as pharyngeal cavity and as respiratory organ. They have no eyes or other organs of special sense, but they have hearts and a circulation of blood, with a remarkable peculiarity that its direction is sometimes reversed. In their mature state they are fixed by the base to some solid substance, as a rock or seaweed, but the young, resembling tadpoles in form, swim by means of a vibratile tail, which disappears when they

settle. These young forms are in many respects fish-like, a fact which has led naturalists to the conclusion that the group of tunicates are degenerate descendants from a fish-like type. The majority of the group are solitary or simple forms, but some of them live in colonies formed by budding, the members of which are connected by a stem, though each has its own heart, respiratory apparatus, and digestive organs. In other kinds, called compound ascidians, the tunicates of many are united into a mass, and they form systems like zoöphytes. The individuals in these systems have always sprung by gemmation from one, and both the solitary and compound ascidians propagate by eggs. "In the dim obscurity of the past," says Darwin, "we can see that the early progenitor of all the *Vertebrata* must have been an aquatic animal provided with branchiae, with the two sexes united in the same individual, and with the most important organs of the body (such as the brain and heart) imperfectly developed. This animal seems to have been more like the larvæ of our existing marine ascidians than any other known form." *Descent of Man* (vol. ii., p. 372). See TUNICATA.

Revised by DAVID S. JORDAN.

Ascidi'um [for etymology, see ASCIDIA]: in botany, a hollow, pitcher-shaped body which occurs on the leaves of certain plants, as *Nepenthes* and *Sarracenia*. It usually contains water, and is sometimes furnished with reflexed hairs, which prevent the escape of insects that fall into it. (See NEPENTHES.) In zoölogy, a genus of tunicates belonging to the *Ascidia*.

Ascit'es [from Gr. ἀσκίτης (sc. νόσος, disease), a kind of dropsy; from ἀσκός, leathern bottle]: dropsy of the abdominal cavity is most frequently an indication of portal obstruction caused by "cirrhosis" or other disease of the liver, which hinders the return of venous blood to the heart and causes pressure in the veins, leading to transudation of serum into the peritoneal (abdominal) cavity, whence the name. In other cases it is a symptom of general dropsy; or it may result from cancer or tubercle of the peritoneum; or, in children especially, it may appear as a temporary and quite inexplicable phenomenon, without serious danger or distress. Ascites must be regarded in almost all cases as a very grave symptom of disease, yet there are not a few cases where the immediate danger passes away, and the patient becomes for the time comfortable; but such results are temporary and unfrequent. The treatment is governed by the cause, but is largely palliative. Diuretics may be useful, but hydragogue cathartics are much more effective in relieving the symptom. Tapping may be practiced where the dropsy very seriously distends the abdomen.

Revised by WILLIAM PEPPER.

Asclepiada'ceæ: See MILKWEED FAMILY.

Asclepi'adæ [Gr. Ἀσκληπιάδαι]: among the ancient Greeks, those who were reputed to be the descendants of Æsculapius, the god of medicine; afterward those who were trained in his temples (Asclepiions) in the science and art of healing. Aristotle, though not a physician, was one of the family of the Asclepiadæ. Young men designed for the medical vocation, if sons of physicians, began their studies before their twentieth year; others, after a preparatory education lasting from the seventeenth to the twentieth year; in both, the special medical training probably did not end before their twenty-fifth year. Much secrecy and exclusiveness were observed in their initiation; and after the first ordeal of preparation had been passed, at the commencement of the ceremonies of illumination, the HIPPOCRATIC OATH (*q. v.*) was administered to the candidate. At the close of the period of training came the ceremony of coronation, by which the young Asclepiadæ were fully introduced into the profession of medicine. See Watson, *Medical Profession in Ancient Times* (New York, 1856).

Asclepiade'an Verse [from its inventor, *Asclepiades*]: a logædic measure (see LOGÆDIC) made up of trochees and irrational dactyls. In Horace the first foot is always a spondee. The Lesser Asclepiadean runs thus:

Ma'ece | na's ata | vi's || e'dite | re'g i | bu's. *Od. i. i. 1.*

The Greater Asclepiadean thus:

Tu' ne | quae'sie | ri's || se'ire ne | fa's || que'm mihi | qu'em ti | bi'.
Od. i., xi. 1.

See Schmidt's *Rhythmic and Metric*, transl. by White (pp. 97-99).

Asclepi'ades [in Gr. Ἀσκληπιάδης]: celebrated Greek physician; b. at Prusa, in Bithynia; flourished about 100 B. C.

He practiced at Rome, where he founded a school, and was very popular with the Romans on account of his pleasant and simple remedies. His maxim was that a physician ought to cure his patients safely, speedily, and agreeably. He relied much on diet, bathing, and exercise or gestation. He wrote several works, of which only small fragments are extant. See C. G. Gumpert, *Asclepiadis Bithyni Fragmenta* (Weimar, 1798); G. F. Bianchini, *La Medicina d'Asclepiade* (Venice, 1769); A. G. M. Raynaud, *De Asclepiade medico ac philosopho* (Paris, 1862).

Ascle'pias [named, on account of its medicinal virtues, from Ἀσκληπιός, the Greek name of Æsculapius, the god of medicine]: a genus of perennial herbaceous plants, the type of the family *Asclepiadaceæ*, mostly natives of the U. S. The corolla is wheel-shaped and reflexed, the crown or coronet is fleshy, and each of its hooded appendages has an incurved horn. The *Asclepias cornuti* (or *A. syriaca*) (milkweed or silkweed) is an American plant, abounding in an acrid milky juice, which contains caoutchouc. The seed-vessels are filled with a silky down, which is sometimes used for stuffing pillows. The fiber of the stem is said to be valuable for ropes. The *Asclepias tuberosa*, sometimes called pleurisy-root or butterfly-weed, has handsome flowers. Its root is used as an expectorant and diaphoretic. Many other species of *Asclepias* grow in the U. S.

As'coli. GRAZIADIO ISAIA: the most eminent linguistic student Italy has produced in the nineteenth century; b. at Göritz, of Jewish parents, July 16, 1829; became Professor of Comparative Philology in the Accademia Scientifico-letteraria of Milan in 1860; made senator in 1889. He is one of the small group of eminent scholars in Europe and America (e. g. Bopp, Brugmann, Whitney) who have given to the study of language its rigidly scientific character. His investigations have extended to very widely diverse fields, and everywhere have led to brilliant results. In his *Studj orientali e linguistici* (1854), and his *Fonologia comparata del sanscrito, del greco e del latino* (1870), as well as in his *Saggi indiani*, published in the *Archivio glottologico italiano*, he has shown himself a master of the larger science of comparative Indo-Germanic philology. His brilliant studies in Romance philology (Wallach, Roumanian, Rhaeto-Romansch, and especially in the dialects of Italy) have given a firm basis to important divisions of this science. His *Saggi ladini* (also first published in the *Archivio*), in which these studies are summed up, must long remain essential for the study of the origins of the Italian and more closely allied Romance tongues. His Celtic researches also have been most fruitful; and he has touched upon the Semitic languages. He was the founder in 1873 of the *Archivio glottologico italiano*, a review which has continued to be the organ of the best Italian students of language. See his *Studj Critici* (Torino, 1877), German trans. by Merzdorf, *Kritische Studien zur Sprachwissenschaft* (1878); also, *Vorlesungen über die vergleichende Lautlehre des Sanskrit, des Griechischen und des Lateinischen* (trans. by Bazzigher and Schweizer-Sidler), 1872. A. R. MARSH.

Ascoli di Satria'no: an episcopal city of Italy, in the province of Foggia; 25 miles by rail S. E. of Foggia, on the eastern slope of the Apennines (see map of Italy, ref. 6-G). Near it, Pyrrhus, in 279 B. C., won a great victory over the Romans, and in 1246 A. D. an imperial army crushed the Apulian insurgents led by Cardinal Rainer. Pop. about 10,000.

Ascoli-Piceno, aas'kō-lēē pee-chay'nō: a province of the Marches, Central Italy; bounded N. by Macerata, E. by the Adriatic Sea, S. by Teramo, and W. by Perugia. Area, 808 sq. miles. The province consists chiefly of mountain-ridges running parallel to each other, the portion on the coast being of superior beauty. Chief town, Ascoli-Piceno. Pop. (1879) 210,610; (1890) 214,927.

Ascoli-Piceno (anc. *Asculum Picenum*): an old episcopal city of Central Italy; province of the same name, situated on a hill and on the river Tronto, 53 miles S. of Ancona (see map of Italy, ref. 5-E). It commands a fine view of the Apennines, a few miles distant. It is well built, and has a cathedral, a museum, a theater, a library, and many private palaces. It was annexed to the Papal States in 1426. A battle was fought here between Tancred of Sicily and the Emperor Henry VI. of Germany, in which the latter was defeated (1190). Pop. 23, 847.

Ascomyce'tes [literally sac-fungi; from Gr. ἀσκός, bag + μύκης, -ητος, mushroom]: a class of (mostly) parasitic plants

much degraded from general red seaweed type. They produce enlarged end-cells which divide internally into spores. These spore-sacs are known as *asci* (sing. *ascus*), and the spores as *ascospores*. The class may be divided into seven orders: viz., (1) simple sac-fungi (*Perisporiaceæ*); (2) subterranean sac-fungi (*Tuberoideæ*); (3) black-fungi (*Pyrenomycetæ*); (4) lichens (*Lichenes*); (5) eup-fungi (*Discomycetæ*); (6) rusts (*Uredineæ*); (7) smuts (*Ustilagineæ*). These include many families, not a few of which are composed of very harmful parasites. With the sac-fungi are commonly associated three orders of "imperfect fungi," viz., *Sphaeropsidæ*, *Melanconieæ*, and *Hyphomycetæ*. Although the details of the structure of these latter are not fully known, it is probable that they are sac-fungi. Of the sac-fungi proper about 13,000 species are known, and of the "imperfect fungi" about 8,000.

CHARLES E. BESSEY.

Asco'nus Pedia'nus, QUINTUS: Roman critic and commentator; b. probably at Padua, and lived from about 3-88 A. D. He taught at Rome, and wrote a reply to the critics of Vergil. Among his works were valuable commentaries on Cicero's *Orations*. Poggio Bracciolini found in 1416 at St. Gall commentaries on these orations—*In Verrem*, *In Divinationem*, *Pro Cornelio*, *In Toga Candida*, *In Pisonem*, *Pro Scauro*, and *Pro Milone*. The first two of these are no longer considered genuine by scholars. (Best edition of genuine commentaries by Kiessling and Schoell, Berlin, 1875.) He wrote a *Life of Sallust*, which is not extant. M. W.

Ascut'ney Moun'tain: an isolated mass of granite in Windsor co., Vt., 3,165 feet above the level of the sea (see map of Vermont, ref. 8-C). Its summit affords an extensive and beautiful view of the valley of the Connecticut river.

Asel'li, GASPARO: an Italian anatomist and physician; b. at Cremona about 1580. He became Professor of Anatomy at Pavia, and acquired distinction by the important discovery of the lacteal vessels in 1622. He wrote on this subject a treatise entitled *De Lactibus sive Lacteis Venis* (published in 1627, a year after his death).

Asexual Generation: See ALTERNATION OF GENERATIONS.

Asfeld, CLAUDE FRANÇOIS BIDAL, Marquis, d': an able French general; b. in 1667. He served with distinction in Spain, and commanded the French cavalry at Almanza in 1707. He was second in command under Villars in Italy in 1733, was commander-in-chief in Germany in 1734, and became a marshal of France in that year. D. Mar. 7, 1743.

Asgard: the heavenly residence of the Scandinavian gods. See SCANDINAVIAN MYTHOLOGY.

Asgill, Sir CHARLES: British general; b. in 1762. He served against the U. S., and having been captured at Yorktown was selected by lot from the prisoners to be hung in retaliation for the death of an American officer, but he was saved by the intercession of the French court. D. in 1823.

Ash: an important tree of the genus *Fraxinus* and family *Oleaceæ*, distinguished by imperfect flowers, sometimes destitute of corolla, and leaves unequally pinnate. The fruit (*samara*) is winged. The genus *Fraxinus* comprises about thirty species, mostly natives of Europe and North America, and valuable for timber, for fuel, and shade trees. The *Fraxinus excelsior*, the common ash of England, is a beautiful ornamental tree, and the timber is much esteemed by carpenters, joiners, coachmakers, and wheelwrights. It grows to the height of 100 feet or more. Cultivation has produced several varieties of it, among which is the weeping-ash, the branches of which droop nearly to the ground. The *Fraxinus ornus*, or flowering ash, a native of Southern Europe, has more perfect flowers than the other species. A saccharine substance called manna is obtained from it by making incisions in the bark, and sometimes exudes spontaneously. Among the noblest trees of the genus is the *Fraxinus americana*, or white ash, which is abundant in the Northern and Middle U. S. Its leaflets are petiolate, ovate, or lance-oblong, entire, acuminate, and in autumn are changed to a dark brown or purple tint. The timber is tough, and valuable for the same purposes as the *Fraxinus excelsior*. In the forests of the U. S. occur also *F. viridis* (green ash), *F. pubescens* (red ash), *F. quadrangulata* (blue ash), and others. The black ash (*F. sambucifolia*) has a tough wood separable into thin layers, and is used in basket-making. The mountain-ash, conspicuous for its clusters of red berries, is a species of *Pyrus*, having no affinity with the genus *Fraxinus*.

Revised by CHARLES E. BESSEY.

Ashan'tee: an extensive kingdom of Western Africa, Upper Guinea, nominally tributary to the British Gold Coast colony; is between lat. 5° and 9° 30' N., and between lon. 0° 55' E. and 4° 7' W. It lies inland from the coast between the Volta and Comoe rivers. Area about 40,000 sq. miles. Population estimated at from 1,000,000 to 3,000,000. It is generally mountainous, well watered and fertile, and covered with dense forests, which are almost impenetrable. The staple products are maize, rice, sugar, yams, tobacco, cocoanuts, gums, and dyewoods. Gold is said to be abundant here, and the chief articles of export are gold-dust, palm oil, and slaves. The people are warlike and fierce, and human sacrifices are common. They have some skill in the manufacture of sword-blades, cotton cloths, and golden ornaments. The government is a despotism. Capital, Coomassie (or Kumassi). The British, who have a fort on the coast at Cape Coast Castle, were involved in a war with the Ashantees, which began in 1807, and continued until 1825. The Dutch also had a colony on the coast until 1871, when they ceded it to the British.

In 1873 a war arose between the Ashantees and the British, because the British refused to pay the annual tribute to the King of Ashantee which the Dutch had formerly paid him. The Ashantees first attacked the Fantis, living under British protection, entirely defeated them, and subsequently succeeded in driving all the natives friendly to the British into the two forts, Elmina and Cape Coast Castle. The British troops under Sir Garnet Wolseley then invaded Ashantee, pushed forward directly toward Coomassie, and after some fighting took it and burned it. The King of Ashantee agreed to pay an indemnity to the British, and the war ceased. Trouble having again arisen in 1895, another expedition, under Sir Francis Scott, was sent. Coomassie was taken, a protectorate declared, and the king carried to Cape Town as a hostage, Jan., 1896.

Ash'burton, ALEXANDER BARING, Lord: an English diplomatist; b. in London, Oct. 27, 1774; was a son of Sir Francis Baring, an eminent merchant. He was employed in his youth in mercantile affairs in the U. S., and married a daughter of Senator William Bingham of Pennsylvania (1798). In 1810 he became the head of the firm of Baring Brothers & Co. of London. He represented Taunton (1806-26), Callington (1826-31), Thetford (1831-32), North Essex (1833-35), in Parliament, in which he acted with the Liberal party until 1831, when he became a supporter of Sir Robert Peel and a moderate Conservative. He was created Baron Ashburton in 1835. In 1842 he was sent as a special ambassador to the U. S. to settle a dispute which had long been pending in relation to the northeastern boundary. He was selected for this mission because he was acquainted with the American people and institutions, and was inclined to a pacific policy. Lord Ashburton and Mr. Webster negotiated this important treaty, which was signed at Washington in Aug., 1842, and was called the Ashburton Treaty. For this service Parliament accorded him a complimentary vote of thanks. D. at Longleat, May 13, 1848, and was succeeded by his son, William Bingham Baring.

Ashby, TURNER: a Confederate general; b. at Rose Hill, Fauquier co., Va., 1824. He was appointed a brigadier-general in 1862, and was greatly distinguished as a cavalry commander. During Banks's pursuit of Jackson in the Shenandoah valley, Gen. Ashby was in command of cavalry covering the rear of Jackson's army, and in an engagement near Harrisonburg, June 5, 1862, he was shot through the body and killed. His loss was severely felt by the Confederates, he being one of their ablest and bravest cavalry leaders.

Ashby-de-la-Zouche, -zooch': a market-town of England, in Leicestershire; 20 miles by rail N. W. of Leicester (see map of England, ref. 9-H). It has a ruined castle in which Mary Queen of Scots was once confined, and an ancient church in which was the burial-place of the Hastings family. Here are iron smelting-works and manufactures of hats and hosiery. Coal mines and salt-springs occur in the vicinity. Pop. 8,500.

Ash'dod, or **Azo'tus** (modern *Asdood* or *Esdūd*): an ancient city of the Philistines, in Palestine, about 3 miles from the Mediterranean and 12 miles N. E. of Ascalon (see map of Palestine, ref. 10-B). It was an important city and stronghold of the Philistines, who, after defeating the people of Israel in the time of Samuel, captured their ark and carried it to the temple of Dagon in Ashdod. It was dismantled by Uzziah, besieged by Psammetichus, and destroyed by the

Maccabees. It is called *Azotus* in the New Testament (Acts viii. 40). Near its site is a village of mud-houses called *Asdood* or *Esdûd*, on the sea 21 miles S. of Jaffa.

Ashe, JOHN: a general and patriot of the Revolution; b. at Grovelly, Brunswick co., N. C., in 1720: he took an active part in the political movements which preceded the Revolution, and served as a brigadier-general during the war. D., a prisoner of war, in Sampson co., N. C., Oct. 24, 1781.

Ash'e, or Ashi: Jewish rabbi of Sora, in Babylonia (353-427 A. D.). He was eminent for his learning and genius, and was the founder of the Babylonian *Talmud*. Devoting his life to the organization of the vast mass of commentary (Gemara) on the *Mishna*, he laid the foundation on which his successors built.

Revised by C. H. Toy.

Ash'er: a tribe of ancient Israelites, descended from Asher, eighth son of Jacob by the handmaid Zilpah. They were assigned a portion of land in the N. W. of Palestine, but never entirely dispossessed the Canaanites and Phœnicians who dwelt there. The tribe furnished but one noteworthy person, the prophetess Anna, who lived during the infancy of Christ (Luke ii. 36-38). The territorial boundaries and the history of this tribe are very obscure.

Ashe'ra: a Phœnician idol or image, most probably representing the goddess Ashtoreth. The image was always of wood, and is frequently mentioned in the Old Testament.

Ash'es: the solid or earthy residuum left after the combustion of wood, coal, or other organic substances. The most important ingredient of the ashes of land-plants is potash, or a salt of potash with a portion of lime and silica. The potash is extracted from ashes by a process called lixiviation—leaching. By dissolving the salt contained in the ashes the water is converted into lye, which is afterward evaporated by boiling. The insoluble part of the ashes remaining after lixiviation is called leached ashes, which is composed of carbonate of lime, phosphate of lime, oxide of iron, etc. The ashes of marine plants, and those that grow near the sea, contain soda instead of potash, with a small portion of iodine. The soda is also separated from the insoluble mass by lixiviation. Wood-ashes are extensively used in the manufacture of soap, and are useful as manure. The salts obtained from them by lixiviation are called potash and pearlash, which latter is a carbonate of potassa. Bone ashes consist mostly of phosphate of lime, which is a valuable manure. See AGRICULTURAL CHEMISTRY, POTASSIUM, and SODA-ASH.

Asheville: city; capital of Buncombe co., N. C.: between the French Broad and the Swannanoa rivers; on the Southern Railway; 142 miles W. by S. of Salisbury (for location, see map of North Carolina, ref. 5-E). It is in a tobacco-growing region, at an elevation of 2,389 feet above sea-level, and is widely known as a summer and winter health resort. It contains 24 churches, 4 public-school buildings, 8 other educational institutions, 2 libraries, 2 national and 2 State banks, 15 hotels, 2 daily and 4 weekly newspapers, 5 tobacco warehouses, and flour, cotton, and wood-working mills. Pop. (1880) 2,616; (1890) 10,235; (1900) 14,694.

Ash'hurst, JOHN, JR., A. M., M. D.: surgeon; b. in Philadelphia, Pa., Aug. 23, 1839; M. D., University of Pennsylvania, 1860; acting assistant surgeon, U. S. army, 1862-65; surgeon to the Episcopal Hospital, Philadelphia, 1863-80; appointed Professor of Clinical Surgery, University of Pennsylvania, 1877; vice-president surgical section, International Medical Congress, 1876; author of *Injuries of the Spine* (1867); *Principles and Practice of Surgery* (5th ed. 1889); editor *International Encyclopædia of Surgery* (6 vols., rev. ed. 1888).

Ash'land: railroad junction; Boyd co., Ky. (for location of county, see map of Kentucky, ref. 2-K); on the Ohio river, 13 miles below Catlettsburg. It has large blast-pig-iron furnaces, complete rolling-mill, and a Bessemer-steel plant, and manufactures steel nails, fire-brick, and furniture extensively. Iron ore, pig iron, and bituminous and cannel coal are shipped from this point. Pop. (1880) 3,280; (1890) 4,195; (1900) 6,800.

EDITOR OF "NEWS."

Ashland: town; Cass co., Ill. (for location of county, see map of Illinois, ref. 6-C); on Chi. and Alt. and Ohio and Miss. R. Rs.; 21 miles from Springfield; is an important shipping-point for grain and other agricultural products. Pop. (1880) 609; (1890) 1,045; (1900) 1,201.

Ashland: town; Middlesex co., Mass. (for location, see map of Massachusetts, ref. 2-H); 24 miles S. W. of Boston. The chief business is the manufacture of boots and shoes,

boxes and thread. Pop. of township (1880) 2,394; (1890) 2,532; (1900) 1,525.

EDITOR OF "ADVERTISER."

Ashland: village; Saunders co., Neb. (for location of county, see map of Nebraska, ref. 7-K); on B. and M. Riv. R. R. and on Salt Creek, about 3 miles from its entrance into the Platte river; 24 miles N. E. of Lincoln. It is surrounded by a rich farming district, which contains superior magnesian limestone. Pop. (1880) 978; (1890) 1,601; (1900) 1,477.

Ashland: town; on New York, Pennsylvania and Ohio R. R.; county seat of Ashland co., O. (for location of county, see map of Ohio, ref. 3-G); 65 miles S. W. of Cleveland, and 85 miles N. N. E. of Columbus; has ten churches, elegant public schools, and Ashland University. There are several manufactures, and a railway north and south is under construction. Has one daily, one semi-weekly, and two weekly papers. Pop. (1880) 3,004; (1890) 3,566; (1900) 4,087.

EDITOR OF "GAZETTE."

Ashland: town and health-resort; on railroad, Jackson co., Or. (for location of county, see map of Oregon, ref. 7-C); the largest town in Southern Oregon; situated in a fruit region. It has a high school, water-power, a woolen factory, planing-mills, quartz mines and mills, abundance of pure mountain water, etc. There are numerous mineral springs here and in the vicinity. Pop. (1880) 842; (1890) 1,784; (1900) 2,634.

EDITOR OF "TIDINGS."

Ashland: borough in the Mahanoy valley; in the center of the anthracite coal-fields of Schuylkill co., Pa. (for location of county, see map of Pennsylvania, ref. 5-H); on Phil. and Reading and Le. Val. and Pa. R. Rs.; 13 miles from Pottsville, the county-seat. It has large machine-shops, foundries, factories, etc., and extensive mining industries. Pop. (1880) 6,052; (1890) 7,346; (1900) 6,438.

PROPRIETOR OF "EVENING TELEGRAM."

Ashland: on railroad, Hanover co., Va. (for location, see map of Virginia, ref. 6-H); 17 miles N. of Richmond. In May, 1864, Gen. Sheridan, in the course of a raid, destroyed a dépôt here. It is the seat of Randolph-Macon College. Pop. (1880) 764; (1890) 948; (1900) 1,147.

Ashland: city on Chequamegon Bay, Lake Superior; 181 miles from St. Paul, 410 miles from Chicago; capital of Ashland co., Wis. (for location of county, see map of Wisconsin, ref. 2-C). Ashland is the fifth port on the Great Lakes in tonnage of vessels entered and cleared; is terminus of four railroads (Northern Pacific, Wis. Cent., Ch., St. P., Min. and O., and Mil., Lake Sh. and W.); has several churches, public and parochial schools, a business college, and Federal buildings. It is the center of vast lumber, iron, and brown-stone industries. Its ore docks are immense; capacity, 100,000 tons. Ashland has two very large charcoal blast-furnaces, used in manufacture of pig iron. In 1892 175,000,000 feet of lumber were produced here, and 2,300,000 tons of ore were shipped. The real growth of Ashland dates from the development, in 1885, of iron mines in the Gogebic range, 40 miles S. E. Pop. (1890) 9,956; (1900) 13,074.

EDITOR OF "NEWS."

Ash'lar: originally a large block of stone with squared sides, smoothly cut and dressed on its beds and joints. But the word is now more generally used as an adjective applied to cut stonework, or to a number of dressed stones laid in place. See MASONRY.

Ash-leaved Maple: See BOX-ELDER.

Ash'ley: a small river of South Carolina; rises in Colleton County, and flowing southeastward, unites with the Cooper river at Charleston.

Ashley: village; Washington co., Ill. (for location of county, see map of Illinois, ref. 9-E); on Ill. Cent. and L. and N. R. Rs.; 62 miles from St. Louis; in a farming and fruit-growing district. Pop. (1890) 1,035; (1900) 953.

Ashley: borough; Luzerne co., Pa. (for location of county, see map of Pennsylvania, ref. 3-11); on Cent. R. R. of N. J.; 3 miles from Wilkesbarre; is in a coal-mining district, and has manufactories of machinery. Pop. (1880) 2,799; (1890) 3,192; (1900) 4,046.

Ashley, LORD: See SHAFTESBURY.

Ashmead-Bartlett, Sir ELLIS, M. P.: English statesman; b. at Brooklyn, N. Y., 1849; educated at Oxford University; was called to the bar 1877; entered Parliament 1880; held the position of Civil Lord of the Admiralty in Lord Salisbury's administration; has been a frequent speaker in the

House and on public platforms, and is noted for his antipathy to Russia. His brother is married to Baroness Burdett-Coutts.
C. H. T.

Ash'mole, ELIAS, F. R. S.: b. at Lichfield, England, May 23, 1617; was educated at Oxford, and served as gentleman of ordnance under King Charles I. in the civil wars. In 1646 he turned his attention to the study of judicial astrology and Rosierucianism, and Oct. 16 of that year became one of the earliest English Freemasons. He was Windsor Herald 1660-75. In 1659 the younger Tradescant gave him his collection of curiosities, which Ashmole presented in 1682 to Oxford University. It was the basis of the present Ashmolean Museum. He wrote *Theatrum Chemicum Britannicum, containing severall poetecall pieces of our famous English philosophers, who have written the hermetique mysteries in their owne ancient language* (1652); *The Way to Bliss* (1658); *History of the Order of the Garter* (1672); *Antiquities of Berkshire* (3 vols. folio, 1719); and a whimsical *Diary* (1717). D. in London, May 18, 1692.

Revised by HENRY A. BEERS.

Ash'muu, JEHUDI: a promoter of colonization in Liberia; b. at Champlain, N. Y., in April, 1794; graduated at University of Vermont, 1816; became professor in Bangor Theological Seminary, later entered the Episcopalian Church; went to Liberia in 1822 as an agent of the Colonization Society, and rendered important services. D. in New Haven, Conn., Aug. 25, 1828. See his *Life* by R. R. Gurley (2d ed. 1839).

Ashmuunen: See HERMOPOLIS MAGNA.

Ashoka: See ASOKA.

Ashtabu'la: important railroad center, Ashtabula co., O. (for location of county, see map of Ohio, ref. 1-J); 55 miles E. of Cleveland, and the principal town between that city and Erie. It has extensive railroad connections with the coal-mining regions of Ohio and Pennsylvania and the great manufacturing districts of Pittsburg and the Mahoning valley. It has a splendid harbor, and receives the largest amount of iron ore of any port in the U. S., and in the amount of ore shipped it is surpassed by few on the lakes. The town has electric light, water-works, electric street railroad, fine public buildings, and is becoming an important manufacturing center. Pop. (1870) 1,999; (1880) 4,445; (1890) 8,338; (1900) 12,949. EDITOR OF "NEWS."

Ash'taroth: See ASHTORETH.

Ash'ton-in-Ma'kerfield: a town of England, in South Lancashire (see map of England, ref. 7-F). The inhabitants are mostly employed in cotton-factories and in collieries. Pop. (1891) 13,379.

Ashton-under-Lyne: a town of England; in the S. E. part of Lancashire; on the Tame; 6½ miles by rail E. S. E. of Manchester (see map of England, ref. 7-G). It is a great seat of the cotton manufacture, and is remarkable for the rapidity of its growth. It returns one member to Parliament. It has a church built in the time of Henry V., a theater, a mechanics' institute, etc. Many of the inhabitants are employed in calico-printing, bleaching, dyeing, and the manufacture of machines. Pop. (1881) 37,040; (1891) 40,494.

Ash'toreth, or (in plural form) **Ash'taroth**: a Syrian goddess, worshiped by the ancient Israelites and other nations of Western Asia. She was called the Queen of Heaven, and appears to have been a personification of the moon. The Greek and Latin name for her is Ashera, translated "grove" in the Authorized Version of the Bible; it should be rendered "statue." Her worship existed in the days of Abraham and is incidentally mentioned in all parts of the Old Testament. She is commonly identified with ASTARTE (*q. v.*). Her chief temples were at Tyre and Sidon.

Revised by S. M. JACKSON.

Ashur: See ASSHUR.

Ashville (North Carolina): See ASHEVILLE.

Ash-Wednesday (in Lat. *Di'es Cin'erum*; literally, day of ashes): the first day in Lent, also known as *Caput Jejunii*, the head or beginning of the fast; called *Ash Wednesday* because in ancient times it was the custom for penitents to appear in the church covered with sackcloth and ashes. In the English Prayer-book the "Commination" service is used on Ash-Wednesday as a provisional substitute for the "godly discipline" to which, of old, offenders were subjected to on this day. Portions of this service were incorporated into the Ash-Wednesday office in the American

Book of Common Prayer in 1789; and "A Penitential Office for Ash-Wednesday" has been appended to the "Special Prayers and Thanksgivings" in the Standard of 1892.

W. S. PERRY.

Asia, ā'shi-a: the largest continent on the globe; has been commonly supposed to be the oldest habitat of the human race. It comprises nearly one-third of the land-surface of the earth, having about 17,000,000 sq. miles and about 900,000,000 inhabitants, or nearly two-thirds of the entire population of the earth. Asia is bounded N. by the Arctic Ocean, touching the 78th parallel N. latitude; on the E. by the Pacific, S. by the Indian Ocean, S. W. by the Red Sea, lying between it and Africa, and W. by Europe and the Mediterranean, Black, and Caspian Seas. The coast-line exceeds 33,000 miles, and is indented by great bays and gulfs, forming the great peninsulas of Asia Minor, Arabia, India, Siam, Annam, Korea, and Kamtchatka. Connected with Africa by the narrow Isthmus of Suez, this has been penetrated by the Suez Canal, uniting the Red Sea with the Mediterranean. On the N. E. the narrow Bering Strait separates it from the continent of America.

Mountains, Rivers, etc.—The mountains of Asia surpass in height those of all other parts of the globe, the loftiest summit being Mt. Everest, in the Himalayas, 29,002 feet, while the mean height of the range (running in Southern Asia between India and Tibet) is 18,000 feet. The long chain of Altai Mountains stretches 3,000 miles across Northern Asia; the Ural Mountains divide Asia from Europe. The mountains of the Caucasus are 10,000 to 18,000 feet high; Mt. Ararat, in Armenia, is 17,212 feet; the Taurus Mountains in Asia Minor, the Kamtchatka range in Northeastern Asia, and many other heights, diversify the whole face of the country. Immense plains or steppes (the plain of Siberia being larger than all Europe) lie between the mountain-ranges. The table-land of Tibet (over 16,000 feet high), of Afghanistan and adjacent countries, of Persia (2,000 to 6,000 feet), of Hindustan, etc., represents other great natural features of Asia. Asia has great rivers flowing hundreds of miles through fertile regions, the Indus, Ganges, Euphrates, Tigris, Hwang-Ho, Amúr, Obi, Yenisei, and Yang-tse-kiang being the chief. Lakes abound, and the great Caspian Sea and Aral Lake are the principal inland bodies of water. Geologists find evidence of great structural changes, indicating the very recent formation of large portions of Asia. Vast areas of dry land were once covered by water. No active volcanoes exist in the interior, but several are found on the east coast. Traces of glacial action abound on the Himalayas.

Climate, Soil, and Productions.—The extremes of heat and cold are found in Northern and Southern Asia, the mean temperature of Upper Siberia being near zero, and the highest mean temperature of India about 82°, with continuous heat, at some seasons, much nearer 100°. A large part of Asia lies in the temperate zone, and has a mild climate. The bleak regions of Northern Asia have a sterile soil, with very little rainfall, the earth being frozen constantly to a depth of 300 feet. The hotter regions near the Indian Ocean and China Sea are subject to violent cyclones or typhoons, and the heated air blown over Southern Asia by the S. W. monsoon brings watery vapor and heavy falls of summer rain. The annual rainfall varies from 5 to 100 inches. The great diversities of climate, water-distribution, and soil yield a corresponding variety of natural productions. In forestry, while vast regions of territory have been wholly stripped of trees, pines, birches, and willows abound in the N., balsams, palms, acacias, banyans, breadfruit, magnolia, cedars, etc., in Southern and Central Asia. Medicinal plants, dyewoods, and spices grow in profusion. China and Japan are the great cultivators of the tea-plant and the camellia. Rice is of Asiatic origin, and in the cooler regions wheat, oats, barley, rye, buckwheat, maize, and millet are grown. Bananas, plantains, yams, sugar-cane, pepper, tobacco, indigo, cotton, hemp, flax, and that baneful plant the opium poppy, are largely cultivated. The orange, lemon, olive, peach, fig, mulberry, vine, etc., all are natives of Asia. Among the animals are the ox, buffalo, sheep, goat, horse, camel, elephant, yak, reindeer, dog, ape, bear, fox, lion, tiger, leopard, boar, rhinoceros, etc. Among birds are the eagle, vulture, raven, owl, heron, swan, goose, duck, flamingo, albatross, pigeon, nightingale, bird of paradise, parrot, ostrich, etc. The cobra and other serpents infest the tropical regions. Fish are abundant in the inland and ocean waters.

Insect life is rampant in the warmer regions, and the locust in innumerable swarms often devastates wide areas. The great fertile districts, cultivated by native industry, sustain the enormous population and yield surplus productions for export, roughly estimated at \$450,000,000 per annum. Gold is found in Siberia and Japan; silver, in China, Asiatic Russia, Annam, etc.; mercury, tin, lead, copper, and iron, in Japan, Siberia, India, Persia, and Turkey; coal is mined in China, Japan, and Siberia; and salt is abundant. Asia is also rich in precious stones.

Civilization, Religion, etc.—Asiatic civilization, although differing widely from that of Europe and America, has its own peculiar development. Oriental culture reaches to a certain point, after which civilization is stationary instead of obeying the law of progress as in the Western nations. In Western Asia are the seats not only of Hebrew civilization, but of those great Oriental monarchies of the Babylonians, Assyrians, and Persians, among whom architecture, road-building, and the useful and decorative arts were carried to a high degree of perfection. In India, likewise, are the magnificent remains of an architecture far superior to anything erected by the modern Hindus. In the northern half of Asia the people live almost wholly by hunting or by keeping flocks in the great grazing regions. They are of a low order of intelligence, but in Siberia are peaceful tribes. The great Tartar race, embracing the Mongols, Manchus, and Turks, are divided into Buddhists and Mohammedans, and are gradually losing their nomadic and predatory habits, becoming more assimilated to Chinese civilization. The Chinese and Japanese are very little migratory, but are a settled people of traders and cultivators of the soil. In China Buddhism and Taoism prevail, but nearly everybody is also a follower of Confucius. The Japanese are mostly Buddhists, but some are followers of Shintō. Brahmanism is the religion of India, but in certain regions the Mohammedans are in the majority, while W. of India Asia is almost wholly Mohammedan, except some small districts of Syria and Asia Minor, where there is a population of Christians. The Greek Church has many adherents in Russian Asia, while the Armenians and Nestorians are numerous in Turkey and Persia. Vague estimates place the adherents of the native religions of Asia at 600,000,000, the Mohammedans at 90,000,000, the Christians at 12,000,000 (4,000,000 Roman Catholics, 7,000,000 Greek Church, and 1,000,000 Protestants, etc.), and the Jews at 350,000. Of savages, properly speaking, Asia holds few, and those in the remote hyperborean regions or in the southern archipelago.

Population, Language, etc.—The inhabitants of Asia are of the Mongolian, Aryan, and Semitic races, and their ancestry runs far back beyond recorded history. The Mongols include the whole of Eastern and Southeastern Asia—viz., the Chinese, Japanese, Tartars, Siamese, Turcomans, Kamtchatkans, Malays, etc. The languages used by this great division are very various, including the Arabic alphabet employed by all the Turkish varieties, the monosyllabic language of the Indo-Chinese, the rude dialects of the Arctic regions, and the Singhalese, Tamil, and Carnatic in Southern Asia. The Aryan race embraces the people of Afghanistan, Baluchistan, Persia, and Northern India. These use the Indo-European languages—viz., Sanskrit, Persian, and Armenian. The third great group includes the Syrian, Hebrew, and Arabian races, speaking the Semitic tongues. Among these various races and languages, between thirty and forty distinct nations are distributed.

History.—The oldest historical records are of Asiatic origin, and, however obscure, will be studied with increasing interest as time goes on. About 600 B. C. the union of the kingdoms of Babylonia, Assyria, Persia, and Media took place under Cyrus the Persian, whose dominion reached from the Mediterranean to the Indus. About 500 B. C. begin the remarkable records of the Vedic theology in India. The Persian monarchy was destroyed by Alexander about 330 B. C., soon after which his Asiatic empire was dissolved. The Roman invasions of Asia about the beginning of the Christian era, with the conflicts continued for centuries between them and the Persians, made no advance beyond Armenia. Christianity was born in Syria, spread rapidly over Asia Minor and the whole Roman empire, becoming the only religion of Europe, but producing no similar effects in Asia. Mohammedanism, with its spirit of conquest, made great advances and acquired a permanent foothold. The annals of Asia abound in records of tyranny and cruelty perpetrated by the Mohammedans, who have unquestionably obstructed its progress in civilization, and the predatory

warfare of the Tartar tribes of the Mongolian race fills many of the bloodiest pages of Asiatic history. The dynasties of India and China have been prolific in wars and rebellions, but the people, with their fixed customs and their productive soil, have remained and multiplied where their ancestors flourished thousands of years ago. A prodigious change was effected in Asia by the modern influx of British and Russian settlement. The British East India Company founded its powerful empire in the East upon its mastery of the great avenues of trade and shipping, and through the dominant and aggressive character of the British race Great Britain has become firmly established as the paramount power in India. At the same time she has competed with Russia in extending the outposts of European civilization farther and farther into Central Asia, and they now stand face to face on the confines of Afghanistan and the Pamirs. France is firmly planted in Southeastern Asia, and is contributing her share to the material and intellectual advancement of the Far East. A progressive spirit has taken a firm hold in Japan, and she has become a great power in the East. Korea is no longer a "hermit" nation; and even China under the influence of foreign contact has waked up and is assimilating European ideas and methods. The old-time exclusiveness is disappearing; the telegraph ramifies the land, and railways are beginning to stretch out over the provinces and bring them nearer to each other.

The following table gives the chief political divisions of Asia, together with their areas and population, according to the best authorities:

COUNTRIES.	Sq. miles.	Population.
Afghanistan.....	257,000	5,000,000
Annam.....	106,250	5,000,000
Arabia.....	1,230,000	5,000,000
Baluchistan.....	130,000	500,000
Bokhara.....	92,254	2,500,000
Cambodia.....	32,370	1,500,000
Caucasia.....	91,346	5,011,555
Ceylon.....	25,364	3,008,466
China proper.....	1,322,841	383,182,793
Dependencies.....	2,881,560	27,180,000
Cochin China.....	23,000	1,991,500
Cyprus.....	3,584	209,300
Hongkong.....	29	221,441
India—British, including Burma.....	965,000	221,173,000
French.....	205	282,900
Portuguese.....	1,080	561,400
Feudatory states.....	598,000	66,081,000
Japan, including Formosa.....	161,640	43,718,000
Kafiristan.....	5,000	200,000
Khiva.....	22,320	700,000
Korea.....	92,000	14,000,000
Persia.....	640,000	10,000,000
Russia in Central Asia.....	1,639,780	29,467,900
Siberia.....	4,925,000	6,000,000
Samos.....	289	43,901
Siam.....	200,000	5,000,000
Straits Settlements and dependencies.....	36,130	930,870
Tonquin.....	34,740	9,000,000
Turkey in Asia.....	686,370	22,500,000
Totals.....	16,203,152	869,964,026
Borneo.....	283,400	1,734,000
Java.....	50,848	23,064,086
Philippine islands.....	114,326	7,000,000
Sumatra.....	162,608	2,972,383
Totals.....	611,182	34,770,469
Totals for Asia.....	16,814,334	904,734,495

AINSWORTH R. SPOFFORD. Revised by R. LILLEY.

Asia Minor: the ancient name of a peninsula forming the western extremity of Asia, now called ANATOLIA (*q. v.*). It was bounded N. by the Euxine (*Pon'tus Euxi'nus*) and Propontis, S. by the Mediterranean, and W. by the Ægean Sea (*Æge'um Ma're*). The principal divisions were Bithynia, Cappadocia, Cilicia, Galatia, Ionia, Lyaonia, Lydia, Lycia, Mysia, Pamphylia, Phrygia, Pontus, and Paphlagonia, which will be noticed separately. The Mt. Taurus range extends through the southern part, and Anti-Taurus through the northern. The principal rivers are the Halys (Kizil-Irmak), which rises in the eastern part and enters the Euxine; the Sangarius (Sakareeyah), which also flows into the Euxine; and the Meander, which enters the Ægean Sea. Here flourished many famous and powerful kingdoms of antiquity, and here many conquerors in successive generations contended for supremacy. "We are now," says Malte-Brun, "to tread upon a soil rich in interesting and splendid recollections, with an existing population completely debased by ignorance and slavery. The glory of twenty different nations which





100 110 F 120 130 140 150 160 C 170 180 H 190 I Bering Str. J

F 90 Greenwich 110 H 120 I 130 J

once flourished in Western Asia has been extinguished: flocks wander over the tombs of Achilles and Hector; and the thrones of Mithridates and Antiochus have disappeared, as well as the palaces of Priam and Cræsus." Recently, however, much has been done to determine the boundaries and geographical characteristics of the nations which once flourished on this now desolate peninsula. In 1886, 1887, and 1888 Prof. W. M. Ramsay made extensive and careful explorations, and first determined in modern times the location of many of the ancient cities. He was able also to establish with considerable confidence the remarkable system of roads by means of which the country was traversed by the Romans. Scarcely less important was the work of Prof. J. R. S. Sterrett, carried on between 1882 and 1885, when by means of a systematic study of inscriptions he was able to make many determinations of great geographical value. See *The Historical Geography of Asia Minor*, by Prof. W. M. Ramsay (London, 1890); *The Wolfe Expedition to Asia Minor*, by J. R. S. Sterrett (Boston, 1888).

Revised by C. K. ADAMS.

Asiarchs: "certain chiefs of Asia" (Acts xix. 31), were wealthy citizens who had been chosen by the cities of that part of the province of Asia of which Ephesus was the metropolis under the Romans to preside at and indeed to pay for the public games, and watch that the customary rules and regulations were not infringed upon. The office was held only one year, and only by one man at a time, but the title was probably given to those who had held it, which accounts for Luke's plural. It was considered a high honor.

Revised by S. M. JACKSON.

Asiatic Societies: societies formed for the promotion of the knowledge of the language, literature, and history of the Asiatic nations. The first society of this kind was established by the Dutch at Batavia in 1780. The next was the Royal Asiatic Society of Bengal, founded at Calcutta by Sir W. Jones in 1784. Among those of more recent date are the Société Asiatique, founded at Paris in 1822; the Royal Asiatic Society of Great Britain and Ireland, 1823; the Asiatic Society of Ceylon, 1845; the German Oriental Society in 1845; the North China branch of the Royal Asiatic Society, established in 1847; the American Oriental Society in 1842; the Japan branch of the Royal Asiatic Society in 1872; and the Italian Asiatic Society, established in 1887.

Asina'rii [deriv. of Lat. *a'sinus*, ass]: a nickname originally given to the Jews because they were said to worship an ass, but afterward also applied to the Christians, against whom the same accusation was made. The story is told us by Tertullian (*Apology*, 16; *Ad Nat.*, 1, 14), and has been most curiously illustrated by a drawing scratched in mockery on the walls of the pedagogium in the palace of Cæsar in Rome some time in the second century, and representing some Christian convert worshipping a man with an ass's head hanging on a cross. Underneath in Greek is written "Alexamenos is worshipping God." The drawing was discovered in 1856 on a wall under the western angle of the Palatine, and is now preserved in the library of the Collegio Romano.

Asinins: See POLLIO.

Ask: in Scandinavian mythology, the first man created by Odin, Honer, and Loder from an ash-tree. See SCANDINAVIAN MYTHOLOGY.

As'kalon, or Ashkelon: See ASCALON.

Askelon: See ASCALON.

As'kew, ANNE; b. at Stallingborough, near Grimsby, Lincolnshire, 1521; a gentlewoman of high distinction in the reign of Henry VIII., and an intimate court-friend of his queen, Catharine Parr. She was the daughter of Sir William Askew, of Kelsey, Lincolnshire; married to Thomas Kyme, and bore him two children. In March, 1545, she was imprisoned and examined in London by Christopher Dare and Sir Martin Bowes, Lord Mayor of London, and subsequently by Bonner, on the charge of denying transubstantiation. She was released on bail, and on June 13 acquitted. The next year she was arrested for heresy, and some time in June, 1546, in the Tower, she was tortured by the rack, Wriothesley, the lord chancellor, and Sir Richard Rich inflicting this inhumanity with their own hands. Finally, being unable to walk to Smithfield, she was carried there in a chair, and her body chained to the stake, at which she was burnt on the 16th of July, 1546.

Revised by S. M. JACKSON.

Ask'ja: the largest volcano of Iceland; situated in 65° N. lat. and 16° 45' W. lon. The crater has an area of 23 sq. miles, circumference of 17 miles, and depth of 700 feet. The height of the mountain is 4,633 feet. The surface of the crater is covered with lava floods and a hot-water lake, while volumes of steam issue from numerous vents. A great eruption occurred in 1875.

C. H. T.

As'mai', or Asmayi: b. about 741; d. about 830; the preceptor of Harun-al-Raschid, and the most celebrated representative of Arab scholarship not only at that court, but in that century. The most widely known of his many productions are his synchronous history of Persia and Arabia before Islam (which Rawlinson has characterized as "perhaps the most valuable and authentic historic volumes in the whole range of Arabian literature") and his romance of *Antar*, the "Iliad" of the desert. But besides these he wrote a great number of other works, poetical and scientific, and founded a literary school which has produced many renowned pupils, such as Thâlab, Ibn-el-Anberi, Sukkari, and others.

Revised by J. R. JEWETT.

Asmode'us, or Asmo'doi: a demon, who, according to the Apocryphal book of Tobit, killed the seven husbands of Sara upon the wedding-nights, until Tobias, under the direction of Raphael, married Sara and drove away the demon by burning in the bride's chamber the heart and liver of a fish he had caught in the Tigris. When the demon smelled the fumes, "he fled into the uttermost parts of Egypt and the angel bound him." In the *Talmud* he is called the prince of demons, and a Talmudic tale tells us how he once drove Solomon out of his kingdom, though at length Solomon got the ascendancy over him and compelled him to work for him in building the temple, which he did without noise by means of Sharnis, a mysterious stone. The name is the Persian *Aeshma-dæva* (see Spiegel, *Eranische Alterthümer*), and the figure of the demon is in general Persian. C. H. TOY.

As'monæ'ans, or Asmoneans: the proper designation of the family of Jewish princes better known as the Maccabees. The name was derived, according to Josephus (*Antiq.* xii. 6), from a certain Asmonæus who lived about 300 B. C., but who otherwise is unknown to history, which makes the derivation somewhat doubtful. His great-grandson, Mattathias, was a distinguished patriot and leader of a revolt against the King of Syria. He had several sons, who ruled over Judea and were called MACCABEES (*q. v.*).

As'nyk, ADAM: Polish poet and patriot; b. at Kalish, Sept. 11, 1838; studied at Warsaw, then in Paris and Heidelberg. He took part in the insurrection of 1863 in Poland, and was forced to spend some years in exile in Germany. He had lived in Cracow since 1872. He published *Poezye* (3 vols., 1872-80); several historical tragedies, *Walka Stroumictew* (1869); *Cola Rienzi* (1873); *Kiejstut* (1878); and a comedy, *Przyjaciele Hioba* (The Friends of Job), in 1879. D. Aug. 2, 1897.

A. R. MARSH.

Aso'ka, Aço'ka, or Asho'ka (with the by-name *Piyadassi*): an ancient King of Maghada, in India; was a grandson of Chandragupta (or Sandracottus). He reigned about 250 B. C., was converted to Buddhism, and erected a great number of monasteries. His dominion extended over the greater part of Hindustan. See É. Senart, *Les inscriptions de Piyadasi* (Paris, 1881-86, 2 vols.); and *Notes d'épigraphie indienne* (1888).

Asp, or Asp'pie (Lat. *as'pis*; Gr. *ἀσπίς*): a species of venomous serpent mentioned by ancient writers. Some of these describe its bite as inevitably fatal, and as producing speedy death without pain. Modern naturalists identify it with the *Naja haje*, a species of hooded viper which is found in Egypt, and is from 3 to 5 feet in length. When it is irritated it dilates its neck. The figure of the *Naja haje* occurs on the sculptured monuments of the ancient Egyptians. The jugglers of modern Egypt cause it to dance to their music, and throw it into a cataleptic state. The name of asp is also applied to the *Viperas as'pis*, common in many parts of Europe. It is much dreaded on account of its bite.

Aspar'agus [from Gr. *ἀσπάραγος*, or *ἀσπάρραγος*]: a genus of plants of the family *Liliaceæ*, natives of Southern Europe and Africa. Its species are partly shrubs and partly herbaceous. They have a six-parted perianth, six stamens, one style, and the fruit is a berry. The most important species is *Asparagus officinalis*, the common asparagus of gardens, which is a native of Europe, and is generally cultivated in Europe and the U. S. It was used as food by the ancient Romans. It grows to the height of about 4 feet, and thrives

best in a rich and deep soil. This plant is raised from the seed, and should not be used until about three years have elapsed after the planting of the seed. The perennial roots continue for many years to send up every spring a crop of tender shoots, which, after having attained the height of a few inches, are cut a little below the surface of the ground. A peculiar principle called *asparagine*, $C_4H_6N_2O_3$, is obtained from these shoots, and also from the root of the marsh-mallow.

Aspa'sia (in Gr. Ἀσπασία): a celebrated woman of ancient Greece, remarkable for her genius, beauty, and political influence; b. at Miletus, in Asia Minor, about 470 B. C. She became in her youth a resident of Athens and the leader of the *hetairai*. Her house was a celebrated resort for the most eminent Athenians, including Socrates, who professed to be her disciple. Pericles was another of her admirers, and in order to live with her (445) he divorced his wife. Having been accused of impiety and inducing free women to become *hetairai* by Hermippus, a comic poet (432), she was defended by Pericles and acquitted. She had a high reputation for talent, and a report obtained currency that she composed part of the great funeral oration which Pericles pronounced over the Athenians who fell in battle about 430. After the death of Pericles, 429, she lived with Lysicles. There is extant an antique bust inscribed with the name of Aspasias. See the works on the age of Pericles by E. Filleul (Paris, 1873, 2 vols.), and A. Schmidt (2 vols., June, 1877-79). Revised by S. M. JACKSON.

Aspasias the Younger: an Ionian woman whose original name was MILTO. She became the favorite mistress of Cyrus the Younger, who changed her name to Aspasias. She was distinguished for beauty and intellect. She was taken captive by King Artaxerxes at the battle in which Cyrus was killed, 401 B. C., and was consecrated by him as a priestess of Anaitis.

As'pect: look, appearance, countenance. In astrology the position of one planet with respect to another. Aspect is defined by Kepler as "the angle formed by the rays proceeding from two planets and meeting at the earth." The ancients reckoned five aspects—namely, conjunction, indicated by the symbol \cup ; opposition, by \otimes ; trine, by Δ ; quartile, by \square ; and sextile, by \times . Planets in conjunction have the same longitude; in opposition the difference of their longitude is 180° .

As'pen, or **Tremulous Poplar** (*Populus tremula*): a tree of the natural family *Salicaceae*; a native of Europe and Western Asia. It is remarkable for the mobility of its leaves, which, having long petioles laterally compressed, are caused to flutter by the gentlest breath of air. The name aspen is also applied to the *Populus tremuloides* and *grandidentata*, natives of the U. S., resembling the European aspen in the proverbial quivering of their leaves.

Aspen: city; on the Colo. Midland and Denver and Rio Grande R. Rs.; capital of Pitkin co., Col. (for location of county, see map of Colorado, ref. 3-C); has an altitude of 7,700 feet and is in a beautiful mountain-locked valley. The city has several churches, excellent public schools, etc. Its principal business is mining, and some of the most famous lead and silver mines of the State are here. The production of silver is at the rate of \$10,000,000 per annum. Pop. (1885) 3,874; (1890) 5,108; (1900) 3,303.

EDITOR OF "TIMES."

Aspergillum: a genus of tubicular bivalve mollusks, characterized by the soldering of both valves to the inner surface of the calcareous sheath. The shell has the form of an elongated cone, the larger end of which expands into a disk, which is pierced by many small tubular holes. Hence it derives its popular name of "watering-pot." The animals of this genus are borers, which live in sand. They are chiefly found in the Indian and South Pacific Oceans. Others have been found fossil in Europe.

As'pern, or **Gross Aspern**: a village of Austria; on the left bank of the Danube, 5 miles E. N. E. of Vienna (see map of Austria-Hungary, ref. 5-F). Aspern, with the adjacent village of Essling, was the scene of a great battle between Napoleon and the Austrian Archduke Charles after the French army had taken Vienna. The French crossed the river by a bridge which they constructed at the island of Lobau, and began the attack on May 21, 1809. After half of the French had crossed the river, the Austrians assumed the offensive. Both of the villages were taken and retaken, and the day closed without a decisive result. The

fight was renewed on the 22d, when Napoleon retreated to the right bank of the river, having lost about 7,000 killed and 30,000 wounded and prisoners. The Austrians lost about 20,500 killed and wounded.

Asphalt [from Gr. ἄσφαλτος, a loan-word]: a general name for the solid forms of bitumen. Asphalt is widely distributed in nature and exhibits several very distinct varieties. Generally asphalt is distinguished from coal by being soluble in bisulphide of carbon and benzole. It occurs disseminated through many crystalline rocks, often deprived of its volatile matter and resembling anthracite. See ASPHALTIC COAL. It occurs often in veins that have evidently been injected into fissures in a plastic condition: albertite and grahamite are examples. On the coast of California, near Santa Barbara, veins of asphaltic sand occur; also in the island of Cuba and in Albania and various localities in France. At Seyssel, in the department of Ain, and Val de Travers, in the canton of Neuchâtel, in the Rocky Mountains and in Texas, veins of limestone impregnated with asphalt occur. French authors have given these latter forms the name of *asphalte*. Asphalt also occurs in beds, where it has resulted from the oxidation of mineral tar, or primarily of petroleum. Such deposits, of small extent, are frequently met in Southern California. In the N. E. states of Mexico deposits of this character of enormous extent occur. The most noted are found in Tamaulipas, on both sides of the river Thamesi; in Vera Cruz, a small mountain near the village of Moloasan, 1,200 feet high, is largely composed of asphalt, which is called by the Indians *chapatote*. On the island of Trinidad and near San Timolis, Venezuela, lakes of asphalt occur. They are each about 3 miles in circumference, and are supposed to float on water. While the surface of the Trinidad lake is sufficiently hard to admit of teams being driven over it, the whole mass is in constant motion around several vortices. Trunks of trees arise and after a time disappear again.

The lake is situated in the crater of an extinct volcano, and the supply is partly renewed (estimated 20,000 tons a year) by a flow from a subterranean source. It has an area of 114 acres, and its depth has been ascertained by boring to be 18 feet near the sides and 135 feet in the middle. During 1881-99, 1,375,415 tons of asphalt were removed. It is dug up with pick and shovel, and conveyed to the shore in carts, where it is lightered to vessels off-shore. On the voyage it becomes compacted into a solid mass that has to be again broken up with the pick. When unloaded it is heated in tanks over a slow fire, and the roots of vegetation with which it is contaminated are removed, and the hot pitch strained through a sort of colander into barrels.

In the mountains that border the eastern coast of the Adriatic Sea and the island of Ragusa, asphalt has accumulated in a great variety of forms and on an immense scale. Asphalt is also of frequent occurrence in the neighborhood of the Dead Sea, where it frequently rises to the surface of the water and floats or is cast ashore by the waves. Asphalt from this source has been an article of local commerce from the most remote antiquity. The asphalt of commerce is obtained from Trinidad, Cuba, Dalmatia, and Syria, and asphaltic limestone from Seyssel and Val de Travers. Other localities furnish local supplies of more or less value.

Pure asphaltum has a specific gravity of 1.2 to 1.3, and hardness 2.5 to 3. It is a dry solid with a conchoidal fracture and glossy, black surface. Some varieties are brownish black in color, with a more or less splintery fracture. These are earthy and impure; when rubbed it has a peculiar odor. It is usually easily melted, is very inflammable, and burns with a yellow, sooty flame, leaving but little or no residue. It is sparingly soluble in alcohol, the fixed and essential oils and ether, and readily soluble in benzole and bisulphide of carbon. With benzole it forms a solution of an intense black color which is used in the arts under the name of black varnish. Asphalt is very brittle at low temperatures, but when warmed it may be sufficiently hard to readily break by a sudden blow, and at the same time yield to the tread. When subjected to destructive distillation it is resolved into a distillate of oils of varying density, and a tarry residue that becomes solid when cold, and is called asphaltum.

The uses of asphalt are:

1. Varnish.
2. Insulation.
3. Water-proofing.
4. Cement.
5. Roofing and paving.

Varnish prepared with asphalt is known as *black varnish*, and is used principally upon iron structures. It is prepared by dissolving Syrian or other of the purer asphalts in benzole or liquids containing benzole. A black enamel is obtained on iron by applying the varnish to the hot iron, by which the volatile ingredients of the varnish are expelled and the surface left smooth as if polished.

Asphalt enters into many mastics and cements that are used by many different methods of application, chiefly for underground purposes of insulation. Asphalt is one of the most tenaciously adhesive substances in nature. This is proved by the persistence with which for unknown centuries the alabaster slabs of Nineveh and Babylon have been held in their places by the asphalt that was used to retain them. In modern times it is used to make constructions water-proof. Foundations of brick or stone are saturated with asphalt dissolved in some more fluid form of bitumen and then laid in asphaltic mortar or cement. This makes a water-proof foundation of the most durable character. For cement asphalt is mixed with petroleum residue to render it more plastic, and the whole tempered with one-seventh its weight of sharp sand. Cement of this character was used with great success in the construction of the arch over the water main at High Bridge in New York city.

It was also used in the construction of the La Salle Street tunnel in Chicago, where its superiority was fully demonstrated, this tunnel being free from water, while those finished with hydraulic cement are never free from more or less infiltration. This cement is also used in the construction of foundations where vibration is for any reason to be avoided.

Enormous quantities of Trinidad asphalt enter the composition of roofing materials at the present time. Felt made for the purpose is saturated with a mixture of asphalt, coal-tar, pitch, and petroleum residue, or still bottoms. The felt is then laid together and rolled of two or three thicknesses, in such manner that *two or three ply* felt is obtained. In this compound felt the two or three layers are so completely cemented together that the whole appears as if it was one piece of felt. When laid the felt is held in place by nails driven through tin disks, and the whole completely covered with the cement used in preparing the felt. While this is still soft the whole is covered with sharp sand or screened gravel. This makes a roof that is tight and durable, and is being extensively used, especially for large structures.

Artificial bituminous mastics, made largely of Trinidad asphalt, for use in pavement have been made by artificially incorporating fine sand or pulverized limestone with natural asphalt, and are used in vast quantities. No method of mixture, however, has ever produced a combination equal to those found in nature.

The natural asphaltic sands of La Goleta on the coast of California contain 50 per cent. of sand, so fine and so uniformly distributed as to give the appearance of a pure asphalt. Others found in France, Spain, Mexico, and the Northwest Territory contain from 10 to 18 per cent. only of bitumen. They are locally valuable as a material for roadways.

The bituminous limestones, called asphaltic rock, found at Seyssel and at Val de Travers are the most valuable deposits of asphalt known. Quite recently deposits of very similar character have been observed in Texas, but they have not yet been developed. That from Seyssel consists of 80 per cent. limestone and 10 per cent. bitumen. The Val de Travers rock is richer, containing 20 per cent. bitumen. The stone is massive, of irregular fracture, and of a liver-brown color. Though easily scratched with the fingernail, it is difficult to break with a hammer.

The bituminous mastics are generally made by mixing these bituminous limestones in powder with the mineral tar extracted from the *molasse* or bituminous sandstone of the same locality. Seven to 8 per cent. of mineral tar is required for the Seyssel mastic, and $4\frac{1}{2}$ to 5 per cent. for that of Val de Travers. The rock is first broken into fragments of 3 inches in size and then poured through toothed rollers, and afterward heated to 500° F. in a cylinder in which a helix revolves, the pieces being fed in at one end. The mastic is then put on to a concrete bed, hot and rolled. For transportation it is prepared by heating the mastic in kettles with 8 per cent. of Trinidad asphalt at 280° for five hours, when it is run into molds. When used, these bricks are again broken and heated with more Trinidad asphalt and sand for ten hours at 300° F., when it is

spread hot, rubbed, and rolled. Five million sq. yards of surface have been put down in Paris, with a length of 1,000 miles. It has also met with great favor in all the larger cities of the U. S. During the ten years previous to 1899 the U. S. produced 657,957 tons of asphaltum and imported 2,906,140 tons. See BITUMEN.

Asphaltic Coal: certain coal-like substances which are found filling irregular cavities and fissures, generally of the older rocks. They have been often classed as coals, but differ in composition and geological position from all true coals. They are not stratified, but fill fissures into which they have evidently flowed when in a fluid or plastic state. They are, in fact, ancient asphalts, which have become more compact and drier—i. e. containing less oil and gas—in the lapse of ages. These asphaltic coals are found in carboniferous rocks in New Brunswick and West Virginia, and in Devonian strata in Ohio and Kentucky.

Revised by G. K. GILBERT.

Asphodel: an herbaceous plant of the genus *Asphodelus* and family *Liliaceæ*, nearly related to the asparagus and onion. The asphodels are natives of Barbary, Sicily, Greece, and other parts of the Levant. Several species are cultivated in gardens for the beauty of their flowers, as the *Asphodelus luteus* (yellow asphodel). *A. ramosus* is said to be the flower which Homer describes as growing in the meadows of Elysium. It is now abundant in Apulia. The ancients imagined that the manes of their friends fed on its roots, and they planted it near their tombs.

Revised by CHARLES E. BESSEY.

Asphyx'ia [Gr. from *a-*, not + *σφύξις*, pulse; *σφύζειν*, throb]: originally cessation of the motion of the heart; but the word has now come to signify disturbance and finally arrest of breathing by suffocation or strangulation. It occurs in drowning, by water excluding air from the lungs; in hanging or choking, by the compression of the windpipe, preventing the entrance of air; in the presence of certain gases, as chlorine or pure carbonic acid, by spasmodic closure of the glottis or entrance to the windpipe. It has been proved by careful observations that after death by asphyxia the left cavities of the heart are empty, and the right distended with blood. This is owing to the fact that venous blood, not renewed by exposure to the oxygen of the air, will not circulate through the lungs, thus being forced to accumulate in the right or venous side of the heart. The mode of treatment of asphyxia must depend on its cause. (See DROWNING.) In partial strangulation, abstraction of blood in moderate amount may unload the heart and promote the movement of the blood, after the cause of obstruction has been removed. For asphyxia from irrespirable gases the first necessity is a supply of pure air. When the heart has almost or quite ceased to beat for a few moments, life is sometimes restored by artificial RESPIRATION (*q. v.*), or by application of galvanic electricity to the chest.

Revised by WILLIAM PEPPER.

Aspic: See ASP.

Aspid'ium: a genus of ferns (shield-ferns), whose fruit-dots are covered with round or kidney-shaped shields (*indusia*). There are about 500 species widely distributed throughout the world.

C. E. B.

Aspidich'thys [from Gr. *dorís*, -*idos*, shield + *ιχθύς*, a fish]: a genus of fossil fishes, described by Dr. Newberry, from the Devonian rocks of Ohio; allied to *Pterichthys*, but very much larger. The middle dorsal plate of the carapace is a foot wide and a foot and a half long, more than an inch thick at the center, and its external surface is studded with smooth enamel tubercles as large as split peas.

Aspinwall [named for WILLIAM H. ASPINWALL (*q. v.*); called **Colon** by the natives]: seaport in the republic of Colombia; on the north side of the Isthmus of Panama, and on Navy Bay, 48 miles by rail from Panama, and on the Caribbean Sea; lat. 9° 21' N., lon. 79° 54' W. (see map of North America, ref. 11-H). Aspinwall was founded in 1852 by the Panama R. R. Company, and is the northern terminus of the Panama R. R., which was opened in 1855. It has a good harbor, which is deep enough for large ships, and has several large hotels. It was formerly a great thoroughfare for the travel between California and the Atlantic States. Steamers ply frequently between this place and New York, which is about 2,000 miles distant. A ship-canal between Aspinwall and Panama, the latter on the Pacific Ocean, was attempted, but failed because of the enormous cost. Pop. 1,800, but fluctuating. See PANAMA and SHIP-CANALS.

Aspinwall, WILLIAM, M. D.: b. at Brookline, Mass., May 23, 1743; graduated at Harvard in 1764, and subsequently took his medical degree in Philadelphia; became a surgeon in the Revolutionary army, and after the war was a prominent Jeffersonian politician in Massachusetts. He practiced medicine with great success at Brookline, and was distinguished for the practice of "inoculation" and his early adoption of vaccination. D. at Brookline, Mass., Apr. 16, 1823.

Aspinwall, WILLIAM H.: b. in the city of New York, Dec. 16, 1807; was trained as a clerk in the house of G. G. & S. Howland; became a partner in 1832; formed the firm of Howland & Aspinwall in 1837; retired from the firm in 1850. D. in New York, Jan. 18, 1875. He was the chief promoter of the construction of the Panama R. R., the northern terminus of which is named after him, and acquired a fortune in the Pacific trade, being a large owner of the Pacific Mail Steamship Company.

Aspirate [from Lat. *aspiratus*, partic. of *aspira're*, breathe upon]: in pronunciation, a breath-sound or a consonant accompanied by a breath-sound. In the stricter use of modern philology, the term is applied to those explosives (stops) which end in a breathing, really due to an audible escape of breath after a forcible breaking of the closure; such are the Sanskrit aspirates *kh, gh, ph, bh*, etc., the Greek aspirates *θ, φ, χ* (as pronounced in fifth and fourth centuries B. C.), and even the modern German and English *k, t, p*, initially before an accented vowel. In popular use the term is often made to include the fricative sounds, as German *ch*, or even the sound of *h*, *spiritus asper*, which is, in general, no more than a collective representation for a variety of whispered vowels, the particular vowel character in each case being determined by the following vowel; thus compare *hā, hē*, in which *h* represents two different sounds.

BENJ. IDE WHEELER.

Aspirator [Mod. quasi-Lat. format. from Lat. *aspira're*, breathe upon]: an apparatus used by chemists to draw air or other gases through bottles or other vessels. It is a tight vessel filled with water, having a tube with a stopcock connected with the upper end, and another tube with a stopcock connected with the lower end. The former tube is attached to the vessel through which the gas is to be drawn; the stopcocks are both opened, and the weight of the water issuing from the lower tube acts as a suction, and draws in the gas.

Aspis, or Clupea: an ancient and important fortified city of the Carthaginians, on the Mediterranean, about 50 miles E. of Carthage; founded about 310 B. C. It was the place where Regulus landed in the first Punic war, and was a distinguished episcopal see from 411 to 646 A. D. It was the last spot on which the African Christians made a stand against the Saracens. Remarkable ruins are to be seen there.

Asplenium: a genus of ferns (the spleenworts) whose elongated fruit-dots are covered with a membrane (*indusium*) attached its full length at one side. About 350 species are known, many of which are grown in greenhouses.

C. E. B.

Aspromonte: a mountain at the southwestern extremity of Italy; 6,300 feet high; 16 miles E. N. E. of Reggio (see map of Italy, ref. 9-G). Here Garibaldi and the greater part of his army were taken prisoners in Aug., 1862.

Aspropotamo (i. e. white river): the ancient *Achelous*; the largest river in the kingdom of Greece. It rises in Albania, flows in a S. S. W. direction, and after a course of about 100 miles enters the Mediterranean (or Ionian) Sea, nearly 15 miles W. of Missolonghi.

Asquith, HERBERT HENRY: English public man; b. at Morley, England, Sept. 12, 1852; scholar and afterward fellow of Balliol College, Oxford; B. A., 1874; called to the bar at Lincoln's Inn, 1876; queen's counsel, Feb., 1890; elected member of Parliament for East Fife, July, 1886, and again in 1892; Secretary for Home Affairs in Mr. Gladstone's Cabinet, 1892; ecclesiastical commissioner, 1892-95.

Ass, or Don'key: a quadruped of the genus *Asinus* and family *Equidae*. It is characterized by long ears, a black cross over the shoulder, and short hairs on the upper part of the tail. It is remarkable for its patience, stolidity, and power of endurance, and has been the domesticated drudge of man from time immemorial. The ass is probably a native of Central Asia, as it is now found wild in that region.

Vast numbers of the wild ass (which the Romans called *onager*) roam over the great Asiatic deserts and steppes, feeding on saline herbage. They also inhabit Persia, Asia Minor, and Syria. An interesting notice of this animal is given in the thirty-ninth chapter of Job. The wild ass is a high-spirited animal of extraordinary speed, and is one of the principal objects of the chase in Persia, where its flesh is highly esteemed as food. There appears to be some doubt whether the domesticated ass is descended from this wild animal, so much superior in speed and other qualities. In Oriental countries the custom of riding on the back of the tame ass is very common; and the Old Testament informs us that it was thus used by patriarchs and kings in the earliest times. The asses which are raised in Syria and other parts of the East are a better breed than those of Europe. The animal is not much employed in the U. S., except for the propagation of mules, which are the hybrid progeny of the ass and mare. Being very sure-footed and able to live on scanty fare, the ass is well adapted for service as a beast of burden in rocky and mountainous regions. Its milk is recommended as a diet for dyspeptic and consumptive patients. The proverbial stupidity of the ass seems rather due to its patience and endurance than to any particular want of intelligence.

Assab': a bay, a territory, and a town on the African shore of the southern part of the Red Sea. The bay is about 40 miles N. W. of the Bab-el-Mandeb, opening northward. It is about 16 miles long by 5 broad, and is full of islands. The territory is an ill-defined region on the coast near the bay, in what is called the Danakil country, now the Italian colony of Eritrea. The town, near the mouth of the bay, is an Italian station. Pop., with the district immediately around it, 6,800.

M. W. H.

Assafœtida, or Asafœtida [from Lat. *asa* (loan from Pers. *azā*, mastic) + *foetidus*, stinking]: a gum-resin or the concrete juice of the root of *Nartherx assafœtida* (the *Ferula assafœtida* of Linnaeus). It is a native of Persia and Afghanistan, has a peculiar and disagreeable odor, and is extensively used in medicine as an antispasmodic. It is considered an efficacious remedy for hysteria, nervous diseases, and spasmodic pectoral affections. In many parts of Asia it is used as a condiment.

Assal': a salt lake of Eastern Africa; 25 miles S. W. of Tajura, and about 760 feet below the level of the sea. It is 8 miles long and 4 miles wide, and has an area of 20 sq. miles. The shores are covered with crusts of salt about a foot thick. Large quantities of salt are carried hence by caravans to Abyssinia.

Assam': a province of British India, bordering on China, and forming part of the valley of the Brahmaputra. It is included between lat. 25° 45' and 28° 15' N., and between lon. 90° 35' and 96° 50' E. Area, 49,004 sq. miles. It is well watered by numerous rivers, and has a fertile soil, but a large part of it is swampy and subject to inundation. The staple products of the soil are rice, tea, cotton, opium, and mustard. Gold, silver, and precious stones are found here, and coal, petroleum, and iron are abundant. The rainy season lasts about six months, from April to October, during which time the whole country is inundated. The large and dense forests of Assam are infested by great numbers of elephants, tigers, leopards, rhinoceroses, buffaloes, etc. Assam was ceded to the British by Burma in 1826. The religion of the Assamese is Brahmanism. Pop. (1901) 6,122,201.

M. W. H.

Assas'sin [viâ Fr. from Arab. *hashshāshīn* (plur.), hashish-eaters]: one who attacks and kills by treachery or surprise a person who is unprepared for defense. The word was originally the name of a fanatical sect or order, the disciples, it is said, of Alo-ed-Deen (Aloaddin), commonly called Sheikh-el-Jebel, or the "Old Man of the Mountains." The founder of the order is said to have been Hassan-ben-Sabah, who flourished in Persia about 1080 A. D. They were called Assassins from their immoderate use of hashish, an intoxicating drug obtained from Indian hemp. The order consisted of several degrees, the lowest of which were *Fedavis* or *Fedais* (i. e. the devoted), who were not initiated into the secret doctrines and mysteries, but with blind obedience executed the bloody orders of the prince or Old Man of the Mountains.

Assault' [through Old Fr. from Lat. *adsili're, assili're*, to leap upon; *ad*, upon + *sali're, saltum*, leap]: in military language, a sudden and vigorous attack on a fortified post or camp, or an effort to carry by open force a breach which has

been made in a fortress. In the regular routine of sieges (as they *were* formalized, for recent changes in the art of fortification and in the character of firearms have rendered the old rules somewhat inapplicable) the "assault" is one of the last scenes of the drama called a "siege." In the regular siege the assault (if, instead of gaining the breach by covered "approaches," it is decided to resort to it) is delivered after the outworks are captured, and one or more "breaches" formed (by "breaching batteries") in the body of the place. It is usually performed by picked troops or volunteers (sometimes called a "forlorn hope"), who, at a concerted signal (upon which the besiegers' artillery ceases to fire), issue from the contiguous parallels or places of arms, descend into the ditch, and advance rapidly and without much order, but without firing, upon the breach. "Firing parties" are stationed in neighboring parallels to keep down the fire of the besieged, and "supports" are close at hand to follow up the assaulting party, if successful in effecting an entrance.

Under Louis XIV. commandants of besieged places were forbidden to capitulate before receiving *three* assaults. Under Napoleon it was declared dishonorable and punishable with death to capitulate before receiving at least one assault. According to Vauban and the "schools," the open assault is a "useless massacre," which, if successful, results only in the demoralization of the troops, the sacking of the place, and the destruction of resources valuable to the besiegers. Nevertheless, it is sometimes compulsory, as in the case of the assault of Constantine (1837) by the French, with a loss of 500 out of 1,750. In Spain the British army delivered terrible assaults, as those at Badajoz (1812) and St. Sebastian (1813); the loss at the former (which failed, the place being entered by *escalade*) cost 3,700 men, and the latter (successful) 2,000, killed and wounded. The bloody assault by which the siege of Sebastopol was terminated Sept. 8, 1855, was necessitated by the fact that the "approaches" could be pushed forward no farther. This so-called siege differed from an ordinary siege in this, that "the difficulty was to conquer the Russian army upon a ground prepared beforehand, quite as much as to surmount the material obstacle presented by the fortifications" (*Niel*). The allied loss in this assault (killed and wounded) was nearly 10,000; that of the Russians, 11,700 men; thus terminating a siege of eleven months' duration, and which cost the besiegers 150,000 and the Russians 84,000 men.

Assault and Bat'tery: an assault is an offer or attempt to inflict corporal injury upon another, accompanied by circumstances which indicate an intent, coupled with a present ability, to do actual violence. If violence be actually inflicted, the act amounts to a battery; but the offer or attempt to do violence is alone sufficient to constitute an assault. It is not necessary that an actual intention to do violence exist; it is enough that there be a sufficiently indicated intent, so that it would appear to a reasonable mind that the apparent purpose was the true one. Moreover, if threats or offers of violence be made, but there is an apparent present inability to carry them into effect, there is no assault committed. Thus one might vehemently threaten actual violence; but if an impassable barrier, as a ditch or wall, intervened between him and the person menaced, the act would not be an assault. A battery is really the consummation of an assault, and therefore requires that the offer or attempt to do violence be carried into effect by the actual use of violence. An assault and battery is sometimes justifiable, as when it is committed in the reasonable defense of one's person or his real or personal property. And in exercising this right of defense the person threatened is justified in acting upon reasonable appearances, but in no case should the force used be greater than is properly adequate to repel the assault or avert or prevent the injury apprehended. An assault and battery is also sometimes justifiable when committed in the cause of rightful discipline, as where a father or schoolmaster inflicts moderate punishment upon a child, or the master of a vessel upon a seaman; but in these cases also there must be no excess of violence. An assault and battery is both a civil and a criminal wrong, and there may be a civil action for damages by the person injured, and also a criminal prosecution instituted. In criminal law there are also recognized certain forms of aggravated assault which receive severer punishments than common assault, as an assault with intent to kill, with intent to commit rape, etc.

GEORGE CHASE.

Assay', or **Assay'ing** [O. Fr. *asayer*; Ital. *assaggiare* < Late Lat **exagiā're*, deriv. of *exā'gium*, weighing, testing]:

the process of ascertaining the proportion of gold or silver in an alloy, or of pure metal in a metallic ore. Silver plate and manufactured articles of gold and silver generally contain an alloy of copper or other metal. (See ALLOY.) In Great Britain each article before it is sold is assayed at Goldsmiths' Hall, so as to determine the proportion of precious metal in its composition. The process of assaying gold and silver depends on the principle that those metals can not be converted into oxides by union with the oxygen of the air, while the baser metals with which they are alloyed can be oxidized if raised to a high temperature. The apparatus employed in this process consists of a *cupel*, a small shallow vessel made of bone-ash, and a *muffle*. The latter is made of fire-clay, is about 8 inches long, 3 or 4 inches in diameter, and is shaped like a railway tunnel (that is, having a flat bottom and an arched top); it is open at one end and closed at the other, and has several apertures in its sides for air to pass through. Weighed fragments of mixed silver and lead are placed on cupels, which, introduced into a muffle, are exposed to the heat of a furnace until the metals are melted. The oxygen of the air unites with the lead, forming an oxide, which is partly volatilized and partly absorbed by the porous cupel. At the end of this process of *cupellation* there remains a globule of pure silver, which by its diminished weight shows how much alloy was contained in the sample. During the assay of silver by the foregoing process, called the *dry method*, a small loss of silver occurs. For this reason the *humid* process has been adopted in the mints of France, of the U. S., and of other nations. This method consists in dissolving the compound or impure silver in nitric acid of density 1.25, and adding a solution of common salt (NaCl), which causes the precipitation of the chloride of silver (AgCl) in white flocculi. The solution of salt is made of a definite strength, and is poured out of a graduated vessel until all precipitation of pure silver ceases. The assay of gold ores or impure gold is performed in a manner similar to that of silver. If gold alloyed with copper is to be assayed, some silver must be added to the alloy. The alloy of the three metals, gold, silver, and copper, may be assayed by cupellation, by which the copper is oxidized and the gold and silver remain combined. These may be separated by a process called *parting*, which, however, is only practicable when the alloy contains three parts of silver to one of gold. The parting or quartation consists in acting on the alloy by hot nitric acid, which dissolves the silver, forming the soluble nitrate of silver, and leaves the gold in a solid and separate state. As no ore of gold or artificial alloy contains so much silver as three to one, it is necessary to incorporate an additional quantity of silver with it. This is done by wrapping the proper quantities of gold and silver in lead-foil and heating them on a cupel. The metallic button which is the result of this cupellation is hammered on an anvil, and rolled into a thin plate or ribbon, which is coiled up and called a *cornet*. This is exposed in a glass vessel to the action of nitric acid, which, dissolving the silver, leaves a brown, spongy mass of gold. It is then heated in a crucible, annealed, and weighed. As jewelry and other articles can not be assayed either by the dry or humid method without injuring their form, their purity is ascertained by the use of the *touchstone*, with which a streak is drawn on the surface of the gold. Black basalt is one of the minerals used as a touchstone.

As'saye: a village of S. India, in the Nizam's Dominions, 24 miles N. of Jaulna (see map of S. India, ref. 3-D). It was the scene of the Duke of Wellington's first great victory. On Sept. 23, 1803, with a force of 2,000 British and 2,500 natives, he utterly defeated the Mahrattas, numbering from 30,000 to 50,000 men, partly officered by the French. Wellington, then Gen. Wellesley, captured 98 cannon, and lost 1,560 killed and wounded.

Asselyn, or **Asselijn**, *ās'sel-līn*, JAN (OR HANS): landscape and animal painter; b. at Antwerp in 1610; studied painting, first in his native city under Isiah Vandervelde, then in Rome, where Bamboccio and Claude Lorraine became his models; settled subsequently in Amsterdam, and died there in 1660. He painted battle-pieces, animals, and landscapes, and his views of the neighborhood of Rome are much appreciated.

Asseman'ni, GIUSEPPE SIMONE: Bishop of Tyre *in partibus*; a learned Maronite; b. at Tripoli, in Syria, in 1687. He was sent in 1715 by the pope to Syria and Egypt to collect manuscripts, and was keeper of the Vatican Library (1738-68). He published a valuable work on Syrian litera-

ture, entitled *Bibliotheca Orientalis Clementino-Vaticana* (4 vols., 1719-28). D. in Rome, Jan. 14, 1768.—His nephew, STEFANO EVODIO, an Orientalist, born at Tripoli in 1707, was educated at Rome. He was Archbishop of Apamea in *partibus*. He succeeded his uncle, Giuseppe Simone, as keeper of the Vatican Library, in 1768. He published several catalogues of Oriental manuscripts. D. in Rome, Nov. 24, 1782.

A. R. MARSH.

Assem'bley: in politics, a convention or body of men associated for civil or legislative business, and possessing more or less political power. In some States of the U. S. the legislature is collectively called the *General Assembly*, and was formerly also called the *General Court*, and had certain judicial powers which are now mostly taken away; in some of the States the lower branch of the legislature is called the *Assembly*, and the other house is called the *Senate*. At the beginning of the French Revolution the members of the *Tiers État* (Third Estate), who had been chosen to represent the common people in the States-General, assumed (Jan. 17, 1789) the title of *Assemblée Nationale*, and, having been joined by the more liberal members of the nobility and clergy, proceeded to frame a new constitution. The court denied their authority, and made a not very vigorous effort to dissolve the Assembly, but failed, and finally yielded to the popular current. This body, which was termed the Constituent Assembly, formed a constitution which was accepted by the king, and, having ordered the election of a legislative assembly, dissolved itself Sept. 30, 1791. The Legislative Assembly, from which all members of the Constituent Assembly were expressly excluded, met Oct., 1791, and continued to undermine or defy the royal authority, which was abolished Aug. 10, 1792. Having convoked a *National Convention*, the Assembly closed its labors and existence Sept. 21, 1792. The formation of the second French republic (Feb., 1848) was followed by the election of a National Assembly, which met in May of that year, and, having formed a constitution, transferred its power to the Legislative Assembly. This body was dissolved or abolished by the *coup d'état* of Dec. 2, 1851. The third republic was proclaimed Sept. 4, 1870, but, on account of the presence of German armies in France, the election of deputies was postponed until the armistice, which began just after the capture of Paris, Jan. 30, 1871. The National Assembly met at Bordeaux in February, and elected Adolphe Thiers as *chef du pouvoir exécutif* (chief of the executive power).

Revised by F. STURGES ALLEN.

Assembly, General: See GENERAL ASSEMBLY.

Assembly, Unlawful: See RIOT.

Assessments (political): See CIVIL SERVICE REFORM.

Asses'sor [from Lat. *assessor*, one who sits beside, assistant, judge; *ad*, to + *sede're*, sit]: in Great Britain, a person, usually a lawyer or jurist, who is appointed to advise the judge; the legal adviser of a magistrate in determining police and similar cases. In several inferior courts assessors are appointed by statute. The burgesses of every borough are required to elect annually two assessors, who assist the mayor in revising the burgess lists and in presiding at the municipal elections. An assessor is also a person elected by the people, as in the U. S., or appointed to assess or appraise all taxable property, in order that the owner of the same may pay a tax proportioned to its value. This valuation or appraisal is called assessment. The assessed value is usually less than the real, or less than the price for which it could be purchased.

As'seteagne Island: an island off the east coast of Northampton co., Va., to which it belongs (for location of county, see map of Virginia, ref. 6-J); has a brick lighthouse 129 feet high, standing 2 miles from the S. W. extremity of the island and showing a fixed light of the first order, 150 feet above the sea, in lat. 37° 54' 37" N., lon. 75° 21' 04" W.

As'sets [O. Fr. *asez*, enough < vulg. Lat. *ad satis*, to sufficiency]: in law, denotes the property in the possession of an heir or under control of an executor, administrator, or trustee, applicable to the payment of debts and charges against the estate which they represent. It is mainly applied to the case of heirs, executors, and administrators. Assets are either real or personal. Real estate is assets in the hands of an heir; personal property, in like manner, in those of an executor or administrator. If the real estate is devised to an executor, he takes it as trustee. Assets are also distinguished into legal and equitable, the first being under the

control of a court of law, and the second administered by a court of equity; and the two courts are not governed by the same rules. In the U. S. this last distinction is, by reason of statute law, of little consequence, as all the estate of a deceased person becomes a fund for the liquidation of his debts, according to a prescribed statutory order. The distinction between real and personal assets is still of importance, as it is a general rule that real estate is not to be taken for the payment of debts until the personal property is exhausted. A testator may by a sufficiently clear direction in his will avoid the effect of this rule, and make his real estate the primary fund for the payment of his debts.

Assh'ur, or Ash'ur: an ancient and populous city; capital of Assyria; on the Tigris, 40 miles below Calah, and 60 miles S. of Nineveh. Its site is marked by extensive ruins at Kileh-Sherghat. Here is a large square mound or platform, 2½ miles in circumference, about 100 feet above the level of the plain, and composed in part of sun-dried bricks. Cuneiform inscriptions of great interest have been found here.—A son of Shem was also called ASSHUR, from whom the name of the city was derived.

Asshurbanipal (i. e. Asshur creates a son): the greatest of the Kings of Assyria; ruled at Nineveh 668-626 B. C. The literary remains from his library and the treasures of art from his palace have been brought in large numbers to the British Museum. See ASSYRIA (*History*). D. G. LYON.

Assien'to (or preferably **Asiento**): a word applied to treaties which the Government of Spain made with several foreign nations for the purpose of supplying her colonies with Negro slaves. The first of the assientos was made with the Flemings, in the reign of the Emperor Charles V. The Genoese obtained the contract in 1580. The privilege was transferred to the Portuguese in 1696, and to the French in 1701. The British acquired it by the treaty of Utrecht, 1713, but resigned or sold it to Spain about 1750, since which no such contract has been made.

Assign, or Assignee: See ASSIGNMENT.

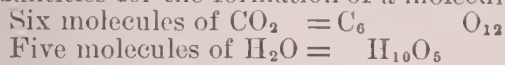
Assignat, äs'-ig-nät (in Fr. ää'sëen'yaa'): one of the notes forming the paper currency issued by the French Government in 1790, and at subsequent periods of the revolutionary régime. It was based on the security of the national domains, which consisted of the confiscated estates of the Church and wealthy *émigrés*. The total amount of assignats issued was 45,578,000,000 francs. The public credit having been ruined by the reign of terror and anarchy, the value of the assignats declined lower and lower. In June, 1793, one franc in silver was worth three francs in paper. The Government, in order to check their depreciation, passed a law to fix the maximum prices of commodities, the effect of which law was very injurious to trade. In Mar., 1796, one franc in gold was equivalent to 300 francs in paper. In July of that year the assignats were recalled, and replaced by the *mandats*.

Assign'ment [from Lat. *assigna're*, appoint]: in law, the act of making over to another one's estate or interest. The person making the assignment is an *assignor*; the recipient is an *assignee* or *assign*. The word is mainly used in reference to transfers of leases, incorporeal rights, such as copyrights and patents, and rights of action. Such transfers are to some extent by statute law required to be in writing. It is a rule of *common law* that a thing in action is not assignable, though this doctrine is not followed in a court of *equity*, an assignment being regarded in that court as in the nature of a declaration of trust, so that the assignor becomes a trustee for the assignee. There are some exceptions to this rule, as in the case of mere personal causes of action and cases where public policy intervenes. Such an assignee simply takes the rights of his assignor, and holds subject to any defenses which the debtor could urge against his creditor. There is a class of things in action not subject to this infirmity, such as bills of exchange, promissory notes, checks upon banks, and public securities payable to order or bearer. He who purchases these in good faith and before maturity, for a valuable consideration, may shut out for the most part the defenses which might have been urged against the payee. Such paper is termed negotiable. In this way the distinction between that which is negotiable and that which is assignable becomes of great practical consequence. It is a frequent practice on taking an assignment of a claim to obtain a statement from the debtor that he has no defense to it. He would then be precluded from setting up any that he might have on the doctrine of estoppel.

The word "assignment" is also used to indicate the act of setting apart dower for a widow in the real estate of her husband. It is also employed in case of bankruptcy or insolvency, to indicate the act of transfer of a failing debtor's property to a person called an assignee, who is substantially a trustee for the benefit of the creditors. A failing debtor by the laws of some States is permitted to make a voluntary and even preferential transfer to an assignee acting in the same general manner, though such laws are substantially superseded for the time being when there is a U. S. bankrupt law in operation.

T. W. DWIGHT.

Assimilation (in plants): the change or series of changes made upon the carbon-dioxide (carbonic acid gas) and water in green cells, resulting in the production of a hydrocarbon food-stuff (usually starch). We can not yet give an exact account of the successive steps in assimilation. The principal facts, however, are as follows: Carbon-dioxide contains carbon (C) and oxygen (O) in the proportion of one atom of the former to two of the latter (CO₂). Water contains hydrogen (H) two atoms and oxygen (O) one atom (H₂O). These are taken in by the green cells, and eventually starch is produced, whether directly or indirectly is not now certainly determined. Some oxygen is liberated during assimilation, indicating a breaking up of one or both of the constituents. It can readily be seen that six molecules of carbon-dioxide and five of water afford the necessary elements in the proper quantities for the formation of a molecule of starch. Thus:



One molecule of starch = C₆H₁₀O₅ + 12 atoms of O set free.

It is not to be supposed that the process is as simple as this; on the contrary, it is probably quite complex, this statement serving merely as a summary of the results. Assimilation takes place in cells which contain chlorophyll, the green substance of plants, and only in the light. Parts of plants destitute of chlorophyll are destitute of the power of assimilation, nor can green cells assimilate in darkness.

CHARLES E. BESSEY.

Assiniboia, ăăs-sin'i-boi'-a (named from *Assiniboine*): a district of the Northwest Territories and a future province of the Dominion of Canada. It is rectangular in form and has Saskatchewan district on the N., Manitoba on the E., North Dakota and Montana on the S., and Alberta on the W. It is a part of the great plains E. of the Rocky Mountains, but has many hills and coteaus. The most celebrated of the latter is a low ridge called the Missouri Coteau, extending from about the center of the district southeastward far into North Dakota. The country is well-watered, and has many small lakes. About a third of it is drained by the Saskatchewan river, which empties into the north end of Lake Winnipeg; about a half drains through the Qu'appelle and Souris rivers into the Assiniboine, and so into the south end of the same lake; the remainder consists in part of small independent basins, and in part drains into the Missouri river. Area, 95,000 sq. miles; pop. (1885) 22,083, but rapidly increasing. Of the population, 4,492 were Indians and 1,017 half-breeds; 5,853 were engaged in agriculture. There were 160,000 acres under cultivation, and the live stock included 8,000 horses, 20,000 cattle, 9,000 sheep, and 17,000 swine. Wheat (1,000,000 bushels in 1885), barley, oats, pease, and potatoes are raised; and there is a considerable production of peltry, including 13,000 muskrat skins, 3,000 mink, and 900 beaver. The Canadian Pacific Railway passes nearly centrally through the district. Capital, Regina, which is also the capital for the Northwest Territories generally. The climate of Assiniboia is rather severe, but the winter temperature is frequently tempered by chinooks. It is subject to severe blizzards, and the most of the severe winter storms and cold waves of the Northern States come from Assiniboia.

MARK W. HARRINGTON.

Assisi, ăăs-see'scē: a town of Italy; province of Perugia; built on a steep hill, 13 miles S. E. of Perugia (see map of Italy, ref. 5-B). It is surrounded by a wall flanked with towers, and has a cathedral built in the eleventh century and many monasteries. It is the native place of St. Francis, and has remarkable paintings by Cimabue and Giotto, and a large and beautiful Gothic structure, Convento Sacro, with fine paintings. Among the remains of the ancient Assisium is a beautiful portico of the temple of Minerva. Pop. about 6,000.

Assis'tance, Writ of: in Great Britain, a writ issued by the court of chancery to the sheriff directing him to put a

party in whose favor a decree has been rendered in possession of land to which the decree has declared him to be entitled; also, in the U. S., a writ issued by the colonial courts to aid the crown officers in enforcing the acts of trade.

Revised by F. STURGES ALLEN.

Assiut, ăăs'scē-ōōt', **Assioot**, or **Siut** (anc. *Lycopolis*): a district and a city of Upper Egypt. The district is a very fertile one. Area, 840 sq. miles; pop. (1882) 562,137. The city is the capital of Upper Egypt; is near the Nile, in lat. 27° 11' N.; the terminus of the railroad on the left bank of the river, and 228 miles S. of Cairo. It is the finest city in Egypt, except Cairo, and has fine mosques and bazaars, a palace, baths, and a cotton-factory. It is the seat of a flourishing American mission. It is the chief resort of the caravans from the Sudan, and was until recently a center for the slave-trade. It is also an important military station, and has a large manufactory of pipe-bowls. Traces of the ancient civilization are abundant in and about it, including the ruins of a Roman amphitheater. The view of the Nile valley from the tops of the adjacent Lybian hills is said to be the finest in Egypt. The population is said to be industrious and reliable. Pop. 31,575.

M. W. H.

Assize [O. Fr. *asise*, a sitting, assessment; past partic. of vb. from Lat. *assidere*, sit down to]: an ancient English court; also, formerly, a writ to recover the possession of a freehold. The word is now used in the plural to denote the stated sittings of the judges of the superior courts in England in the various counties, by virtue of several commissions, to try civil and criminal cases.

Revised by F. STURGES ALLEN.

Associate Presbytery: 1. The organization formed by Ebenezer Erskine and others, who seceded from the Church of Scotland in 1733. In 1745, having grown to forty-five congregations, it was reconstituted under the name of the *Associate Synod*. In 1747 it was torn into two bodies, commonly known as Burgher and Antiburgher, each of which claimed the name Associate Synod, though from 1778 the Antiburghers are called the *General Associate Synod*. 2. In 1799 the "Old-light" Burghers, having separated themselves from the "New-light" majority, called themselves at first the *Associate Presbytery*, but from 1805 the *Associate Synod*, or *Original Burgher Synod*. *Constitutional Associate Presbytery* is the name taken by the Old-light Antiburghers, when they separated from the New-light majority, in 1804.

Through many schisms and reunions these bodies are now represented in various existing Presbyterian Churches, particularly those that are known as "United," or "Reformed," or "Secession," or "Seceder," as well as in the Associate Church of North America, the Associate Reformed Synod of New York, the Associate Reformed Synod of the South, and the Associate Synod of North America. For statistics of these Churches, and for their history, with the history of the various "Associate" movements, see the article PRESBYTERIAN CHURCH; also UNITED PRESBYTERIAN CHURCH, UNITED SECESSION CHURCH, UNITED ORIGINAL SECEDERS, SCOTLAND, CHURCH OF, and FREE CHURCH OF SCOTLAND, etc.

W. J. BEECHER.

Associated Presbyteries: the presbyteries of Morris County, Westchester, Northern, and Saratoga (in New York State), organized from 1780 to 1807. So far as their associated character is concerned, they were soon absorbed in other bodies. See PRESBYTERIAN CHURCH.

Associated Press: an association of newspapers in the U. S. for the collection of news. Its principal center was at New York, but there were subordinate centers, as at Cincinnati, Chicago, and Washington, to which items of news were transmitted, to be there condensed and distributed to the various journals. The association either sold the news it collected to other similar associations in different parts of the country or in Europe, or exchanged with them. In 1892 it was absorbed by *The United Press*, an association organized in 1882 for similar purposes.

Associate Synod: See ASSOCIATE PRESBYTERY.

Association of Ideas (otherwise called **Mental Association**, or simply **Association**, **Suggestion**, **Connection of Ideas**, **Train of Thought**, **Succession of Thoughts**, etc.): a principle or law in mental philosophy exercising an important influence upon the operations of the mind. "When a traveler visits the ruins of Athens or of Rome, the plain of Pharsalia or of Marathon, the sight of these places awakens the memory of the men and of the deeds which have made

them glorious." The names of the great recall their achievements. A portrait revives similar memories, and calls up emotions which might have seemed dormant forever.

It may be a sound,
A tone of music, summer's eve, or spring,
A flower, the wind, the ocean, which shall wound,
Striking the electric chain.—Byron.

These facts rest upon the reciprocal power of thought to evoke thought. Under this power arises what is called the association of *ideas*, but its law is the law of intellectual gravitation—its sphere is the universe of mind. It is wider than "ideas," and extends to all our mental modifications. Our cognitions, emotions, and active powers, all come under the law of association. Our feelings, our willings, and our efforts are as completely held in groups by internal bonds as our ideas are.

Association may connect ideas by a simple link or by a multitude of links. The idea of the civil war of England prompts the question, "What is the value of a Roman denarius?" There are no two thoughts so remote as to have no link. The laws of association have been variously enumerated. Some of the most obvious and important are:

1. Simultaneity and succession, synchronism and chronology. Thus Cæsar and Pompey, Luther and Leo, Charles I. and Charles II.; Aristotle back to Plato, Descartes on to Spinoza.

2. Contiguity and remoteness between ourselves and the things, or between the things themselves: New York and Brooklyn, ourselves and our antipodes. We think of Mercury as nearest the sun, and that suggests Neptune as the farthest off.

3. Resemblance and contrast to the eye in works of art, which recall the original to the mind: metaphor; punning rests on the association of sounds that resemble with things that differ. Night recalls day, sickness recalls health.

4. The logical relations involve association of ideas, though not all association of ideas is logical: cause and effect, workmen and work, father and child, the universe and God, object and means, analogy, premise and conclusion, part and whole. The relations of physical, mechanical, and cosmical order are of the same kind, and hence association is the mother of invention and discovery.

5. The association of the verbal sign with the thing signified, which is the essence of language and the necessary preliminary to reasoning. Two or more of these causes may co-operate in particular cases, or the thing may in one aspect give rise to one association, in another aspect to another. Aristotle reduces the principle of association to three parts: Proximity in time and contiguity in place as one; resemblance, contrast. Hume says: "There appear to be only three principles of connection among ideas—namely, resemblance, contiguity in time or place, and cause or effect. A picture naturally leads our thoughts to the original (resemblance); the mention of one apartment introduces an inquiry concerning the others (contiguity); we think of a wound and the pain which follows it (cause and effect)." Augustine reduces the principle to one: What is once together is afterward together. Hobbes says: "The cause of the coherence or consequence of one conception to another is their first coherence or consequence at that time when they are produced by sense." Cardaillae (1830) in substance repeats Hobbes when he says that simultaneity is the common condition of all the other connections: nothing can be linked now that has not been linked before. Hamilton in the same way reduces the laws to two, simultaneity and affinity; and these two laws, he asserts, are only modifications of one law, redintegration, or totality: "Those thoughts suggest each other which had previously constituted parts of the same entire or total act of cognition." This is ending where Augustine began. Hamilton maintains that a third thought may be associated with a first through a second which "does not rise into consciousness," "suggestions passing through one or more ideas which do not themselves rise into consciousness." This false theory in metaphysics he illustrates by an example drawn from a false theory in physics—to wit, that billiard-balls in a row, intermediate between the first one, which is struck, and the last one, which flies off, remain motionless. Hamilton's whole position and argument are marked by the crudity and self-contradiction which often mar his lectures. The true theory in such cases is that the acts of consciousness are too rapid to mark themselves deeply and distinctly enough in memory to be carried on by it to the end of the process. Reflection usually with very little difficulty ar-

ticulates all the parts. When Hamilton reflectively associated Ben Lomond with the Prussian system of education, he simply did slowly what he had done before rapidly. The human mind is subtler than light, far beyond the degree in which light is subtler than lead. Consciousness is the essential condition of an idea. Memory, as objectively separated in time from consciousness, is not essential to it. Both can be born together, and both die together. A precedence in the order of thought must not be confounded with a precedence objectively in time. Alexander Bain reduces the primary attributes of intellect to three, of which the third is retentiveness, the facts connected with which may, with few exceptions, "be comprehended under the principle called the law of contiguity or contiguous adhesion. The principle of contiguity has been described under various names—as Hamilton's law of 'redintegration,' the 'association of ideas.' The principle may be stated thus: Actions, sensations, and states of feeling, occurring together or in close succession, tend to grow together or cohere in such a way that when any one of them is afterward presented to the mind the others are apt to be brought up in idea." Bain further discusses agreement, law of similarity, compound association, constructive association.

Not all ideas once integrant are necessarily redintegrated. The strength of the impression which they originally made, their duration in fellowship, the time which has elapsed since we had them, the cogency of their connection, are all determining forces. But in advance of all this the tendencies of the law of association in the particular individual are determined by the native constitution of his mind and by the circumstances of his whole training, mental and moral. These tendencies carried out make the poet or the mathematician, the sensualist or the sage. An illegitimate association of ideas may mar a whole life, may work out crime and ruin. One and the same thing may be to two persons a deadly or a reviving savor. The same flag calls forth the fiercest assaults and the most vigorous defense. The same strain of music awakens joy, sadness, hope, or despair. The poem of Wordsworth on the *Power of Sound* is but an exquisite painting of one class of illustrations of the power of association. There are national tendencies under this law as well as individual. Governments and societies are built for ages on the ideas associated with a single central idea embodied in a word. It is the association of ideas which makes the mightiest and holiest bond of our life—the tie of the home, the native land, the Christian communion. It makes the heart of the Swiss sicken and die for the little rocky mountain-nook which is associated with the *Ranz des Vaches*. The principle of the association of ideas is therefore not only of profound interest in psychology, but has great importance in morals. Like every power of man, it comes under the law of moral responsibility. Association is in certain respects involuntary, and habit can in any case carry it beyond the proper control of the will. But the will can largely determine what shall be the original links of association, and bear an important part in determining whether we shall follow up or repress a particular class of associated ideas. The association of a profane or ludicrous idea with a sacred name or fact may make that name or fact through a whole lifetime the means of recalling blasphemy or mockery.

The attempts to account for the association of ideas are of course affected by the general features of the different systems. The effort to give them in whole or in part an organic mechanical relation has been made by Descartes, Hartley, Bonnet, and a number of later writers, who relate them to brain-fiber and the nerve. Locke says: "They seem to be but traces of motion in the animal spirit." Kant (*Anthropologie*) truly says: "It is in vain to look for a physiologic solution of them." This wonderful power of the human mind is part of the perfection which it owes to the Great Being who is its author. The thinker who makes ideas and their associations physical things is as extravagant as the idealist who converts the solid earth into a mere relation between the mind that thinks of itself and the mind itself thus thought of. The materialist and the absolute idealist are the antipodes of the one world of extravagance in thought. The later psychologists, Herbart, Benecke, and others, have made clearer the twofold character in the association of ideas: First, where the associated elements are homogeneous, and produce what Herbart calls perfect fusion; second, where the elements are heterogeneous, and result in complication or imperfect fusion. This distinction is regarded as of great value for the entire soul-life, but es-

pecially with reference to the points at which the approaches of soul to the physiological processes are closest.

A well-regulated association of ideas on our own part and a delicate perception of what is likely to be the association in the minds of others with particular words or things are essential to the charm of conversation and of social intercourse. Without both of these a good and intelligent man may be a bore and a nuisance. One of the characteristic differences between logic and wit is that logic keeps the association of ideas under the control of reason, while wit uses it for combinations which triumph over reason and carry it away a delighted captive. The active imagination is the result of this force of the association of ideas. The imagination no more creates its own primary elements than the painter creates the matter of his colors or his canvas. The imagination selects and combines what the law of association furnishes. Its most daring so-called "creations" are capable of an easy analysis, which shows that they are shaped under this law. The memory is largely dependent upon association. (See MEMORY and MNEMOTECHNICS.) Various uses have been made of the principle of association in philosophy. Hume employs it to explain the idea of causality; Reid and others to account for the force of habit. But though the association of ideas can become the subject of culture, it is, as we have seen, primary and innate.

The association of ideas has been observed by thinkers from an early period. Aristotle speaks of it in his *Treatise of Reminiscence* very briefly, but in a manner worthy of his wonderful acuteness. It is to Locke, however, in the latest edition of his *Human Understanding*, we owe the first discussion of the subject with a fullness at all commensurate with its importance; and no system worthy of the name, since Locke, has failed to devote a large space to it.

Revised by W. T. HARRIS.

Associations for Advancement of Science: See AMERICAN ASSOCIATION FOR ADVANCEMENT OF SCIENCE and BRITISH ASSOCIATION FOR ADVANCEMENT OF SCIENCE.

As'sonance: in prosody, the repetition of the same accented vowel with different consonants, as *hat* and *man*, *late* and *shape*. "The rule of assonance requires the repetition of the same vowels in the assonant words, from the last accented vowel inclusive" (*Marsh*). This may extend to several syllables. This substitute for rhyme is common in Spanish poetry, and also in old French poetry.

C. H. T.

As'sos, or **Assus** (in Gr. Ἄσσοσ): an ancient city and seaport of Asia Minor, in the territory of Mysia; was situated on the north shore of the Gulf of Adramyttium, between Cape Lectum and Andros, about 7 miles from the opposite coast of the island of Lesbos or Mitylene. It occupied a commanding position and was connected with the sea by a long, steep ascent; was well protected by walls, and was still visited by shipping in the time of the apostle Paul. The surrounding country was famous for its wheat. Assos was singularly a Greek city, and contains many interesting ruins, including those of a theater, citadel, temples, etc. The Street of Tombs is one of its most remarkable features. The earliest work done by the Archaeological Institute of America was a thorough exploration of the site of Assos, in 1881-83; the first volume of a full report upon this was published by the Institute in 1882.

Revised by RUSSELL STURGIS.

Assouan, ās-swān' (anc. *Sye'ne*): a town of Upper Egypt, on the right bank of the Nile, near the border of Nubia, 115 miles S. of Thebes; lat. 24° 5' N., lon. 33° E. (see map of Africa, ref. 3-F). It is 2½ miles below the First Cataract, and is remarkable for its picturesque situation and ancient monuments. Here are quarries of syenite, a variety of granite which derives its name from Syene. From these quarries came the red obelisks that adorned various temples of Egypt. Here are also ruins of a large Saracen or Arabian town, among which are found many Cufic inscriptions. Here, according to some authorities, the poet Juvenal died in exile about 125 A. D., but this is not now generally believed. Pop. 4,000.

Assump'sit [Lat., he has taken upon himself, perf. act. 3d sing. of *adsu'mere*]: a contract not under seal, either written or oral, express or implied, as distinguished from a *covenant*, or written contract under seal; also, a common-law action to obtain damages for the violation of such an agreement. It is usually divided into common or *indebitatus assumpsit*, brought in general upon an implied prom-

ise; and special assumpsit, which is founded on an express promise. This action is now generally superseded by statute.

Revised by F. STURGES ALLEN.

Assump'tion: village; on Ill. Central R. R., Christian co., Ill. (for location of county, see map of Illinois, ref. 7-E); 23 miles S. of Decatur. It has flouring-mills. Pop. (1880) 706; (1890) 1,076; (1900) 1,702.

Assumption of the Vir'gin: a festival of the Greek and Roman Churches in commemoration of the resurrection and miraculous ascent of the Virgin Mary to heaven. It is held on August 15. Protestant Christians unanimously reject the tradition of these events.

Assumption of Moses: a pseudepigraphical or apocryphal book containing a pretended account of the death of Moses and of the assumption of his soul to heaven. Some suppose that St. Jude alludes, in his reference to the contest between the archangel Michael and the devil, to the statements made in this book; but it is not certain that it existed in apostolic times.

Asswan: See ASSOUAN.

Assye: See ASSAYE.

Assy'ria (in Gr. Ἀσσυρία, L. *Assyria*): the ancient Semitic kingdom of Asshur, whose great capitals were Asshur, Nineveh, and Calah, on the Tigris river. Assyria proper was a small region about these capitals. It was settled by colonists from Babylonia, according to the statement of Genesis x. 8-12, which is supported by many considerations drawn from the native literature and from a study of the native religion, art, and institutions. Assyria was bounded N. by what is now Armenia, E. by Media, S. by Babylonia, with an indeterminate line on the W. At times the boundaries were greatly enlarged by conquest, and included Babylonia, portions of Elam, Palestine, Egypt, parts of Arabia, and Asia Minor; in a word, most of Asia west and south of Assyria proper. This period of enlargement falls particularly in the eighth and seventh centuries B. C. Assyria proper has no mountains, though it has several ranges of hills. Its chief streams besides the Tigris are the Upper Zab and the Lower Zab, both of which enter the Tigris on the E. The natural fertility of the soil was aided by irrigation. During the long, dry summer season the heat becomes intense.

History.—Our sources of information regarding Assyrian history are chiefly the native literature preserved in the cuneiform inscriptions, and the remains of art and industry dug from the ruins. These sources are now so abundant as to supersede very largely what has been written on the subject by classic authors. Many of the great kings have left a double record of their lives, one in the bas-reliefs with which they lined their palace walls, and one on books of stone and clay. Some of the kings felt an interest in past history, and have given us valuable epitomes. The royal annals frequently make references to past events, stating the number of years which have intervened. Sennacherib, 705-681 B. C., fixes for us the date of Tiglathpileser I. at about 1120-1100 B. C. A long inscription of Tiglathpileser I. mentions restoring a temple at the capital, Asshur, which had been built 701 years previously by Shamshi-Raman, son of Ishmi-Dagan. This carries the erection of the temple back to about 1820 B. C., the oldest Assyrian date yet recovered. Shamshi-Raman and his father are called *Isshak*, a word which is believed to mean priest-prince. It seems likely, therefore, that in their day Assyria had not yet grown into a kingdom. In the sixteenth century B. C. royalty is well established, and we have letters written from this time to the Pharaohs. Assyria now begins a series of quarrels with Babylonia, which, with interruptions, continued till Nineveh was destroyed. The Assyrians were more warlike than the Babylonians, and were more often the successful contestants. In the eighth and seventh centuries Babylon was at times tributary to Assyria. The first Assyrian king from whom we have long records is Tiglathpileser I. One of these, an octagonal clay prism, of which four copies were dug from the ruins of Asshur, contains 809 lines of writing, recording the wars, hunts, and buildings of the king. Assurnazirpal (884-860) carried his conquests to the shores of the Mediterranean. From his palace at Calah many of the finest bas-reliefs were excavated by Mr. A. H. Layard, and are now in the British Museum. These bas-reliefs, as well as the inscriptions on them, were often duplicates. Several of these were sent to America, and copies are now in the Boston Museum of Fine Arts, the Mercantile Library of St. Louis, the libraries of Yale University, the University of Pennsylvania,

and in several other libraries and institutions of learning. His son Shalmaneser II. (860-824) was the first Assyrian king, so far as we yet know, to come into relations with Israel. He defeated a great coalition led by Damascus, one of the allies being Ahab, who furnished 2,000 chariots and 10,000 soldiers. Jehu likewise paid tribute to Shalmaneser. The successors of Shalmaneser continued these western campaigns. Tiglathpileser III. (745-727), the first Assyrian king mentioned by the Hebrews (2 Kings xv. 29), and now proved to be identical with Pul (2 Kings xv. 19), carried a portion of northern Israel into captivity. With him begins the period of Assyria's greatest glory. The last dynasty was founded by Sargon (722-705), and includes some of the greatest names in the history—Sennacherib (705-681); Esarhaddon (681-668); and Assurbanipal (668-626). Under this dynasty the kingdom reached its greatest territorial enlargement. Sargon put an end to the kingdom of Israel (722). The discovery of the palace of Sargon at Khorsabad, a few miles N. E. of the ruins of Nineveh, by P. E. Botta, in 1843, was the beginning of the era of exploration. In the Louvre are some fine winged bulls and bas-reliefs from this palace. The Berlin Museum contains an inscribed monument of Sargon, found on Cyprus, set up there at the time when this island submitted to Assyria.

Sennacherib has left a vivid account of his campaign in Palestine in 701 (cf. Isa. xxxvi. and xxxvii). He destroyed Babylon, but his son rebuilt it eleven years later. Esarhaddon names the western kings who were subject to him, and among them we find Manasseh of Judah. He made three campaigns to Egypt, and died on the road during the third. By his will Assurbanipal succeeded him in Assyria, and another son, Shamash-shum-ukin, in Babylon, with a certain degree of inferiority to Assurbanipal. After twenty years the two brothers became involved in a disastrous war, which resulted in the death of Shamash-shum-ukin, but which struck a serious blow at Assyrian greatness and hastened its decay.

Assurbanipal, the most illustrious Assyrian ruler, gathered in his palace at Nineveh a library of clay books, and was a great patron of letters. He seems to be the Osnappar of Ezra iv. 10. Under the name of Sardanapalus his true character has been much distorted by classic tradition. Little is known of his successors or of the destruction of the Assyrian power in 606 B. C.

The best history of Assyria is C. P. Tiele's *Babylonisch-Assyrische Geschichte* (1 vol. in two parts: Gotha, part i. 1886; part ii. 1888). George Rawlinson's *Five Great Monarchies* is still serviceable, though greatly in need of revision. Franz Kanlen's *Assyrien und Babylonien* is very useful, and gives a full bibliography, though, like the *Five Great Monarchies*, not the work of a specialist. See, further, George Smith's *History of Babylonia* (1 vol.); George Smith's *History of Assyria*; A. H. Sayce's *Ancient Empires of the East*; E. Meyer's *Geschichte des Alterthums* (vol. i., Stuttgart, 1884); F. Hommel's *Geschichte Babyloniens und Assyriens* (Berlin, 1885-87); Justi's *Geschichte des Alten Persiens* (Berlin, 1878); Perrot and Chipiez's *History of Art in Chaldaea and Assyria*, from the French (2 vols., London, 1884); A. H. Sayce's *Assyria, its Princes, Priests, and People* (1 vol., London); E. A. W. Budge's *Babylonian Life and History* (London); E. Schrader's *Cuneiform Inscriptions and the Old Testament*, from the German (2 vols., London, 1885, 1888); *Records of the Past* (new series, edited by A. H. Sayce, 6 vols., 1888-92); G. Maspero's *Life in Ancient Egypt and Assyria* (New York, 1892).

Social Organization.—The social organization of the ancient Assyrians and Babylonians was complex and highly developed, as we can clearly see in the numerous records of social transactions. Our information is fuller regarding Babylon, but the constitution of society was perhaps not very different in Assyria. While the monarchy was hereditary, the insurrections, revolutions, and dynastic changes of which we read show that the subjects often made their own wishes felt. Real estate was owned by the people, who bought and sold it at will. Slavery was an old institution. Captives of war were at times enslaved, and the children of slaves inherited the condition of their parents. While the king and perhaps also the wealthy had many wives, the rule among the common people was monogamy. Women might hold property and engage in all forms of commercial transactions. Lawsuits, in the later Babylonian times at least, were decided by a board of judges, apparently without the intervention of lawyers. Fraudulent claims were punished by fines as well as by loss of the suit. The

great complexity of the social organization must have divided the society into numerous castes and guilds. The good order, the industrial activity, the prosperity are clear from the commercial records, and are likewise attested by the fact that most of the Jews, on the fall of Babylon in 538 B. C., preferred residence there to returning to Palestine. See G. Maspero's *Life in Ancient Egypt and Assyria* (1 vol., New York, 1892); Budge's *Babylonian Life and History*; Tiele's *Babylonisch-Assyrische Geschichte*.

Religion.—Like the Semites in general, the Assyrians and Babylonians were a very religious people. All their wars were carried on in the name of the gods, and in important commercial transactions the gods were invoked to punish violators of agreements; restoration and adornment of the temples were specially meritorious works. The great gods were largely the striking objects and moods of nature—as the heavens, Ann; the sun, Shamash; the moon, Sin; the weather, Raman. There was no supreme deity, but there was in Assyria a special national god called Asshur. The national god at Babylon bore the name Marduk. The most striking difference between the pantheons of Assyria and Babylonia is that Asshur has no place in the latter, while Marduk has place in the former, though not the first place. A notable fact is the disposition to group the gods in triads. The first of these consists of Ann, god of the heavens; Bel, god of the earth; and Ea, god of the abyss—corresponding to the cosmogonic notions of the people. A second triad comprised Sin, the moon-god; Shamash, the sun-god; and Raman, the weather-god. As god of the abyss, Ea had control of the sea and of canals, and was likewise the god of wisdom. Shamash, as the seer of all things, was the great judge of things in heaven and on earth. Raman was in charge of the rains, which he used to reward the good or to deluge the wicked. Among the other great deities were Ishtar, who appeared both as war-goddess and as goddess of love, and whose worship, under the name of Ashtoreth and Astarte, spread far to the W. of Assyria; Nergal, the god of the chase; Adar, the god of war; and Nabu, the inventor of writing and god of literature. There were also other gods of great consequence, as the fire-god, the pestilence-god, the messenger-god, etc. The gods are represented by symbols and by human and animal forms. A favorite symbol was the numeral. Thus Sin, the moon, was 30, for the thirty days of the month; Ishtar was 15; Marduk 11. At other times the moon was represented by his disk; the sun by an image of that orb; the weather-god by the lightning. The great sun-god of Sippar is represented by a sun-disk and also by a human figure. Sometimes the gods are represented by combinations of elements, as of a man, ox, lion, and eagle, in the giant figures carved from stone acting as guardians of palaces and temples. The winged globe, within which a human bust appears, is another favorite symbol. The human-shaped statues were at times overlaid with gold, adorned with jewels, and dressed in gorgeous attire. After the great gods came the demons and spirits, which, if hostile, were a source of constant dread, and to ward off or exorcise which there existed an elaborate system of magic. Sometimes these spirits even attacked the greater gods, producing solar and lunar eclipses, or joining the dragon Tiamat in resisting the work of creation. Disease was due to them, and hence medicine and magic were closely allied. The gods were believed to reveal themselves to men by oracles, and in dreams and visions. The oracle of Ishtar at Arbela was one of the most famous. Ishtar appears to a seer by night, and encourages the Assyrian army to cross a swollen river. Marduk and Sin reveal themselves to Nabonidus, and communicate instructions regarding the restoration of a temple. Men approached these gods by prayer and by sacrifice. Many of the psalms are prayers for the divine favor. The royal prayers are for victory, peace, numerous offspring, and firm throne. But some of the later Babylonian royal prayers also ask the gods to implant in the heart a reverence of the deity, so that no sin may be committed against him. The temples were numerous. Among the oldest and most famous was the temple of Shamash at Sippar, built nearly 4000 years B. C. The people whom Sargon transported from Sippar to Samaria, being sun-worshippers, burned their children in the fire (2 Kings xvii. 31). A second famous temple was that of Nabu at Borsippa, represented now by the ruins called Birs Nimrud. Most grand and magnificent of all was the temple of Marduk at Babylon, whose superiority is due to the political supremacy attained by Babylon under Hammurabi about 2300 B. C. This is the temple on which Nebuchadnezzar lavished so much wealth, and which Herodotus describes in

detail. While the great temples were sacred to individual gods, they were provided with numerous shrines in which other gods were also worshiped. The same city might have several temples, each with many shrines. One tablet records for us the list of temples in the city Asshur, and the many gods who had shrines therein. The temples consisted of chambers and courts with houses for the priests, places for altars and sacrifices, depositories for records and other valuables. A tower of solid masonry, with an external ascent by an inclined plane, was also an attachment to the temple, and there may at times have been a shrine on the top of this tower. The sacrifices were oxen, sheep, birds, wine, oil, and the fruits of the earth. They were offered daily, as well as at special times. The priests in whose charge was the elaborate religious system must have been a very influential portion of the community. The vitality of the system is seen in its power to survive the greatest political changes. Both Persian and Greek kings of Babylon record restorations of the ancient temples in language similar to that used by their great Semitic predecessors.

The most elaborate study of the religion is by A. H. Sayce in the *Hibbert Lectures for 1887*. See also the account in C. P. Tiele's *Babylonisch-Assyrische Geschichte*, and in other works mentioned higher up under the sub-heading *History*.
D. G. LYON.

Assyrian Art: The Assyrians were artists of no mean ability, as is witnessed by the thousands of sculptured slabs of alabaster and limestone exhumed by Layard, Botta, Place, and other explorers. These slabs, about 8 feet high, formed



FIG. 1.—Bas-relief. Assyrian court officials.

a wainscoting for the crude brick walls of the royal palaces, and represent, in low relief, scenes of war and the chase, and mythological subjects. While far inferior to the best Greek reliefs, they surpass the Egyptian in fidelity to nature, especially in their representations of animal life. More striking even than the reliefs are the "portal guardians"—winged and human-headed bulls and lions of great size and terrible aspect—flanking the city gateways and palace entrances. All Assyrian sculpture is subordinate to the architecture, in which art the Assyrians achieved colossal works in spite of the scarcity of stone and timber and the lack of fuel, which compelled them to use their abundant clay-deposits in the form of crude brick, and to employ the more

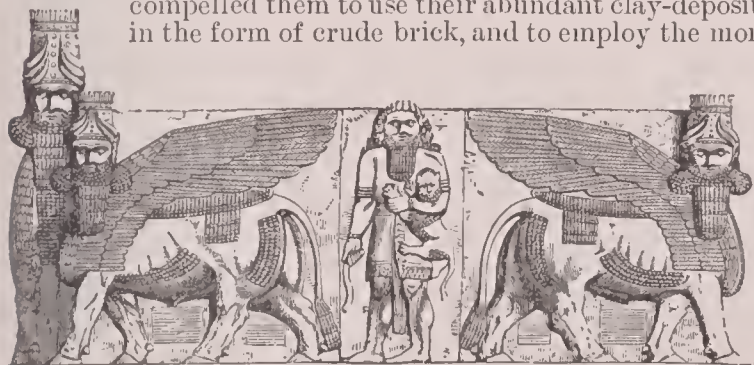


FIG. 2.—Remains of Propylæa at Khorsabad.

costly burned brick only for facings and decorations. Buildings in several stories being impracticable with such poor materials, they raised enormous clay-mounds, carefully drained by vaulted sewers; faced them with hard brick or stone, and built upon them palaces of vast extent, elaborately planned with courts, halls, and chambers, separated by crude-brick walls from 10 to 30 feet thick. The lack of good timber, and the generally admitted fact that the Assyrians did not employ the column except in minor structures, restricted the spans of the halls and rooms to 25 feet or less,

except in a few cases, where it would appear that barrel-vaults were used, built of crude or burned brick. The interior chambers must have been poorly lighted, a fact of less

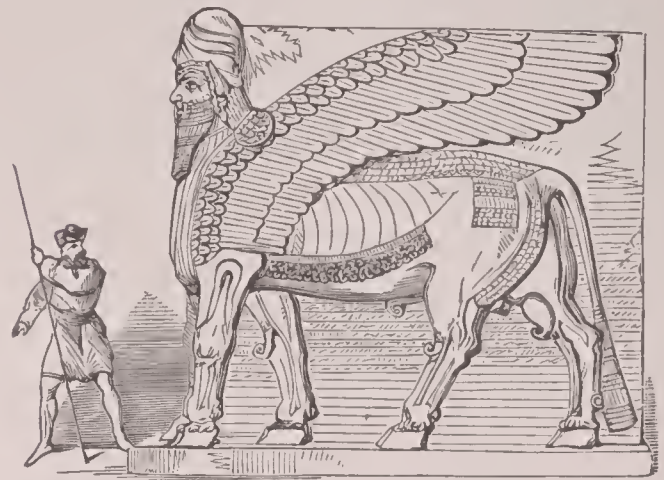


FIG. 3.—Winged bull with a human head, from Nimrod; now in the British Museum.

consequence in a hot climate than in one like ours. The walls were wainscoted with the alabaster reliefs already referred to; above these they were either plastered and painted, or adorned with enameled tiles in sumptuous symbolic or conventional patterns in blue, green, red, yellow, and black. In these decorative details, largely imitated from Egyptian motives, the Assyrians showed great taste, as well as in the arts of weaving, embroidery, and bronze-working.

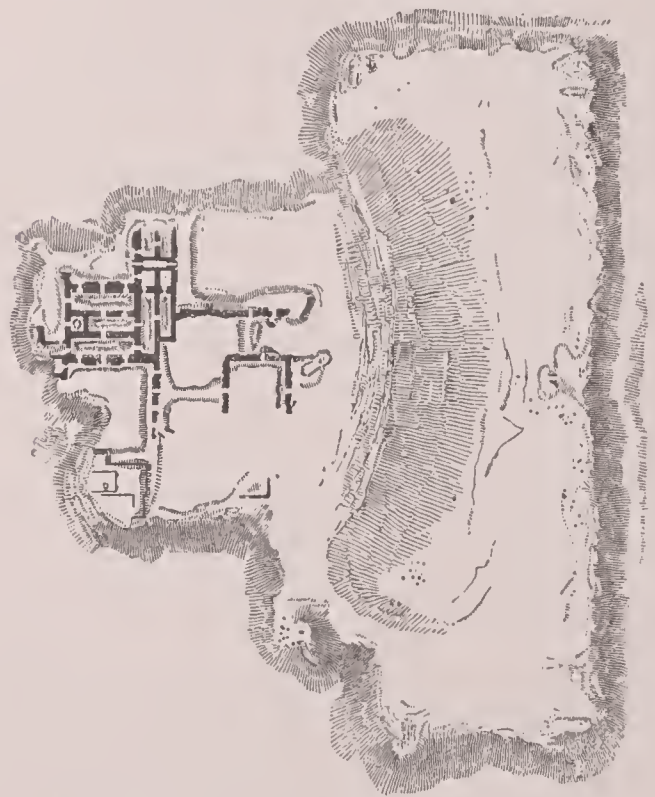


FIG. 4.—Plan of the palace of Sargon at Khorsabad.

The temples followed Chaldæan models, and consisted of small shrines or observatories surmounting terraced pyramids with exterior ramps, the whole faced with enameled brick in divers colors. For Assyrian art, etc., see Perrot and Chipiez, *History of Art in Chaldea and Assyria* (tr. Armstrong, 1884); V. Place, *Ninive et l'Assyrie*; also the works of Layard and Botta. Fergusson's conclusions regarding Assyrian architecture (*Palaces of Nineveh and Persepolis Restored*) have not found general acceptance.

A. D. F. HAMLIN.

Assyrian Explorations: the explorations carried on in the site of the ancient Assyria. The great period of exploration begins with the appointment in 1842 of P. E. Botta as French consul at Mosul. Botta began by digging in the ruins of Nineveh just across the Tigris from Mosul, but without much result. Learning that at a modern village named Khorsabad, a few miles north of Nineveh, stones of ancient buildings might be dug from the earth, he investigated the spot, and soon came upon what proved to be the palace of Sargon. This was fully excavated by himself in 1843 and

1844, and his consular successor, Victor Place, whose excavations extended from 1851 to 1855. Botta published his results in five magnificent folios, entitled *Le Monument de Ninive* (Paris, 1847-50), and Place published his in two folios, entitled *Nineveh et l'Assyrie* (Paris, 1867-70). Botta's great success at Khorsabad led Austen Henry Layard to take up the work at Nineveh, Calah, and other ruined cities of Assyria and Babylonia, and Mr. Layard's good fortune enriched the British Museum with vast treasures of Assyrian art and literature. In his *Nineveh and its Remains* and *Nineveh and Babylon* are the accounts of his excavations carried on in 1845-47, and in his second expedition beginning in 1849. In Babylonia W. K. Loftus led two exploring parties in 1849 and in 1853, while J. E. Taylor was at the same time digging in the ruins of Mugheir, commonly identified with Ur of the Chaldees. Two expeditions by George Smith, of the British Museum, resulting from his discovery in 1872 of a deluge story on the tablets, greatly enriched the museum treasures (cf. his *Assyrian Discoveries*). Mr. Hormuzd Rassam, who took part with Mr. Layard in exploring Nineveh, made repeated visits to the East for the British Museum, and met with great success, notably at Nineveh, at Balawat and at Abu-Habba. In 1877 the French consul, E. de Sarzec, began excavating the ruins of Telloh, about midway between Babylon and the Persian Gulf, and made the discovery of the remarkable statues in the round which are now one of the ornaments of the Louvre. With the aid of Prof. León Heusey he has published the story and representations of the art objects in *Découvertes en Chaldée*. In the winter of 1884-85 there was an American party to Babylonia, led by Dr. William Hayes Ward, the expenses being met by Miss Catherine Wolfe. Some hundreds of tablets, seals, and other objects, acquired by purchase, now in the Metropolitan Museum of New York, are the result. The Germans have in recent years sent an expedition to Babylon, whose most interesting feature was the excavation of an ancient Babylonian burial-mound, which shows that cremation was extensively employed. The discovery at el-Amarna, in Egypt, in 1887, of several hundred clay tablets in cuneiform script and in the Assyrian language, many of which were written in Phœnicia and Palestine, has revealed to us the fact that this script and language were used for international purposes in the sixteenth century B. C. In 1889-92 extensive diggings were carried on at Niffer, S. E. of Babylon, by Prof. John P. Peters, of Philadelphia. Many interesting objects were found, including a great mass of clay tablets and fragments, some thousands of which are now deposited in the library of the University of Pennsylvania.

D. G. LYON.

Assyrian Language: the language of the ancient Semitic people who lived in the valleys of the Tigris and Euphrates rivers. (See SEMITIC LANGUAGES.) The oldest specimens of this language date from about 4000 B. C., and the latest from about the beginning of our era. The most ancient and most recent are from Babylonia, this country antedating Assyria as a power, and continuing after the fall of Assyria (606 B. C.). The name Assyrian has gained general currency, though Babylonian might be better, especially in view of the fact that the Assyrian people were originally a colony from Babylonia. The dialectical differences are few, the most important being the Babylonian tendency to a softer pronunciation of the mutes, *b* for *p*, *g* for *k*, *tau* for *teth*.

The Assyrian belongs to what is known as the northern branch of the Semitic stock of languages, being thus more closely related to the Aramaic and Hebrew than to Arabic, the chief member of the southern branch. It had originally all the sounds found in Hebrew, but has suffered great phonetic degradation. This is particularly true of the gutturals and the so-called quiescents (*waw* and *yōd*).

In its grammar the Assyrian has the general characteristics of the Semitic languages, but there are certain features peculiar to it, or which belong to it along with one or two others. There is no article; in the noun three case-forms exist, represented by final *u*, *i*, *a*; the verb has four primary stems (simple stem, as *sapānu*, to overwhelm; intensive stem, as *suppunu*, to overwhelm much; causative stem, as *shuspunu*, to cause to overwhelm; and reflexive, passive stem, as *naspunu*, to be overwhelmed), and four secondary, made by insertion of the syllable *ta* in the primary stems. From the simple and the reflexive stems two tertiary stems are formed by insertion of the syllable *tan*. Each verb stem has a perfect and an imperfect form. The perfect, commonly called permansive, indicates condition or state, and is usually passive in signification. Of the imperfect there are two forms,

the shorter being the usual form in narrating past events, while the longer is used for repeated and future actions. In vocabulary and syntax the Assyrian language is strikingly like the Hebrew, and the chief difficulty in acquiring it comes from the complexity of the written character. The recovery of the language kept pace with the decipherment of the inscriptions, the chief workers being Henry Rawlinson, Edward Hincks, and Jules Oppert. Grammars have been published by Jules Oppert, Joachim Mécant, A. H. Sayce, and Friedrich Delitzsch. The last named, both English and German, 1889, is the most recent and the best. The Assyrian dictionary of Edwin Norris (1868-72) omits the verbs and extends only into the letter N. Friedrich Delitzsch has begun in German a lexicon on the scale of a thesaurus. For beginners several chrestomathies have been prepared, among which those of Friedrich Delitzsch and of Abel and Winckler deserve special mention. The *Assyrian Manual* published by the writer of this article makes it possible for a student to acquire the language without learning the signs. The growth of interest in the Assyrian language during the past decade has been remarkable, especially in Germany and the U. S., and there are now many institutions in both countries where the subject is taught.

D. G. LYON.

Assyrian Literature: Assyrian writings may be grouped as historical, social-commercial, scientific, religious, and poetical. The historical writings are preserved on clay and stone, and are found in the ruins of palaces and temples, especially at the four corners of the great edifices. The finest record of Assurbanipal was found by Hormuzd Rassam in the ruins of Nineveh, walled in by solid masonry. Some of the royal records are arranged chronologically. Others follow a geographical or an oratorical order. Closely related to the historical are such state documents as royal proclamations, reports from generals, petitions to the king, and oracular responses. Under social-commercial are included the inscribed boundary stones and the great mass of small clay tablets, already found by scores of thousands, recording loans, sales, partnerships, lawsuits, marriages, wills, adoption of children, etc. These are found especially in the ruins of temples. They are commonly known as "contract-tablets," and many of them are stamped with the seals of the contracting parties. Of peculiar interest are those called "case-tablets," on account of the outer covering of clay completely concealing the inner document, and duplicating its record. The object was the better protection of the inner record against violence or fraud. In case of dispute it was always possible to break the covering in order to read the original on the inner tablet. By scientific must be understood the astronomical reports, computations of eclipses, lists of squares and cubes, grammatical and lexico-geographical compilations, and other lists showing the beginning of interest in botany, zoölogy, geography, geology, etc. The religious documents include lists of the gods, of the temples and sacrifices, of omens and portents, of magical formulæ, etc. Here belong also the hymns and psalms. These last are poetic in form, and they make with the epic and the mythological writings what might be called literature in the narrower sense of the word. The poetical writings come for the most part from the library of Assurbanipal, but they are copies from older Babylonian originals. The hymns and psalms sing the praises of the great gods, as Shamash, the sun-god; Sin, the moon-god; Raman, the weather-god; Marduk, the national god of Babylon, etc. Some of these productions indicate genuine poetic feeling and religious fervor. This is particularly true of the so-called penitential psalms, which frequently remind the reader, both in tone and in expression, of the biblical psalms. A most remarkable literary fragment is the account of the descent of Ishtar, goddess of love, to the Assyrian Sheol. This region, presided over by a goddess, is located in the subterranean waters, and is surrounded by seven walls. The inmates live in gloom, have clay for food and feathers for clothing. The seven gates are guarded by a watchman, who strips the goddess of ornament and apparel before he grants her entrance. Once within the innermost gate there is no exit for her except by intervention of other gods in her behalf. The creation of the world is represented by a series of tablets, of which considerable fragments have been recovered. Beginning with a condition of chaos, the first tablet relates how by the commingling of the waters of the abyss (personified as a male called *Apsu* and as a female called *Tiamat* = *Tehōm*, "abyss," Gen. i. 2), the gods were

generated. After a break in the story, we find *Tiamat* as a dragon engaged in a fierce contest with the gods, by one of whom she is finally slain. Then follows the creation of the constellations, the moon, sun, animals, and doubtless, last of all, man, though the close of the story has not yet been found. The war of the dragon with Marduk, who slew her, is a favorite theme in the art, especially on the seals. The most considerable literary work yet found is the epic commonly known, after its hero, as the *Izdubar* epic. It is written on twelve tablets, containing in all some 3,600 lines of writing. Fragments of several copies have been found, and some of the tablets have been almost entirely restored. The discovery of a portion of this epic among the clay books in the British Museum by George Smith in 1872 gave a new interest to Assyriology, because there is related on the eleventh tablet a deluge story which is strikingly similar to the one recorded in Genesis. The epic is believed to have taken shape in Babylonia prior to 2000 B. C. The scene is laid at Erech, at a time when this ancient city is oppressed by a foreign tyrant. *Izdubar*, the hero, residing at Erech, has a dream which none can interpret until he induces *Eabani* to come into the city. *Eabani* is a composite creature, partly man and partly bull, famous for wisdom, whose home has been in the mountains. He interprets the dream, and the two become fast friends. They succeed in ridding Erech of the oppressor. Hereupon, *Ishtar*, goddess of love, attracted by his prowess, woos *Izdubar*, but is rejected. At her request, *Ann*, her father, the god of the heavens, sends down a monster bull to gore the two friends, but after a fierce struggle they dispatch this creature. This struggle is a favorite theme with the ancient artists. The gods then smite *Eabani* and *Izdubar* with disease. The former dies in agony, and the latter travels over the world, across its deserts and mountains, in search of healing. At last he arrives at the gates of death and finds them barred and guarded. After much parleying he gains admission, and is rowed by a boatman to the blessed isles at the mouth of the rivers, where he finds a deified man who gives him the secret by which he may be healed, but before doing so he relates to *Izdubar* the deluge story already mentioned. After this *Izdubar* is healed by following the instructions given, and then returns to Erech to lament the dead friend *Eabani*. Sir Henry Rawlinson first pointed out the astronomical character of this poem, which seems to represent the annual passage of the sun through the heavenly constellations. The twelve tablets correspond to the twelve zodiacal signs and to the twelve months of the Babylonian year. The *Izdubar* story has been supposed to be connected with the stories regarding *Hercules*, *Nimrod*, and *Samson*. Indeed, the poem is by some scholars called the *Nimrod* epic. The exact pronunciation of the cuneiform signs by which the name *Iz-du-bar* is written has not yet been made out. Quite recently Mr. T. G. Pinches, of the British Museum, has expressed the opinion that the hero ought to be called *Gilgames*. Fragments of fables have likewise been found among the Assyrian writings, in which the eagle, the fox, the serpent, the horse, and the ox are the speakers. That the poetic literature of Babylonia was once extensive is proved by some fragments in the British Museum giving a list of the ancient works, with the names of their reputed composers. Some of these works have doubtless perished completely. Others still await the spade of the explorer. For what has already been recovered we are indebted mainly to the farsightedness of *Assurbanipal*, who caused copies to be made for his own library at Nineveh.

Great collections of inscriptions in the original script have been edited by Sir H. C. Rawlinson, P. E. Botta, J. N. Strassmaier, and Hugo Winckler. Collections of translations from the monuments are found in George Smith's *Chaldean Account of Genesis*; *Records of the Past*, edited by A. H. Sayce; A. H. Sayce's *Hibbert Lectures for 1887*; *Keilinschriftliche Bibliothek*, edited by E. Schrader (Berlin, 1889-90). Accounts of the literature are given in A. H. Sayce's *Babylonian Literature*, and in George Smith's book just mentioned. A well-digested bibliography of modern works on Assyriology is given in Friedrich Delitzsch's *Assyrian Grammar* (Berlin, 1889), and also (in chronological arrangement) in F. Kaulen's *Assyrien und Babylonien*; Carl Bezold's *Kurzgefasster Überblick über die Babylonisch-Assyrische Literatur* (Leipzig, 1886) can be used only by students of the original. The journals whose interest is mainly or largely the study of the Assyrian language and literature are the *Proceedings of the Society of Biblical Archaeology* (London); the *Zeitschrift für Assyriologie*

(Leipzig); the *Beiträge für Assyriologie* (Leipzig); and the *Babylonian and Oriental Record* (London). D. G. LYON.

Ast, GEORG ANTON FRIEDRICH: German philologist and critic; b. at Gotha, Dec. 29, 1778; appointed Professor of Classical Literature at Landshut in 1805, and obtained the same chair in the University of Munich in 1826. He wrote, besides other works, a *Manual of Aesthetics* (1805); *Introduction to Philology* (1808); and *The Life and Writings of Plato* (1816). He also published a good edition of the works of Plato, with a Latin version and a commentary (11 vols., 1810-32). D. in Munich, Oct. 31, 1841.

Ast'acus [Lat., lobster, from Gr. ἀστράκος]: a genus of crustaceans, including the crayfishes of Europe and the Pacific States of the U. S. Those of the Eastern U. S. belong to another genus, *Cambarus*. See CRAWFISH.

Astar'te [the Greek and the Phœnician form of *Ash-tareth*]: a goddess worshiped by the Phœnicians, Syrians, and Carthaginians, and the original of the Greek *Aphrodite* (*Venus*). The common view is that as *Baal* was the sun-god, so *Astarte* was the moon-goddess, or goddess of the heavens. She is variously represented, but more usually with four wings (the two uppermost of which are intended to symbolize the horns of the moon), wearing a pointed cap, and holding a dove in her hand, as shown in the accompanying illustration, taken from an image of *Astarte* found in Etruria. The Syrians built to her a famous temple at Hierapolis. Her chief temples, besides that at Hierapolis, were at Tyre and Sidon. The Assyrian goddess called *Ishtar* or *Istar* is identified with *Astarte*. But, according to another view, *Astarte* is the virgin goddess of death and war, who, unlike *Ashera* (*q. v.*), lays the strictest chastity and continence upon her priests and priestesses.



Astarte.

Revised by S. M. JACKSON.

Astarte: a genus of bivalve mollusks; the type of the family *Cyprinidae*, nearly related to the *Veneridae*. Fossils of some 200 extinct species are widely distributed over the world. Some of them are found in the lias formation. Fifteen or twenty species of *Astarte* now exist in the deep sea in various parts of the world.

Astat'ic [from Gr. ἀστατος, unstable; ἀ-, not + στήναι, stand]: applied to the magnetic needle when it is withdrawn from the action of the earth's magnetism, and has no longer a *static* position of equilibrium under the influence of this force; also to the galvanometer of which such needles form an essential part. A needle becomes *astatic* when the axis about which it is movable is placed parallel to the lines of force of the magnetic field in which it lies, because it can not receive any motion from the force, and will rest in any position. The term is generally applied to a pair of needles, which are rendered neutral as regards the earth's magnetism by placing them parallel to one another, the north-seeking pole of the one in opposition to that of the other.

E. L. NICHOLS.

As'ter [from Gr. ἀστήρ, star]: a genus of plants of the family *Compositæ* (which Lindley proposed to call *Asteraceæ*). This genus comprises a great number of species, generally herbaceous, mostly natives of the U. S. Many of them are cultivated in the gardens of Europe for the beauty of the flowers, which bloom from July to November. The ray-florets, which are never of the same color as the disk, are purple, blue, violet, white, etc. Among the remarkable American species are *Aster novæ-angliæ*, *Aster puniceus*, *Aster cyanus*, and *Aster spectabilis*. The China aster (*Aster chinensis*; *Callistephus chinensis*) is a favorite garden-flower in England and the U. S. Many varieties are cultivated, and present a great diversity of colors. They prefer a rich soil, and bloom until the end of autumn.

CHARLES E. BESSEY.

Aster, ERNST LUDWIG, von; b. at Dresden, Oct. 5, 1778; received a military education, and served first in the Saxon, then in the Russian, and finally (after 1815) in the Prussian service. In 1810, while still in the Saxon army, he attracted the attention of Napoleon by a plan for the fortification of Torgau, and while in the Prussian service he undertook the fortification of Coblenz and Ehrenbreitstein; was made inspector-general of all the Prussian fortresses and general of infantry in 1842. D. at Berlin, Feb. 10, 1855. His *Nachgelassene Schriften* were published at Berlin (5 vols., 1856-61).—His brother, KARL HEINRICH VON ASTER, b. at Dresden, Feb. 4, 1782; d. there Dec. 23, 1855; colonel in the Saxon army; wrote several valuable military works, of which the most noted are *Lehre vom Festungskriege* (2 vols., 1812; often reprinted and translated into other languages), and *Die Gefechte und Schlachten bei Leipzig* (2 vols., 1852-53).

Asteracanthus [from Gr. ἀστήρ, star + ἄκανθα, spine]: a genus of fossil sharks, of which only the dorsal defensive spines are known. These are found in the Mesozoic rocks of England, and were named by Agassiz from the stellate tubercles with which they are ornamented.

Asteria: See SAPPHIRE.

Asteroid [from Gr. ἀστεροειδής, star-like; ἀστήρ, star + εἶδος, form]: one of the small planets which revolve around the sun, between the orbits of Mars and Jupiter. The name was first used by Sir William Herschel, but is not universally recognized by astronomers, "small planets" being sometimes preferred. As far back as the time of Kepler it was noticed that a wide gap existed between the orbits of Mars and Jupiter, in which an additional planet might be so placed that the distances of all the planets would then follow a uniform law. (See BODE'S LAW.) It was therefore surmised that a planet yet to be discovered might actually revolve in this region. After the discovery of the planet Uranus this conviction became so strong that an association of astronomers was organized to search for the supposed missing member of the solar system. The zodiac was divided among twenty-four observers, each of whom was to search through one hour. But just as the search was commencing the discovery was made by an astronomer who did not belong to the association at all. Piazzi, at Palermo, was at work on his great *Catalogue of Stars*, and, on the first day of the nineteenth century, his attention was attracted by an apparent change of place in one of the stars he had observed. In a few days more it proved to be the planet required to fill the gap. When the orbit was computed it was found that the new planet travels at a mean distance of 2.767 from the sun, the earth's distance being unity, while the predicted distance, from Bode's Law, was 2.8. The approach to the expected distance was so near that the law seemed to be confirmed, and the planet to be the one member necessary to complete the solar system. Piazzi gave it the name *Ceres*.

But while astronomers were congratulating themselves on this new proof of law and harmony within the solar system, a fresh discovery threatened to throw all into disorder again. On Mar. 28, 1802, while examining a part of the constellation Virgo, Olbers, a physician and astronomer of Bremen, noticed a small star which he was sure had not previously been visible. In two hours he found that it must be a new planet. In the course of a month an approximate orbit was found for it, and its mean distance was found to be nearly the same as that of *Ceres*. Thus there were two planets where only one had been wanted to complete the system. Olbers was led to expect that others would be found, and, a search being instituted for the purpose, a third was discovered on Sept. 1, 1804, and a fourth on Mar. 29, 1807.

The discovery of four planets where apparently only one belonged, and the fact that these planets were excessively small, much smaller, in fact, than Mercury itself, suggested to Olbers the idea that these four bodies were the fragments of a single original planet which had been destroyed through some internal explosion, or, perhaps, by coming into contact with some heedless comet. This idea has since become celebrated under the name of "Olbers's hypothesis." The author of the hypothesis himself suggested that, if true, there were probably many other fragments, but that the orbits of all these fragments must pass through a common point, namely, the point where the explosion occurred. This, however, would not be true unless the cataclysm was of comparatively recent occurrence. Owing to the secular variations to which all orbits in the solar system are subject, the orbits of these planets would change their form

and position in such a way that, after a few thousands of years, the common point of intersection would no longer be recognizable. Thus, so long as only four bodies were known, it was impossible to find any decisive test for or against the hypothesis. It therefore remained for many years a mere subject of speculation, the general current of the best opinion being against it.

Thirty-eight years passed after the discovery of *Vesta* before another of the supposed fragments was found. But in 1845 the astronomical world was interested by the discovery of a fifth, and two years later a sixth was added. Ambitious observers then began to search for new ones with greater system and zeal than before, with the result that not a year has since passed without adding one or more to the list, the approximate average rate of discovery since 1850 being about ten per year. The number now known (1900) is about 450.

The number of these bodies is now so great that it is almost impossible to keep the run of their motions. In fact, two or three are as good as lost, but will doubtless be rediscovered at no distant time. Apparently all that can be done with them is to discover them, get an approximate orbit, and let them go again, bearing, metaphorically speaking, the initials of the astronomer that found them. Formerly they were found only by careful and systematic search with the telescope, and by the exercise of a great amount of skill derived from long practice; but the introduction of photography into astronomical research has placed in the hands of astronomers a much more simple and effective method. Planets show themselves on the photographic plate in a very curious way. To the eye they are indistinguishable from the stars, and can be detected as planets only by their motion. In taking a photograph of the stars the plate has to be exposed for a considerable period, perhaps half an hour or an hour, and to be so moved by clockwork that the image of the star shall constantly be formed on the same point of the plate. Since a planet will move among the stars, it follows that if a planet is also making its impression on the plate the motion will cause the planet to be represented by a straight line instead of by a point, as in the case of a star. In the space even of half an hour a planet moves over such a distance as to make an appreciable line. Thus all the planets that happen to be in the field of the plate will be detected.

Eros, discovered by Wolf, Feb. 17, 1899, by the photographic method, is the most important astronomical discovery of modern times. Two thirds of its orbit lies between the orbits of the earth and Mars, instead of between those of Mars and Jupiter. It approaches the earth nearer than any other known heavenly body excepting the moon, and its parallax at such times amounts to almost 1', hence its great value in determining the earth's distance from the sun. It makes this near approach once in thirty-one years, and was in this position three years previous to its discovery. Fortunately, it was quite near in Dec., 1900, and careful and valuable observations were made. *Eros's* diameter is about 17 miles, and at its nearest approach it is just visible to the naked eye.

The bodies forming this group are distinguished from the larger planets by a number of characteristics.

1. Their very small size. They are so small that, unless with some of the recent great telescopes of the world, they appear to the eye simply as points of light, and so admit of no measurement. Judging from the amount of light which they reflect, the largest may be 300 or 400 miles in diameter, the smallest perhaps 10 or 20. The whole mass of them, known and unknown, is so small that it has not yet been detected by its attraction upon the planet Mars, as it would be if equal to a single large planet.

2. The orbits are generally much more eccentric than those of the larger planets, one, *Polyhymnia*, having so large an eccentricity that its greatest distance from the sun is double its least distance. Hence the brightness, as seen from the earth, varies in a yet greater degree; many are scarcely visible when at their greatest distance from the sun, unless with the most powerful telescopes.

3. The inclinations of their orbits are also in the general average much greater than in the case of the larger planets. Many exceed ten degrees, and one, *Pallas*, is nearly thirty-five degrees.

This great eccentricity and inclination, and the small size of the planets, are about what might be expected if Olbers's hypothesis were true; nevertheless, at the present time the general consensus of opinion is against it. In fact, when the secular variations of the orbits are computed, it is found

that if they were subjected only to the action of the larger planets the orbits never could have intersected in a single point. Still this is not absolutely conclusive, because, if at any time two of the planets had passed very close together, they might possibly have so influenced each other as to make a considerable change in their orbits. This kind of action does not admit of being calculated or foreseen. But the idea now is that the original ring of matter out of which these bodies were formed, instead of collecting into a single planet, as in the case of the larger ones, separated itself into these minute fragments, owing to the absence of any one center of condensation sufficient to draw the entire ring into its neighborhood.

S. NEWCOMB.

Asteroid'ea [from Gr. *ἀστήρ*, star + *εἶδος*, form]: a class of the division *Echinodermata*, including the starfishes. It is characterized by the star shape, with five or more angles, and by the fact that its ambulacral feet are confined to the ventral surface. Two orders, *Stellerida* or *Asteridea*, the starfishes, and *Ophiuridea*, the brittle stars, are usually recognized. See STARFISH.

D. S. J.

Asterol'epis [from Gr. *ἀστήρ*, star + *λεπίς*, scale, in allusion to the marks on the dermal plates of the head]: a genus of fossil ganoid fishes, described by the famous geologist, Hugh Miller, from the Scotch old red sandstone. Some are believed to have been 20 feet long.

Asthma, *ἄσθμα* [Gr. *ἄσθμα*, panting, from *ἀῆναι*, breathe hard]: in a general sense, any disease characterized by difficulty of breathing, occurring in paroxysms; thus spasm of the glottis is sometimes called "thymic asthma"; autumnal catarrh is known as "hay asthma"; the dyspnoea (difficult breathing) of Bright's disease has been, with questionable propriety, called "uræmic asthma"; and similar symptoms arising from heart or lung disease have also been mistaken for true asthma, which, however, may be associated with these various diseases. True asthma, according to Niemeyer, includes only those cases where the point of the irritation producing the attack is either at the origin of the vagus nerve or in some remote part of its course. This does not exclude cases of reflex asthma, such, for example, as may occur in uterine disease. Others state that irritability and hyperæmia of the bronchial mucous membrane are essential elements of the disease; and the readiness with which powdered ipecacuanha, the exhalations from feathers, etc., will excite paroxysms, would appear to confirm this view. It is rare to find structural changes of any organ in cases of simple asthma. The trained diagnostician alone can discriminate between asthma and dyspnoea from other chest diseases. True or nervous asthma consists in a paroxysmal spasm of longer or shorter duration, attacking the muscular elements of the bronchial tubes, diminishing temporarily their caliber, and thereby obstructing respiration. The peculiar wheezing and whistling sounds produced by the breathing of asthmatic persons are due to the air passing through narrow air-tubes. While true asthma may thus occur without any disease of the lungs, it very commonly leads to diseases by its repeated occurrence. Of such distension of the tissue by excessive air, a disease called emphysema is most common; and from the fact that the elasticity of the lungs is greatly impaired by this distension the subsequent paroxysms of asthma are all the more severe. Notwithstanding the great distress which may accompany the attack of asthma, the immediate danger is not great. The smoking of salt-peter paper or of stramonium leaves, the administration of opiates, coffee, belladonna, conium, cannabis, chloral, vapor of chloroform, etc., may or may not relieve the paroxysm. Iodide of potassium benefits many cases, permanently or temporarily. Quinia, Fowler's solution, iron, and other tonics are often useful. A nutritious diet, with careful regulation of the bowels, is important. The compressed air-bath is recommended as affording great relief during the paroxysm.

Revised by WILLIAM PEPPER.

As'ti (anc. *As'ta Pompe'ia*): a city of Italy, in the province of Alessandria; situated on the river Tanaro, and on the Turin and Genoa Railway, 36 miles by rail E. S. E. of Turin (see map of Italy, ref. 2-A). It is a bishop's see, has a fine Gothic cathedral, a royal college, a theological seminary, a printing-office, established in 1479, and many elegant mansions. Here are several manufactories of silk stuffs. This is the native place of the poet Alfieri. Asta Pompeia was a town of great antiquity. In the Middle Ages it was the capital of a republic, which existed from 1098 to 1155. Its light white and sparkling wine is in very great demand. Pop. about 34,000.

Astié, *ἄσ'τῆ-αῖ'*, JEAN FRÉDÉRIC: b. at Nerac, department of Lot-et-Garonne, France, Sept. 21, 1822; was a pastor in New York 1848-53, became Professor of Philosophy at Lausanne 1856, and wrote, besides various theological works, *Le Réveil religieux des États-Unis* (Lausanne, 1857), *Histoire de la République des États-Unis* (2 vols., Paris, 1865), *Théologie allemande contemporaine* (1874), *L'Orthodoxie et le Liberalisme* (1880), and *La Crise théologique et ecclésiastique* (1881). D. at Lausanne, May 20, 1892.

Astig'matism [from Gr. *ἀ-*, not + *στίγμα*, a point, i. e. focus]: a peculiar defect in the eye which consists in its refracting the rays of light differently in different planes. The defect may be detected by looking at a small pinhole in a card held up against any bright object, and moved to different distances from the eye. To an ordinary eye the image of the hole remains circular at all distances, but to an eye having the peculiar defect in question the image of the hole, as the card is moved away from the eye, becomes elongated, and at a certain distance passes into a straight line. This imperfection may be corrected by means of a cylindrical or spherico-cylindrical lens. Revised by WILLIAM PEPPER.

Astolphus, or **Astul'phus** (in Fr. *Astolphe*; in Germ. *Ais'tulf*): King of the Lombards; obtained the throne in 749 or 750 A. D. Having seized Ravenna about 752, he threatened Rome. The pope then applied for help to Pepin, King of the Franks, who defeated Astolphus in 754, and forced him to cede Ravenna and the Pentapolis to the pope. This is said to have been the origin of the temporal power of the popes. D. in 756 A. D.

Aston Manor: a suburb of Birmingham, England. Pop. (1881) 53,842; (1891) 68,639.

As'tor, JOHN JACOB: b. at Waldorf, near Heidelberg, in Germany, July 17, 1763; emigrated to the U. S. in 1783, and invested his capital in furs, which he took to London and sold with much profit. He next settled at New York, and engaged extensively in the fur-trade. He exported furs to Europe in his own vessels, which returned with cargoes of foreign commodities, and thus rapidly amassed a fortune. In 1811 he founded Astoria on the western coast of North America, near the mouth of the Columbia, as a dépôt for the fur-trade, for the promotion of which he sent two expeditions to the Pacific Ocean. He was remarkable for his sagacity and diligence in business. He purchased in New York a large amount of real estate, the value of which increased enormously. At his death (in New York city, Mar. 29, 1848) his fortune was estimated at \$20,000,000. He left \$400,000 to found a public library in New York. See ASTOR LIBRARY.

Astor, WILLIAM WALDORF: public man and author; b. in New York, Mar. 31, 1848; only son of John Jacob Astor, and great-grandson of John Jacob Astor, founder of the family; was graduated at Columbia Law School, admitted to the bar 1874; member of New York Assembly 1877, of the New York Senate 1879; U. S. minister to Italy 1882-85; author of *Valentino* and *Sforza*. Removed to London in 1890, and in 1899 was naturalized as a British subject.

Asto'ria: town; Fulton co., Ill. (for location of county, see map of Illinois, ref. 5-C); on C. B. & Q. R. R., 119 miles from Rock Island; surrounded by fine coal-fields, and much coal is mined. Pop. (1880) 1,280; (1890) 1,357; (1900) 1,684.

Astoria: city and port of entry; capital of Clatsop co., Ore. (for location of county, see map of Oregon, ref. 1-B); in the extreme northwestern part of the State; on the south bank of the Columbia river, 15 miles from its mouth. It is the headquarters of the salmon and fishery business of the Northwest; 24 of the 38 canneries of the Columbia river are here, yearly packing \$3,000,000 worth of salmon. The city is the general dépôt for coast and river steamers, has large lumber-trade, water-works, gas-works, electric light, electric street railway, telephone system, district telegraph messenger service, extensive summer travel, fine public schools, free mail-delivery, iron-works, machine-shops, etc. Pop. (1870) 639; (1880) 2,803; (1890) 6,184; (1900) 8,381.

PROPRIETOR OF "ASTORIAN."

Astor Library: a library of New York city, founded by John Jacob Astor (d. 1848), who bequeathed \$400,000 for that purpose. His will directed that the government of the library should be vested in eleven trustees, including the mayor of New York and the chancellor of the State. The library, erected on Lafayette Place, was opened in 1853. William Backhouse Astor (d. Nov. 24, 1875), eldest son of

the founder, added \$200,000 to his father's bequest, besides building an addition on adjoining property which he gave. John Jacob Astor (d. Feb. 22, 1890), grandson of the founder, bequeathed \$450,000 for this library, and in his lifetime presented it three lots on which he erected an addition, and added to the central building. It now has 260,651 volumes. In 1896 it was consolidated with the Lenox and the Tilden Libraries as the New York Public Library.

As'trabad': a town in the northern part of Persia, capital of a province of its own name. It is on a small river which enters the southeastern part of the Caspian Sea, from which it is about 20 miles distant (see map of Persia, ref. 2-H). The situation is not healthful in summer, but is rendered attractive by extensive gardens. The greater part of the town is in ruins. Here are some manufactures of silk and cotton stuffs. Pop. 15,000; of province, 80,000.

Astrachan: See ASTRACHAN.

Astræ'a (in Gr. Ἀστραία): goddess of justice, a personage of classic mythology; was said to be a daughter of Jupiter and Themis. At the termination of the Golden Age, when violence began to prevail in the world, she ascended to heaven, being the last of the goddesses to leave the earth.—ASTRÆA is also the name of an asteroid discovered by Hencke in 1845. Its mean distance from the sun is 2.577 times that of the earth. It completes a revolution in 1,511 days.

Astræa: a genus of coral animals of the order *Madreporaria*. They live in the sea, and form calcareous skeletons (star-corals), which are characterized by sessile, star-shaped, lamellate cells, crowded on the upper surface. The polyps are often an inch in diameter. They form large, hemispherical masses of coral.



Astræa viridis.

Astrag'alus [Lat., from Gr. ἀστράγαλος, vertebra, ball of the ankle-joint]: in anatomy, the first or uppermost bone of the tarsus, which forms with the leg-bones the hinge of the ankle-joint. Its lower surface rests on the os calcis, or heel-bone.

Astragalus: a genus of herbaceous and shrubby plants of the family *Leguminosæ*. The leaves are pinnate, with an odd leaflet, and the pod is two-celled. It comprises numerous species, mostly natives of the temperate and cold parts of the eastern hemisphere. Several species of *Astragalus* growing in Persia and Asia Minor yield gum-tragacanth. The *Astragalus bæticus* is cultivated in Hungary and Germany for its seeds, which are used as a substitute for coffee. Numerous species of *Astragalus* are found in the U. S., especially westward.

Astrakhan': a government in the southeastern part of European Russia, bounded N. by Samara, E. by Orenburg and the Caspian Sea, S. by Caucasia, and W. by the country of the Don Cossacks and Saratov (see map of Russia, ref. 10-G). It is intersected by the Volga, which divides it into two nearly equal parts. Area, 91,327 sq. miles. The surface is nearly level, and the soil mostly sterile and saline. A large part of it is occupied by salt marshes and saline lakes. The fisheries of the Volga in this government are very valuable, many sturgeon being caught in it. Pop. (1897) 1,002,316, of whom 220,000 are Kirghiz Tartars and 139,000 Kalmucks.

Astrakhan, or Astrachan: a city of Russia, capital of the above government; is situated on an island of the river Volga, 40 miles from its entrance into the Caspian Sea (see map of Russia, ref. 10-G). It has crooked and dirty streets, and houses mostly built of wood. It contains a cathedral, about 35 churches, 15 mosques, an archiepiscopal palace, a botanic garden, an Indian temple, and a gymnasium. Immense quantities of fish are exported hence. The other articles of export are leather, fur, linen, and woolen goods. This place is the seat of Greek and Armenian archbishoprics. It has an extensive trade, and manufactures of silk and cotton. Steamboats ply between this place and the ports of the Caspian Sea. Pop. (1897) 113,075.

As'tralite: a variety of glass resembling aventurine, containing crystals of a cuprous compound, which exhibits a dichroitic iridescence of dark red and greenish blue. It is made by fusing and cooling slowly a mixture of 80 parts of silica, 120 of litharge, 72 of carbonate of soda, 18 of borax glass, 24 of scale oxide of copper, and 1 of scale oxide of iron.

As'tral Spir'its: spirits supposed by the ancient Persians and other Orientals to animate the stars. This opinion or superstition was adopted by some of the Greeks and Jews. The demonologists of the Middle Ages conceived them as fallen angels or souls of departed men.

Astrin'gent [from pres. partic. of Lat. *astrin'gere*, draw together; *ad*, to + *strin'gere*, bind]: an agent which produces a persistent contraction in organic tissues, and thus checks discharges from the body, such as excessive purging or diarrhœa and hæmorrhages. Astringents are of two classes, vegetable and mineral. Of the former, tannic and gallic acids are the prevailing active principles, and these may be obtained and used in the pure state. The most common vegetable astringents are galls, oak-bark, logwood, blackberry root, rhatany, catechu, and kino. Of mineral astringents, the most important are acetate of lead, sulphate and chloride of iron, nitrate of silver, alum, carbonate of lime, and the mineral acids, sulphuric, nitric, and hydrochloric.

Astroca'ryum [from Gr. ἄστρον, star + κάρυον, nut]: a genus of palms; comprises about sixteen known species, natives of tropical America, and remarkable for the sharp spines with which the stem and almost every part are armed. They have pinnated leaves. The murumuru palm (*Astrocaryum murumuru*), a small tree about 10 feet high, grows on the Amazon and bears a fruit about an inch long, which is esculent and highly esteemed. Another edible fruit is produced by the tucuma palm (*Astrocaryum tucuma*), which grows near the Amazon to the height of 30 to 40 feet. The *Astrocaryum vulgare*, called tucum palm, is more lofty than the tree last noticed. It is cultivated by the natives, who obtain from the epidermis of its unopened leaves a fine and strong fiber of which they make cordage, nets, etc.

Revised by CHARLES E. BESSEY.

As'trolabe [from Gr. ἀστρολάβον, star-taking; ἄστρον, star + λαβεῖν, take]: a name given by the Greeks to a circular instrument used to make astronomical observations, which is now superseded by better instruments. The ancient astrolabe consisted of two or more circles having a common center, and so inclined to each other as to enable the astronomer to observe in the planes of different circles of the sphere at the same time.

Astrol'ogy [Gr. ἀστρολογία, star-doctrine; ἄστρον, star + λέγειν, discuss]: originally, astronomy; later, a spurious science which professed to explain the events of human life by the influence of the stars or planets. Astrology, which is a very ancient form of superstition, may be defined as the study of horoscopes and an attempt to predict the fortunes of men by the positions and aspects of the stars. Judicial astrology is supposed to have originated in Chaldæa. The Jews, after their captivity in Babylon, were much addicted to it, and the same delusion has prevailed among all the nations of Europe. In ancient Rome, during the empire, astrologers were a numerous and influential class. In the Middle Ages astronomy proper was chiefly studied as subsidiary to astrology, which was considered as the more important of the two sciences. The relation between astrology and astronomy was like that between alchemy and chemistry. The Copernican system contributed greatly to bring astrology into discredit. The fundamental conception of astrology seems to have been drawn from the actual influence of the sun upon the earth in affecting health, fertility, and temperature. Connected with these facts was the worship of the heavenly bodies as divinities. The notion of Aristotle, set forth in the twelfth book of the *Metaphysics*, that the heavenly bodies were "ensouled," and that each moved in its orbit by a conscious volition, gave currency to similar ideas among the students of the Peripatetic system. The power of these heavenly beings was supposed to flow out from their dwelling-places, and affect beings on the earth for good or evil. Astrological predictions are founded on the relative positions and aspects of the sun, moon, and planets at the moment of birth, and on certain arbitrary influences supposed to belong to each of these bodies. To facilitate the determination of the aspects,

the whole heaven, visible and invisible, is divided into twelve equal parts by the horizon, the meridian, and four other circles passing through the north and south points of the horizon and the points of the equator (or prime vertical), which are at the distance of thirty and sixty degrees from the meridian. These equal spaces are called the twelve houses of the heavens, and the circles by which they are circumscribed are called circles of position. The circles of position are supposed to remain fixed, so that a celestial body is carried through each of the twelve houses in the course of a day by the diurnal rotation. The first house is contained between the eastern horizon and the next circle of position going to the eastward. The beginning of the first house, or the point of the ecliptic just rising, is called the horoscope. The first house is the house of life; the second, of riches; the third, of brothers; the fourth, of parents; the fifth, of children; the sixth, of health; the seventh, of marriage; the eighth, of death; the ninth, of religion; the tenth, of dignities; the eleventh, of friends; and the twelfth, of enemies. Each of the houses has one of the heavenly bodies as its peculiar lord. They have different powers, the first being the most powerful. The next object is to consider the aspects or configurations of the influential bodies. The ancients reckoned five aspects. (See ASPECT.) The quartile and opposition were considered malignant or adverse, the trine and sextile as benignant or propitious, and the conjunction was an indifferent aspect. The influences ascribed to the planets were as arbitrary as those ascribed to the aspects. Saturn, being at the greatest distance from the sun, was supposed to be of a cold nature; Jupiter, Venus, and the Moon, temperate and benignant; Saturn and Mars were the most dangerous. The influence of the sun and Mercury varied according to circumstances. See Zadkiel's *Handbook to Astrology* and LILLY, WILLIAM.

Astronomy [from Gr. *ἀστρονομία*, classification of stars, *ἀστρονόμος*, astronomer; *ἄστρον*, star + *νέμειν*, arrange]: the science which treats of the constitution, motion, and appearance of the heavenly bodies, and the art or practice of utilizing their known positions for determining positions on the surface of the earth.

Under the term heavenly bodies is included every visible mass of matter outside the atmosphere of the earth. Since these masses of matter, known as planets, stars, comets, etc., are, in most cases, immensely larger than the earth itself, it follows that, so far as mere extent is concerned, the field of astronomical science is immensely greater than that of all other sciences combined. The earth is but a speck in the order of creation, and every other science besides astronomy is concerned with what is going on upon this little speck of matter. In the present article we can do nothing more than give a general idea of the development and present condition of the science, referring to subdivisions for all details.

Astronomy is the oldest of the sciences, and the development of the ideas on which modern astronomy rests is co-extensive with the history of civilization. The names of the constellations antedate all authentic history; and the earliest thinkers devoted to the heavenly bodies an amount of careful study which, had it been applied to mundane things, would, we may suppose, have enabled them to anticipate many of the conclusions of modern science. The development of the ideas of the constitution of the universe has been so natural and orderly that no treatment of astronomy is complete without explaining it.

There is no doubt that the first conception which ignorant men formed of the earth was that of a vast, extended plain. But it needed very little observation to show that this supposed plain was an illusion, and that we really live on the surface of a globe. Ptolemy himself, about the time of the Christian era, gave the proofs that the earth is a sphere as fully and clearly as they are given in our modern geographies; in fact, we have no authentic record of a time when men did not know that the earth was a globe.

The earliest astronomical system was that in which this globe was supposed to be at rest in the center of the universe, all the heavenly bodies revolving around it in the space of twenty-four hours. The theory which assigned the earth to this position in the universe is known as the Ptolemaic or geocentric system. (See PTOLEMAIC SYSTEM.) It remained the accepted system until the time of Copernicus, whose hypothesis or discovery that the sun is the actual center of the planetary motions, and that the earth revolves on its own axis, introduces the second great era in the progress

of astronomy. To this era belong not only Copernicus, but Kepler, Tycho Brahe, and Galileo. The Copernican system had to be established, and the laws of the motion of the planets discovered, before further progress was possible. The third era was introduced by Sir Isaac Newton, through the discovery of gravitation. The Newtonian system did not supersede that of Copernicus, but only generalized and explained it by referring the celestial motions to known mechanical laws. The heavenly bodies were no longer mysterious creations, revolving in ellipses owing to some inscrutable law impressed upon them by their Creator; but they were simply masses of matter, flying through space with perfect freedom, each gravitating toward all the others, and toward the sun. The motion in ellipses, which had been demonstrated by Kepler from observation, was shown to be the result of gravitation toward the sun.

The acceptance of the Copernican and Newtonian systems and the discoveries made with the telescope have completely revolutionized our ideas of the universe and the place of the earth in it. So long as the latter was considered as the center, all the rest of creation was supposed to be within a comparatively short distance of it. Surrounding the earth were a succession of spheres, and outside of all the empyrean, the realm of fire, the abode of the gods. But the new system of astronomy, and the discoveries, observations, and measurements made possible by the telescope, extended the universe, step by step, into the domains of infinity itself. The earth became merely one of a number of bodies circulating around the sun, some larger and some smaller than itself. The fixed stars became not merely points of light, but suns, each with its possible retinue of inhabited planets. As observations were made upon these stars to determine their distance by their annual parallax, they retreated farther and farther toward infinity. Copernicus probably supposed them not very far outside the solar system. Kepler supposed that they were arranged near the surface of an immense sphere. As the arts of measurement improved, it was found that even the whole orbit of the earth, a stretch of 186,000,000 miles, must form a very small angle as seen from the nearest of the stars: To determine this angle became one of the great problems of astronomy; yet it eluded all measurement generation after generation. The first quarter of the nineteenth century was past when the illustrious Bessel found, by the aid of a new instrument, that there was one star which was only 600,000 times the distance of the earth from the sun. This distance has since been diminished a little, and another star in the southern hemisphere has been found to be distant only about 270,000 times the radius of the earth's orbit. A score of others have been found within a distance of 2,000,000 or 3,000,000 of these radii; but the great mass of the stars still lies without this range, and all we can say of their distances is that they are immeasurably great, even with the refined instruments of modern astronomy. See STARS.

The stars forming, as it were, the basis of creation, the centers of possible planetary systems, we reach the question of their number and extent. About 5,000 are usually visible to the naked eye, but very keen observers can detect as many as 8,000. The number visible is greatly increased when a small telescope is used, and continues to increase with the power of the instrument, rising, in the case of the most powerful telescopes, to perhaps 50,000,000, or many thousands for every one visible to the naked eye. But even then there is no evidence that the smallest stars are seen, but every reason to believe that greater instruments would show millions more in every direction.

Besides these millions of scattered stars, great clusters exist, in which powerful telescopes show a whole firmament of stars in a spot scarcely large enough to be visible to the naked eye.

As to the extent of the universe, and the scale on which it is constructed, we can do little more than set an inferior limit to the magnitude of creation. Beyond this limit we can not tell how extensive it may be. We may, however, conclude, with considerable probability, that most of the stars visible to the naked eye lie at distances which light would traverse in between fifty and three hundred years. In other words, if we conceive of two spheres described around our sun, the smaller with a radius over which light would pass in fifty years (in round numbers, three hundred millions of millions of miles), and another with a radius four times as great, it is probable that we should find a few score of the brighter stars within the inner sphere, and the great mass of the fainter ones visible to the naked eye, be-

tween the two spheres. If we suppose that the smaller telescopic stars have a general average of about the same intrinsic brilliancy as the brighter ones, we may conclude that they are placed at distances which light would traverse in from five to fifty thousand years. Of what is beyond we know nothing as yet.

Of the form and boundaries of this agglomeration of stars which forms the visible universe nothing certain is known, but it is certain that there is a great tendency to aggregation near the plane of the Milky Way. The latter is well known to consist of vast aggregations of telescopic stars too small to be separately visible to the naked eye. This fact was first clearly shown by Herschel, and led him to his celebrated theory that all the visible stars form a comparatively thin stratum, near the center of which our sun is placed. That the densest portions of the universe are spread out into such a stratum or plate there can be no doubt, but of the limits of the thinner portions, composed of stars scattered outside of this stratum, nothing positive can be asserted.

Nothing indicating either growth or decay has been actually observed in the stellar universe. There is no established instance either of a known star disappearing from the heavens, or of a really new one coming into view. The supposed cases of the latter kind are now found to be due to extraordinary variability; a small star, perhaps invisible to the naked eye, suddenly bursting forth into brilliancy, and after a time subsiding to its former magnitude. Several instances of this kind are on record, the last as late as 1866, when a star of the second or third magnitude suddenly appeared in the Northern Crown. An examination of Argelander's great star-catalogue showed that it was formerly a telescopic star of the ninth magnitude. After a few weeks it gradually returned to this magnitude, and has not since shown any kind of disturbance.

The stars are found to be moving among themselves in a way that must ultimately lead to an entire change of their distribution, and perhaps to their entire separation. The velocity of motion is usually from 20 to 50 miles per second, but in one instance it probably exceeds 200 miles per second. So far as observation can show, the rule is that each star moves forward independently in a straight line with a uniform velocity. From the few estimates of the masses of the stars which have been made, there is no reason to believe that their motions can be appreciably affected by their mutual gravitation, unless after the lapse of thousands of ages, or when two chance to pass near each other. The combined attraction of all the stars visible with the most powerful telescope, supposing their masses to be correctly judged by those of the stars which have been weighed, would never stop, and would hardly turn aside, the star Arcturus in its course of 60 or 80 miles per second, nor Groombridge 1830 in its headlong course of 200 miles per second. There is, in fact, no certain evidence that the stellar universe is held together by any bond of attraction whatever, as our solar system is. Mädler's view that Aleyone is the central sun of the universe is a piece of groundless speculation which has never received the assent of astronomers qualified to judge it. The stellar motions take place in every possible direction, and without regard to any known law, except that very frequently stars in the same region of space move nearly in the same direction.

Besides stars, we have nebulae as component parts of the telescopic universe. They are cloud-like patches of light scattered all over the heavens, but less numerous in the Milky Way than at a distance from it. Two of them, situated in the northern hemisphere, the great nebulae of Orion and of Andromeda, are clearly visible to the naked eye. Before the discovery of spectral analysis it was not possible to draw the line between nebulae and clusters of stars, because large numbers of objects which look like nebulae through small telescopes are found, with large ones, to be clusters of stars, and every increase in the power of the instrument was found to change objects from the former to the latter class. It was therefore doubtful whether all nebulae were not really clusters of stars too small or too distant to be resolved with the telescope. But, as soon as the spectroscope was turned upon such of these objects as could give a visible spectrum, it was found that many of them were not solid bodies at all, but masses of incandescent gas, generally hydrogen or nitrogen. To this class belongs the nebula of Orion, which is therefore a true nebula. On the other hand, the nebula of Andromeda gives a continuous spectrum, showing that the luminous matter is in a solid or

liquid state, and probably consists of an agglomeration of stars, though no telescope has yet resolved it.

We have no data whatever for forming a judgment of the distance of the nebulae, as we have in the case of the fixed stars. A favorite theory is that the forty or fifty millions of stars separately visible through the largest telescopes, the greater number of which, as we have said, are spread out in a thin, widely extended stratum, form a system to which our sun belongs, and that many of the resolvable nebulae are similar systems situated far outside of our own. In favor of this view is to be said that our Milky Way, viewed from a point 500 times the distance of the most remote star in it, would have the appearance of a nebula, and would give a continuous spectrum, although no telescope we possess would resolve it. It is therefore possible that many of the more distant resolvable nebulae may be such systems. But the greater number of visible clusters can not compare with our Milky Way in the number of their stars, as they only comprise a few hundreds or thousands. We can really draw no line of demarkation between the agglomerations of stars within our own system and the most distant cluster, the whole range from one extreme to the other being filled with known objects. We must therefore regard the views in question as forming a very grand but yet unproven hypothesis.

Our description of the stellar universe may be summed up by saying that it is composed of an unknown host of stars, certainly more than 50,000,000, mostly scattered in irregular aggregations forming the Milky Way, while many are aggregated in yet closer clusters, some of which are situated within the Milky Way and some without it, and of a number of enormous masses of incandescent gases situated at unknown distances. Our sun is simply one of these 50,000,000 of stars, without, so far as we know, any mark to distinguish him among his fellows. He is probably rather smaller than the average: removed to 1,000,000 times his present distance, which is probably the average distance of the stars of the first magnitude, he would shine only as a star of the third or fourth magnitude. He is, indeed, accompanied by a number of non-luminous planets, while, with one possible exception, no such companions are seen to the stars; but this does not disprove their existence, because every planet of our system would disappear from view in our most powerful telescopes at a distance far less than that of the nearest star.

The physical constitution of the sun and stars is a subject which has greatly occupied investigators in recent times, without leading them to an entirely certain and definite conclusion. The theory of Wilson and Herschel that the sun is a dark, cool body, surrounded by a stratum of luminous clouds floating in an atmosphere, has been one of the best known, but it is completely disproved by the modern discoveries of the conservation of force and the equivalence of heat and force. The enormous volumes of heat sent off by the sun can be supplied only by a continuous expenditure of force, and any theory which accounts for the solar light and heat must show whence that force comes. We know that our sun has been radiating light and heat in quantities as great as at present for thousands, or even millions, of years, while the sun of Herschel would cool off very quickly, and then cease to give either light or heat. In one respect, however, the theory in question is now universally agreed to: the "photosphere"—that is, the shining surface of the solar sphere—is composed of cloud-like matter, apparently floating in some kind of fluid, the whole being at an extremely high temperature. The spots are known to be dark depressions in the photosphere, as to the cause of which investigators are not yet agreed. Of the interior of this enormous globe we can see nothing, but there is good reason for holding that it is mostly formed of materials similar to those which compose the crust of the earth, heated to so high a temperature as to be completely vaporized and reduced to a state of *dissociation*, or one in which chemical union of different elements is no longer possible. At the same time the pressure to which this vaporous interior is subjected by the weight of its outer layers is so great that it is compressed into the smallest possible space, so that the mean density of the sun is not much greater than that of water.

On the outside, this mass is continually cooling off by radiation, and hence condensing to the solid or liquid state. The matter thus condensed forms the photosphere, which seems to be in a state of continual change.

Immediately above the photosphere lies a comparatively

shallow, but extremely complex, incandescent atmosphere, the absorption of which causes the dark lines in the solar spectrum. This atmosphere consists of hydrogen gas, mixed with the vapors of many of the metals, especially magnesium, calcium, sodium, and iron; the metallic vapors, except that of magnesium, mostly lying so near the base that they are not visible, even with a spectroscope, except just at the beginning and end of a total eclipse. This atmosphere shines with a red light, and was frequently seen during total eclipses of the sun, but its existence and nature were first clearly brought to light by Mr. J. N. Lockyer's spectroscope. This gentleman termed it the chromosphere. It is agitated by storms of fire, the fury of which exceeds anything ever pictured by the wildest imagination of the poet, the velocity of the wind sometimes rising to 100 miles per second, and masses of fiery vapor many times the size of our earth shooting up to the height of 20,000, 50,000, or even 80,000 miles. These masses constitute the red "protuberances" always visible during total eclipses of the sun, the nature of which was a complete mystery until the spectroscope was turned upon them by Janssen in India during the great eclipse of 1868. They are now the subjects of daily observation by spectroscopists.

Outside the chromosphere lies an appendage the nature of which is still involved in mystery, as it can be studied only during the rare moments afforded by total eclipses of the sun. It is seen in the glow of light which then surrounds the whole sun, extending to a height greater than the semi-diameter of that body, and is known as the solar corona. Its spectrum consists principally of a single green line, not identified with that of any terrestrial substance, but Janssen also recognized some of the lines of hydrogen during the eclipse of Dec., 1871. See SPECTRUM.

One of the most difficult questions respecting the sun is, Whence come the floods of heat which he is continually radiating into space? Why did he not cool off hundreds of thousands of years ago? Why does he not now grow cooler from year to year? Only in recent years have serious attempts been made to answer these questions, because only then was it recognized that heat was a form of force which could not be expended without being continually renewed. The theory now most generally received is that of *contraction*. It is supposed that as the sun cools off he contracts in volume; and it is found by calculation that a very small contraction will develop an enormous amount of heat in a mass so immense as that of the sun, so long as it does not condense to the solid or liquid state. Thus the supply of heat may be kept up for a million of years to come, but it must give out some time, unless renewed from some unseen source, and our system will then be involved in darkness and death.

By the motion of the spots it is found that the sun rotates on his axis in about twenty-five days, this being the period at the equator. But as we approach the poles the rate becomes slower and the period longer, approaching twenty-six days at a distance of 45°. Beyond this point very few spots are to be seen, and the law of rotation is not completely known. The liquid or gaseous or cloud-like character of the sun's surface is conclusively proved by the variation in the rate of rotation. See SUN.

The sun is accompanied by a retinue of eight major planets, of which our earth is one, and by a large group of minor planets, often called asteroids. (See ASTEROID.) The major planets may themselves be divided into two groups of four each, the four inner and smaller ones being Mercury, Venus, the Earth, and Mars, and the four outer and larger ones being Jupiter, Saturn, Uranus, and Neptune. The smallest of the outer group (Uranus) has more than ten times the mass of the largest of the inner group (the Earth), and is more than fifty times its size. Between the two groups is a wide gap in which the minor planets are found. The sun with its planets and their satellites form a connected group called the *Solar System*. For a description of this system and of the bodies which compose it, see ASTEROID, MOON, PLANET, SOLAR SYSTEM, and the names of the eight major planets mentioned above.

Besides the planets quite a number of comets are known to be members of the solar system, and a great number of others are suspected to be such, even though their time of revolution is so great that they have never been recorded as seen but once. The general rule is that a comet comes into view suddenly and unexpectedly, falling nearly toward the sun as if dropped from an infinite distance. It whirls around the sun in a parabolic orbit, and flies off into space

nearly in the direction from which it came. If astronomers have an opportunity of observing it carefully for several months, they can tell whether it is or is not flying so fast that the attraction of the sun will never bring it back again. It is thus definitely ascertained that the great comet of 1858 will return, in consequence of the sun's attraction, in about 1,950 years, probably between the years 3800 and 3820, after flying off into space to the distance of 15,000,000,000 miles.

The physical constitution of comets is still one of the enigmas of astronomy. Large comets are generally found to consist of three distinct formations: (1) a small bright, but ill-defined nucleus; (2) a round mass of hazy, nebulous, or foggy matter surrounding this nucleus, and indeed seeming to rise from it; and (3) a tail of extremely rare matter, but of enormous length, extending off from the comet in a direction opposed to the sun, growing wider and fainter as it extends, until it gradually becomes invisible. But the smaller telescopic comets often exhibit neither nucleus nor tail, but consist only of an irregular, ill-defined, nebulous mass, perhaps brighter at one point. As the comet approaches the sun the tail develops enormously, and frequently shows itself when none was visible at a distance. It is now generally considered that the tail of a comet is not a permanent appendage, but a stream of finely divided matter continually driven off from the comet into space by some repulsive force residing in the sun, the nature of which is not yet understood. It may be compared to the steam rising from a boiling pot, or to smoke from a chimney. If this view be correct—and it can hardly be disputed—all the comets are continually evaporating into space, and must in time be entirely dissipated. See COMET.

This theory of the constant dissipation of comets has recently received a striking confirmation in the ascertained coincidence of meteor-streams with the orbits of comets, and in the disappearance of Biela's comet from the heavens. It has long been known that we have either a meteoric shower or an unusual number of meteors every year on the nights of Aug. 9 and Nov. 14, and they are now found to be produced by the earth's atmosphere meeting a swarm of very minute particles which move in the respective orbits of two comets. The particles are supposed to be the fragments or dust of the comets which have become separated in the course of ages. See METEORS.

The sun, being seven hundred times as heavy as all the planets, keeps them moving in orbits around him by his own gravitation, while the motion of each planet is affected with small irregularities caused by the attraction of all the others. By this theory the courses of all the planets, and of the moon and many of the satellites, are predicted with an astonishing degree of accuracy. The first thing which gravitation settles is the motion of the earth itself on its axis. The daily revolution around its axis seems to take place with perfect regularity, but the axis itself is subject to several very slow motions, which make its direction decidedly different in the course of ages. These motions can not well be described without a globe, but as the whole earth and the instruments with which observations are made partake of them, they change all observed positions of the heavenly bodies, and these changes must be carefully allowed for in all calculations. See PRECESSION OF THE EQUINOXES.

The Copernican system and the theory of gravitation have reduced theoretical astronomy almost to branches of pure mathematics—mechanics, geometry, and trigonometry. The system is quite simple in its original conceptions, but very complex when we descend to minute details. A number of imaginary planes are conceived of as passing through the earth or sun, and extending out into infinity in every direction. The positions of the heavenly bodies are defined by their distances from these planes, and the angles which the line drawn from the sun or the earth to the body makes with different lines drawn in the planes. The most common mode of defining position is by giving three data: (1) the distance of the heavenly body from some point, either the center of the earth or the center of the sun, in a straight line; (2) the angle which this straight line makes with one of the planes in question; (3) a perpendicular being dropped from the body on the plane, the angle which the line to the point of intersection makes with some fixed line in the plane. When the distances are reckoned from the earth, it is usual to take the plane of the equator as that of reference; when from the sun, the ecliptic is usually selected. Both these planes are constantly changing their position in consequence of the attraction of the moon and planets on the earth, and this change has always to be calculated and

allowed for. This operation makes the subject a very intricate one, which can be fully developed only in works devoted especially to the subject.

The various branches of astronomical research may be included under three great classes. We have, first, a branch which is a direct continuation of the studies of the ancient and mediæval astronomers, namely, that which is concerned with the positions and motions of the heavenly bodies. Astronomers who pursue this branch prepare catalogues of stars, accurately determine their positions in the heavens by the aid of instruments of measurement, study the motions of planets, compute orbits of comets, measure the satellites of the planets, and investigate the laws of motion in the planetary system. Work of this kind frequently requires the co-operation of many men, and is therefore that principally pursued in the great national observatories. It is, perhaps, the least interesting branch of astronomy, since it is concerned with development and not with discovery. Yet to men with mathematical tastes it offers a splendid field for their ingenuity. Probably no achievement of the human intellect compares with that of discovering the laws of motion of the planets by the aid of gravitation, through countless ages past and to come.

Directly connected with this is the application of practical astronomy to the determination of positions on the earth. Every navigator who finds the longitude and latitude of his ship by observations of the sun with a sextant is an astronomer in this sense. This branch is principally pursued in the great national surveys, such as the Coast and Geodetic Survey in the U. S. It is intimately associated with GEODESY (*q. v.*). It is a branch of astronomy only in the sense that its work has to be done by observing the heavenly bodies, and that astronomical instruments and methods have to be used.

The usefulness of practical astronomy, and the perfection it has attained, may be judged from this consideration: take an astronomer blindfolded to any part of the globe, give him the instruments we have mentioned, a chronometer regulated to Greenwich or Washington time, and the necessary tables, and if the weather be clear, so that he can see the stars, he can in the course of twenty-four hours tell where he is in latitude and longitude within a hundred yards.

Another branch is known under various names, as physical astronomy, astrophysics, cosmical physics, etc. Probably the term astrophysics will supersede all others, because it is concerned with the physical constitution of the heavenly bodies. Photography has in recent times come to its aid, and proved a most powerful method of research. The great progress made in scientific photography has made it possible to obtain an impression on a photographic plate of objects which are quite invisible to the naked eye, or even in the telescope, and has led to the discovery of new nebulae in this way.

But the great instrument of research in this line has been the spectroscope. The chemical constitution of the stars is now being investigated, and their motions to and from the earth have been subject to measurement. The most wonderful discovery in this line is that of Vogel, that the variations of light in the star Algol, which have been observed for a century or more, are due to the revolution of a dark body around it, partially eclipsing it during each revolution, as it passes between the earth and the star. The body itself, and the whole mechanism of its motion, is absolutely invisible, star and planet forming but a point which the most powerful telescope can not distinguish. Yet the attraction of the invisible planet upon the star, wholly intangible in any other way, is measured in the spectral lines by a minute change in the wave-length of the light which the star emits. Modern science has in no direction gone farther than in this. See ALGOL.

S. NEWCOMB.

Astruc. aăs'truk'. JEAN: French mediæval writer; the son of a Huguenot pastor; b. at Sauve, in Languedoc, Mar. 19, 1684. He was educated at Montpellier, became M. D. 1703; appointed Professor of Anatomy at Toulouse in 1710, and of Medicine at Montpellier in 1716. Having removed to Paris in 1728, he became consulting physician to the king, and in 1731 Professor of Medicine at the Royal College. He had a high reputation as a professor. He published, besides other medical works, *De Morbis Venereis* (On Venereal Diseases, 1736). His medical researches led him to study those passages in the Pentateuch which treat of diseases. While so doing he lighted upon the discovery which has immortalized him: viz., he noticed that in some passages of Genesis in Hebrew God is called Elohim and in others Jehovah,

whence he inferred that the passages so distinguished belonged to two different documents from which Moses had compiled his book. This was the virtual start to the fruitful Pentateuch criticism, and the germ of the documentary hypothesis of Eichhorn. He issued his book anonymously under the title *Conjectures sur les mémoires originaux dont il paroît que Moïse s'est servi pour composer le livre de la Genèse* (Brussels, 1753). (There is a copy of the rare volume in the library of Union Theological Seminary, New York city.) Besides the two principal documents, the so-called Elohist and Jehovist, he distinguished nine or ten others on the basis of repetitions and alleged inconsistencies. He did not, however, dispute that Moses was the compiler of Genesis, nor that he was the author of the rest of the Pentateuch. D. in Paris, May 5, 1766. See A. C. Lorry, *Vie d'Astruc*, in his edition of Astruc's *Mémoires pour servir à l'histoire de la Faculté de Médecine de Montpellier* (Paris, 1767).

Revised by S. M. JACKSON.

Astulphus: See ASTOLPHUS.

Astu'ria: a former kingdom in the N. of Spain: bounded N. by the Bay of Biscay, and S. by the Cantabrian Mountains. The Asturians made a long and brave resistance to the Goths and Vandals who invaded Spain about 500 A. D., but were finally subdued. Asturia was the only part of Spain that was not conquered by the Moors. See ASTURIAS.

Asturias: an ancient division of Spain, now the province of Oviedo; area of 4,091 sq. miles. It is bounded N. by the Bay of Biscay, E. by Santander, S. by Leon, and W. by Galicia (see map of Spain, ref. 12-D). The surface is mountainous, and abounds in wild and picturesque scenery. Along the southern border extends a chain of mountains, the summit of which, called Peña de Peñaranda, is about 11,000 feet high. It has extensive forests of oak, chestnut, beech, and fir. Among the mineral resources are copper, iron, lead, cobalt, antimony, marble, coal, and zinc. The eldest sons of the Kings of Spain formerly took the title of Prince of Asturias. Pop. (1887) 595,420. The chief town is Oviedo. See ASTURIA.

Asty'ages (in Gr. 'Αστυάγης): King of Media; a son of Cyaxares I.; reigned from 593 to 569 B. C. He had a daughter, Mandane, who was married to Cambyses, a noble Persian, and bore a son who was Cyrus the Great. He was succeeded by Cyaxares II., the last King of Media (569-536 B. C.).

Asuncion. aă-soon'-sē-ōn' (i. e. assumption): a city of South America, the capital of Paraguay; situated on the left (east) bank of the river Paragnay, 645 miles N. of Buenos Ayres; lat. 25° 16' 29" S., lon. 57° 42' 42" W. (see map of South America, ref. 7-E). It was founded by the Spaniards in 1536. It has a cathedral, five churches, a government palace, a college, a public library, etc. Hides, tobacco, timber, and *yerba maté* (or Paraguay tea) are shipped here by the river. The houses are mostly built of brick, one story high. Pop. of commune (1886) 24,838.

Asylum [Lat. *asylum*, from Gr. ἄσυλον, refuge; ἄσυλος, inviolable; ἀ-, not + σύλη, σύλον, right of seizure]: a sanctuary and place of refuge and security for criminals and others; any place of retreat and security. In ancient Greece the temples, altars, and sacred places were appointed as asylums for criminals and persecuted persons, and it was considered a sacrilege to kill or remove by force those who had taken refuge in them. They were, however, sometimes surrounded and watched until they died of starvation. Among the ancient-Jews cities of refuge were appointed for the benefit of persons who had accidentally committed manslaughter. Romulus is said to have attracted men from other states to Rome by offering an asylum to criminals, debtors, or outlaws. Asylums became so numerous under the Roman empire that they were considered nuisances by honest people, and were nearly all abolished by Tiberius. In the reign of Constantine the Great all Christian churches were asylums. The privilege was afterward extended to convents, and was much abused by criminals in the Middle Ages. Several popes, in order to prevent this abuse, excluded murderers and some other classes of offenders from the privilege of sanctuary, which was abolished in England by acts passed in 1534 and 1697. In modern usage the term asylum is applied to charitable institutions for the relief of the blind, insane, orphans, etc.

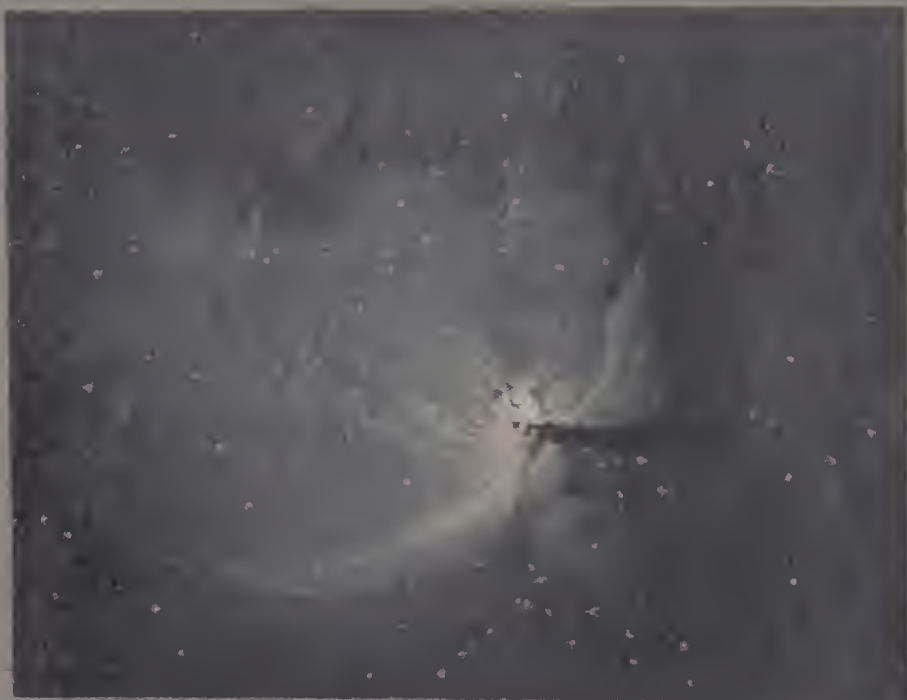
Asylum, in international law: The jurisdiction of a state covers only its own territory. When one of its subjects takes refuge within another state he becomes amenable to the laws of that state. The right of asylum then is that exercise of the right of sovereignty which forbids one gov-



NOVEMBER METEORS.
OBSERVED BETWEEN MIDNIGHT AND 5 A. M.,
NOVEMBER 13-14, 1868.



AURORA BOREALIS.
OBSERVED MARCH 1, 1872, AT 9:25 P. M.



GREAT NEBULA IN ORION.
FROM A STUDY MADE IN THE YEARS 1875-1876.



THE PLANET JUPITER.
OBSERVED NOVEMBER 1, 1880, AT 9:30 P. M.



TOTAL ECLIPSE OF THE SUN.
OBSERVED AT CRESTON, WYO., JULY 29, 1878.



SOLAR PROTUBERANCES.
126,000 MILES HIGH. OBSERVED MAY 5, 1873.



THE PLANET MARS.
OBSERVED SEPTEMBER 3, 1877, AT 11:55 P. M.



THE PLANET SATURN
OBSERVED NOVEMBER 30, 1874, AT 5:50 P. M.

ernment to apply its laws to its own or its enemy's subjects when within the jurisdiction of another government. It may be used to protect individuals, ships with their crews, or armed bodies. It may apply within the territory of a state, upon its ships on the high seas, in certain cases even in its embassies in foreign parts. Where the refugee is a common criminal, the country of his refuge, not wishing crime to go unpunished, yet undesirous of assuming this burden itself, will probably surrender him. This is solely under treaty regulation, however. Extradition is thus a limitation of the right of asylum. (See EXTRADITION.) But the surrender of political offenders is not customary, since their crime is not against society, and no sympathy with their punishment can be presumed. If such offenders escape to foreign men-of-war in port, or to foreign ships on the high seas, the right of asylum holds good. In most countries if they seek refuge in foreign embassies the right would be denied them. In Oriental countries and in the states of South America, however, it has been frequently exercised. An instance of this was seen in Chili after the overthrow of Bahnaceda, when a number of his adherents were protected in the U. S. legation. The U. S. Government has consistently discouraged such protection as a settled policy, though granting it in some such instances. Where armed troops are driven by superior force into neutral territory the right of asylum is granted them, but they are not at liberty to use this refuge as a vantage ground for making war. The practice is to disarm and intern them in the interior of the neutral country until the close of the war. A man-of-war may take refuge from superior force within the waters of a neutral, but subject to whatever conditions it chooses to lay down.

THEODORE S. WOOLSEY.

Atabalipa : See ATAHUALLPA.

Atacama, aã-taã-kaa'ma : a territory of Chili ; bounded N. by the province of Tarapaca, E. by the Argentine Republic and Bolivia, S. by the province of Coquimbo, and W. by the Pacific Ocean. Area, 43,180 sq. miles, including former province of Atacama, Bolivia. The country is for the most part mountainous and sterile, and produces only along the banks of a few rivers some vegetables and a few fruits. It contains, however, rich copper mines. The climate is dry and warm : most of the springs contain salt water. Capital, Copiapo. Pop. (1891) 67,205.

Atac'amite : an ore of copper, abundant in the desert of Atacama (whence its name), and occurring also as a crust on the lavas of Vesuvius and Etua. It may be defined as a hydrated oxychloride of copper, or a combination of protoxide of copper with chloride of copper. It is a rich ore, containing 55 or 60 per cent. of copper. The natural varieties of atacamite are crystallized, massive, and pulverulent or granular. The primary form of its crystals is a rhombic prism. The greenish incrustation which is formed on antique bronze weapons, utensils, etc., and which is called *æruo nobilis*, is composed of this salt.

Atahuall'pa, or **Ataba'lipa** : the last inea of Peru ; a son of Huayna Capac, who died in 1529. By his will the latter divided his dominions between his two sons, Huascar and Atahuallpa, who obtained the kingdom of Quito. These brothers reigned in peace about five years, after which Huascar sent an envoy to Atahuallpa, and required him to render homage for the kingdom of Quito. That inea, who was ambitious and warlike, refused to pay homage, and, having invaded Peru with an army, defeated Huascar and took him prisoner in 1532. He spared the life of Huascar, but deprived him of his throne and liberty. In the same year Peru was invaded by Pizarro and a small army of Spaniards. The inea, with an unarmed retinue, approached the camp of Pizarro in Nov., 1532, for a friendly interview, during which a Spanish priest informed the inea that the pope had given Peru to the King of Spain. As he rejected with indignation the authority of the pope, the treacherous Spaniards seized him and massacred his attendants. The captive inea offered to ransom himself by a quantity of gold which would fill the room in which he was confined as high as he could reach. The Spaniards accepted the gold, but refused him liberty. Pizarro accused Atahuallpa of plotting against him, and ordered him to be tried by a court martial, which condemned him to be burned alive. After he had consented to be baptized his sentence was commuted to strangulation, and he was executed Aug. 29, 1533. See Prescott, *Conquest of Peru*, vol. i.

Atalan'ta (in Gr. Ἀταλάντη) : the name of two mythical personages who figure in ancient Greek legends—(1) the most

swift-footed of mortals, and renowned for personal beauty. Having many suitors, she offered to marry any man who should defeat her in a foot-race, with the condition that if he lost he must be put to death. He was to be unarmed, but she was to carry a spear. Hippomenes, who had received from Aphrodite three golden apples, became the successful competitor by dropping them one by one before Atalanta, who could not resist the temptation to stop and pick them up. Having forgotten, in his joy, to thank the goddess as he should, the latter took revenge in singular fashion. She so inflamed him that he embraced his bride within the shrine of Cybele, who thereupon in punishment changed the pair into lions. (2) Another Atalanta was a renowned huntress, like Artemis. She wounded the Calydonian boar ; took part in the Argonautic expedition ; and wrestled successfully with Peleos at the funeral games of Pelias. She won the patient, long unrequited love of Meilanion, and finally yielded to his quiet persistency and married the hero, to whom she bore Parthenopaios. See W. Immerwahr, *De Atalanta* (Berlin, 1885).

Revised by S. M. JACKSON.

Ataman : See ATTAMAN.

Atamas'co Lily (*Zephyranthes atamasco*) : an amaryllis-like ornamental bulbous plant, with white or flesh-colored flowers, native of the Southern U. S., but cultivated for upward of 250 years.

C. E. B.

At'aulf, **Adaulf**, or **Adolf** (in Lat. *Ataul'phus*) : King of the Visigoths, and a brother-in-law of Alarie I., whom he succeeded in 411 A. D. He had aided Alarie in the capture of Rome in 410, and had captured Placidia, a sister of the Emperor Honorius, whom he married. In 412 he retired from Italy into Gaul, where he defeated Jovinus, took Bordeaux (*Burdigala*), and conquered Aquitania. He was assassinated by one of his own officers in 415 A. D.

At'avism [Fr. *atavisme*, from Lat. *atavus*, ancestor] : 1. In natural history atavism is the reappearance in animals or plants of traits belonging to their remote progenitors which their immediate parents did not present. *Reversion* is a term nearly synonymous, used (by Darwin and others) to indicate not only the occasional or individual appearance of such remotely descended traits, but the actual returning to them of a variety or species. Domesticated breeds of animals allowed to run wild become, after a time, nearly (seldom exactly) like their wild ancestors. This is a familiar fact with horses, cattle, hogs, and pigeons. The wild horses on the great North American prairies and on the pampas of South America, though all derived from those imported to the Western continent by Europeans, are nearly of one size, shape, and color ; and the same is true of the wild herds of cattle of the South American pampas and llanos. Domestic hogs running wild assume, in a few generations, a moderate size, slender figure, and (in some places at least) a nearly black color, with head and tusks approaching those of the wild boar of Europe. Darwin mentions the fact that in all the breeds of domestic pigeons there appear occasionally birds of a slaty-blue color, with bars and other marks characteristic of the ancestral rock-pigeon (*Columba livia*). He also considers the occasional appearance of stripes upon a horse or mule as indicating ancestral identity between the now distinct species of the equine genus. 2. In human pathology atavism is a reversion (similar to the above) to morbid traits existing in ancestors, but not in immediate parents. This may be briefly illustrated by an example (from *Lectures on Practice of Medicine*, by Sir T. Watson) : A deaf-mute man married a woman whose hearing was perfect, and had two children by her—one a deaf-mute son, who died childless ; the other, a *hearing* daughter, who married a *hearing* man, and gave birth to two *deaf-mute* daughters and a *hearing* son. This son married a woman also with good hearing, and had by her a deaf-mute son. One of the daughters married a deaf-mute and bore a hearing son. Gout, consumption, insanity, and other diseases sometimes thus disappear for one, two, or more generations in a family, and yet return in a manner evidently due to hereditary (though interrupted or latent) transmission.

Revised by WILLIAM PEPPER.

Ataxia, **LOCOMOTOR** : See TABES DORSALIS.

Atba'ra (*Astab'oras*) : a river of Northeastern Africa ; rises in Abyssinia, near Lake Dembea (or Tsana), and flows north-westward. After receiving several tributaries from the mountains, it traverses the desert of Southern Nubia, and enters the Nile in lat. 17° 37' N., and about 25 miles S. of Berber. It is the last tributary that the Nile receives, and is one of the principal causes of the inundation of Egypt. Its

length is estimated at 550 miles. In the dry season, October to June, it contains no water except standing pools. Crocodiles and hippopotami abound in this river, on the borders of which are great numbers of elephants, rhinoceroses, giraffes, lions, etc.

Atchafalaya Bay'on: an outlet in Louisiana of the Red river, from whence it issues near the mouth of the latter at the northern extremity of Point Coupée parish. It flows nearly southward through Chetimaches Lake, and enters Atchafalaya Bay, a part of the Gulf of Mexico. The whole length is estimated at 225 miles. It is navigable for steamers. At the entrance to the bay is Southwest Reef, with an iron lighthouse 50 feet high.

Atchison: city and important railroad center; capital of Atchison co., Kan. (for location of county, see map of Kansas, ref. 4-J); beautifully situated on the west bank of the Missouri river, at the extreme western point of the "Great Bend." It is one of the principal commercial cities in the State and has fine public-school buildings, one of which cost \$50,000, academies, and St. Benedict's, Midland, and St. Louis colleges; 10 churches; has fine paved streets (vitrified brick); 3 newspapers, and the largest output of flour of any city in Kansas. Pop. (1870) 7,054; (1880) 15,105; (1890) 13,963; (1900) 15,722. EDITOR OF "PATRIOT."

A'te (in Gr. Ἄτη): in classic mythology, a goddess supposed to avenge crimes, and also to stir up mischief. According to Homer, she was a daughter of Jupiter, who, for her mischief-making character, banished her from Olympus.

A'teles [Gr. ἀτελής, imperfect; ἀ-, not + τέλος, completion]: a genus of South American monkeys, characterized by the absence of a rudimentary condition of the thumb of the anterior hands. They have long, prehensile tails. The genus comprises the marimonda (*Ateles beelzebub*), which is very numerous on the Orinoco, besides a dozen other species.

Atella'næ Fa'bulæ [from *Atella*, a small Oscan town in Campania, south of Capua]: rude farces, largely improvisatory, performed originally in the Oscan vernacular, with certain stock characters. Afterward they were brought to Rome, and acted by Roman youth of good family, wearing masks. Still later (about 89 B. C.) they received a literary development at the hands of Pomponius and Novius. The ordinary masks or characters were four in number: Mæcus, the simpleton; Buceus, the loquacious glutton and boaster; Pappus, the old man constantly outwitted; Dossennus, the cunning parasite. See fragments in O. Ribbeck's *Comicorum Romanorum Fragmenta* (pp. 225-76). M. WARREN.

A Tem'po (literally, in time): a musical term used to denote that after some short relaxation in the time the performer must return "to the [proper] time," or original degree of movement.

A Tempo Gius'to (in the correct time): in music, a direction to the performer to keep the rhythm true and correct without retarding or accelerating the time.

Ateuchus: See SCARABÆUS.

Athabasc'a: a river and lake of the Northwest Territories of British North America. The lake is about lat. 59° N., and between lon. 106° and 112° W. It extends E. and W. about 230 miles, and has an average width of 20 miles. The river rises in the Rocky Mountains, flows northeastward, and enters the lake near its western extremity. The water of this lake is discharged through Great Slave river, eventually into the Mackenzie river.

Athabasca (from Athabasca Lake): a district of the Northwest Territories, Canada, and a future province of the dominion. It is nearly square in form, with Alberta on the S. and British Columbia on the W.; on the N. and E. are the still undistricted Northwest Territories. The northern boundary is a parallel not far from that of 60° N., and the eastern one is for the most part formed by Athabasca and Great Slave rivers. It is south of Great Slave Lake, and Athabasca Lake is on the eastern border; Peace river crosses the district diagonally; Little Slave Lake is in the southern part of the district. The surface is made up of wooded plains broken by low mountain-ranges. The population is mostly Indian, including the Strongbow and Beaver nations. The agricultural possibilities of the district are greater than the geographical situation would indicate. Wheat, barley, and potatoes can be raised in favorable situations in all parts of the district, and occasional chinook winds give warm weather for a few days, even in midwinter. Peltry is the chief product of the country at present, and the old Hudson's Bay Com-

pany's posts are numerous. There is quite a settlement at Dunvegan, in the southwestern angle on the Peace river. The area of Athabasca is 104,500 sq. miles. M. W. H.

Athali'ah: a Queen of Judah; a daughter of Ahab, King of Israel, and Jezebel. She was married to Jehoram, King of Judah, whom she survived, and became a notorious idolater. After the death of her son Ahaziah, about 884 B. C., she usurped the royal power and murdered all the males of the royal family except Joash. In 878 B. C. she was killed by the partisans of Joash. Her story is the subject of one of Racine's most celebrated tragedies. See 2 Kings viii. and xi.

Athana'sian Creed (in Lat. *Sym'bolum Athanasia'nium*): so called because it was mistakenly supposed to have been written by Athanasius (d. 373). It did not appear in Greek till the eleventh or twelfth century, and was then evidently a translation. In the West it was commented upon by Venantius Fortunatus in 570. And it contains extracts from Augustine's *Trinity* (415 A. D.), and from the *Commonitorium* of Vincentius Lirinensis (434 A. D.); so that it was probably written not far from 450 A. D., and apparently in Gaul.

The Athanasian Creed is the sharpest and most rigid of the three catholic symbols. It sometimes takes as its title the words *Quicumque vult*, with which in its Latin version it commences. The entire passage of which those words are a part is in English as follows: "Whosoever will be saved, before all things it is necessary that he hold the catholic faith; which faith except every one do keep whole and undefiled, without doubt he shall perish everlastingly." Then follows a minute and precise exposition of the Trinity, and an equally exact statement of the doctrine of the incarnation; after which this clause occurs: "This is the catholic faith; which except a man believe faithfully he can not be saved." The common inference would be that unless a man held the doctrine precisely as it is taught in the creed he can not be saved. On account of these "damnatory clauses," as they are sometimes called, many Christians, while substantially accepting the doctrines of the creed, disapprove of its being used in the churches. Though still retained in the church-service in England, and its use appointed for certain festivals, it is omitted from the American Book of Common Prayer, although its retention was ardently desired by Seabury, the first American bishop.

Revised by WILLIAM STEVENS PERRY.

Athana'sius (in Gr. Ἀθανάσιος), SAINT: a celebrated Greek Father of the Church; b. at Alexandria about 296 A. D. His education was directed by Alexander, Archbishop of Alexandria, with whom he lived as a son with a father. Alexander ordained him a deacon in 319, and was accompanied by him to the general Council of Nice (325), in which Athanasius distinguished himself by his eloquence, learning, and zeal against Arianism. In 326 or 328 he was elected Archbishop of Alexandria by the clergy and the people to succeed Alexander. The beginning of his episcopate was signalized by the organization of the Church in Abyssinia, through Frumentius, whom he consecrated as its first bishop (329). But to his dying day he was in trouble from the Meletians, the schismatics who supported Meletius, Bishop of Lycopolis, in his insubordination to the Archbishop of Alexandria, and especially from the Arians, whose doctrines he opposed so determinedly. His enemies contrived to gain the ear of Constantine, whom they convinced that Arius had really altered his views. So the emperor ordered Athanasius to restore him to communion. But he refused (331). Then he was summoned to appear at a council held in Casarea (334) to answer to certain alleged offenses, but he would not attend it. The next year he was by Constantine summoned to appear at the Council of Tyre (probably June 6) to answer several charges, and was there deposed. The Emperor Constantine banished him to Treves, but the Emperor Constantius, on the death of Constantine, restored him (338) to his see, and he was received with great rejoicing. Yet in 340 Athanasius deemed it advantageous to lay his case before the Bishop of Rome. In his absence he was deposed by a council held at Antioch (341). He recovered his office in 346. The Arians prevailed in the Council of Arles (353) and in that of Milan, which, under the influence of the Emperor Constantius, condemned Athanasius in 355. He was again driven out of Alexandria (356), and took refuge in the solitudes of Upper Egypt, where he passed six years, and wrote several doctrinal works. Shortly after the accession of Julian the Apostate he returned to Alexandria (Feb. 22, 362), under the general order that all bishops exiled by his predecessor should be allowed to return to their

homes. But the pagans easily persuaded Julian to banish Athanasius on the ground that he was destroying their religion, and so for a fourth time he was an exile (362). The next year he was restored by Jovinian. In 365 he was once more exiled by the Arian Emperor Valens, but after a few months (366) he was allowed to return, and continued in peaceable possession of his office until his death, May 2, 373. Athanasius was the most eminent and influential leader of the orthodox party (who were sometimes called Athanasians), and was distinguished by his fortitude under persecution, self-sacrifice, steadiness of purpose, versatility, resourcefulness, width of ready sympathy, and other virtues which endeared him to his people and qualified him to be a pillar of the militant Church in stormy and perilous times. He left numerous polemical and religious works, written in Greek in a simple, nervous, and perspicuous style. The most complete edition, unhappily inaccurately printed, is Migne's, in his *Patrologia Græca* (vols. xxv.-xxviii.). J. E. Thilo edited his select dogmatic works (*Athan. Opp. dogm. selecta*, Leipzig, 1853), and W. Bright his *Orations against the Arians* (his chief work; London, 1873; 2d ed. 1883); and his *Historical Writings* (Oxford, 1881). His principal works, including his writings against the Arians, his *Life of Antony* (founder of monasticism, a disputed work), and his *Festal Letters*, have been translated and edited by Archibald Robertson, with admirable introductions, general and special (New York, Christian Literature Co., 1892), who has written a sufficiently full life of Athanasius for the general reader. See also the *Life*, popular yet scholarly, by H. R. Reynolds (London, Religious Tract Soc., 1889).

SAMUEL MACAULEY JACKSON.

Athapascan Indians: the whole stock or family of North American Indians, formerly called Tinnah, extending from Alaska and British North America to Mexico; also a single tribe, the Athapascan Indians proper, dwelling around Athabasca Lake and along Slave river. The name is derived from Lake Athabasca in British North America, and signifies, according to Lacombe, "place of hay and reeds." In literature it once referred specifically to the Northern Tinnah, Chippeweyans or Montagnais, in Alaska and British North America W. of Hudson's Bay and N. of Churchill river.

Habitat.—As defined by Gallatin the area occupied by the Athapascan Indian family is included in a line drawn from the mouth of the Churchill or Mississippi river to its source; thence along the ridge which separates the north branch of the Saskatchewan from those of the Athapascans to the Rocky Mountains; and thence northwardly till within 100 miles of the Pacific Ocean, in lat. 52° 30'. The only tribe within the above area excepted by Gallatin as of probably a different stock was that of the Quarrelers, Kutchin or Loucheux, living at the mouth of Mackenzie river. This tribe, however, has since been ascertained to be Athapascan. The Athapascan Indians thus occupied almost the whole of British Columbia and Alaska, and were, with the exception of the Eskimo, by whom they were cut off on nearly all sides from the ocean, the most northern family in North America. Since Gallatin's time the history of this family has been further elucidated by the discovery on the part of Hale and Turner that isolated branches of the stock have become established in Oregon, California, and along the southern border of the U. S. The boundaries of the Athapascan Indian family, as now understood, are best given under three primary groups—*Northern*, *Pacific*, and *Southern*.

(1) The *Northern Group* includes all the Athapascan tribes of British North America and Alaska. In the former region the Athapascans occupy most of the western interior, being bounded on the N. by the Arctic Eskimo, who inhabit a narrow strip of coast; on the E. by the Eskimo of Hudson's Bay as far S. as Churchill river, S. of which river the country is occupied by Algonquian tribes. On the S. the Athapascan tribes extended to the main ridge between the Athabasca and Saskatchewan rivers, where they met Algonquian tribes; W. of this area they were bounded on the S. by the Salishan tribes, the limits of whose territory on Fraser river and its tributaries appear on Tolmie and Dawson's map of 1884. On the W., in British Columbia, the Athapascan tribes nowhere reach the coast, being cut off by the Wakashan, Salishan, and Chimmesyan families. The interior of Alaska is chiefly occupied by tribes of this family. Eskimo tribes have encroached somewhat upon the interior along the Yukon, Kuskokwim, Kowak, and Noatak

rivers, reaching on the Yukon to somewhat below Shageluk island, and on the Kuskokwim nearly or quite to Kolnakoff Redoubt. Upon the two latter they reach quite to their heads. A few Kutchin tribes are, or have been, N. of the Porcupine and Yukon rivers, but until recently it has not been known that they extended N. beyond the Yukon and Romanzoff Mountains. The region to the N. of those mountains is occupied by Athapascan tribes. Only in two places in Alaska do the Athapascan tribes reach the coast—the K'naia-khotana (Kenai), on Cook's Inlet, and the Ah-tena, of Copper river.

(2) The *Pacific Group*.—Unlike the tribes of the Northern group, most of those in the Pacific group have removed from their prairie habitats since the advent of the white race. The Pacific group embraces the following: Kwalliioqua, formerly on Willpah river, Washington, near the Lower Chinook; Owilapsh, formerly between Shoalwater Bay and the heads of the Chehalis river, Washington, the territory of these two tribes being practically continuous; Tlatskanai, formerly on a small stream on the northwest side of Wapato island. Gibbs was informed by an old Indian that this tribe "formerly owned the prairies on the Tsihalis at the mouth of the Skukumchuck, but, on the failure of game, left the country, crossed the Columbia river, and occupied the mountains to the south"—a statement of too uncertain character to be depended upon; the Athapascan tribes now on the Grande Ronde and Siletz reservations, Oregon, whose villages on and near the coast extended from Coquille river southward to the California line, including, among others, the Upper Coquille, Sixes, Euchre creek, Joshua, Tutu tûnnë, and other "Rogue river Indians" or "Tou-tou-ten bands," Chasta Costa, Galice creek, Naltûnne tûnnë, and Cheteo villages; the Athapascan villages formerly on Smith river and tributaries, California; those villages extending southward from Smith river along the California coast to the mouth of Klamath river; the Hupa villages or clans formerly on Lower Trinity river, California; the Kenesti or Wailakki who live along the western slope of the Shasta Mountains, from North Eel river (above Round valley) to Hay Fork; along Eel and Mad rivers, extending down the latter about to Low Gap; also on Dobbins and Larrabee creeks; and Saiaz, who formerly occupied the tongue of land jutting down between Eel river and Van Dusen's Fork.

(3) The *Southern Group*.—This group, which is the best known, includes the Navajo, Apache, and Lipan.

Navajo.—Ten Kate says that the term Navajo has been erroneously attributed to the Spanish *navaja*, a pocket-knife, instead of to *navajo*, a tank or pond formed by heavy rains. Bancroft states that "Navajo is said to mean *grand semaille* or great sowing."

Habitat and Population.—The Navajo, since first known, have occupied the country on and S. of the San Juan river in Northern New Mexico and Arizona, and extending into Colorado and Utah. They were surrounded on all sides by the cognate Apache, except on the N., where they meet Shoshonean tribes. In 1630 they were mentioned as "Apaches de Navajo" by Benavides in his letter to Philip IV. The first known reference to them by the single name Navajo is found in Blaeu, *Atlas*, xii. p. 62, 1667. The Spanish missionaries among them were killed in 1680. Schermerhorn (in *Massachusetts Historical Collection*, 2d ser., p. 29, 1812) mentions them as the "Namakan, an erratic people, N. W. of Santa Fé, and estimated at 2,000 warriors and 6,500 souls." The Navajo made their first treaty with the U. S. Nov. 22, 1846. At that time they were in the main range of the Cordilleras on Colorado river, 200 miles W. of Santa Fé. Bent gave their population in 1846 as 1,000 families and 7,000 souls. Backus, in Schoolcraft, gave their habitat in 1853 as W. of Santa Fé, extending from near the Rio Grande on the E. to the Colorado on the W., and from the land of the Utes on the N. to that of the Apaches on the S. Eaton, in Schoolcraft, said that the Navajo moved down into the country near the Sierra of Cibolletta (San Mateo Mountain), but were so severely treated by the Comanche and others that they abandoned that country and removed to their present abode. The population of the Navajo in 1891 was 16,102.

Sociology.—Matthews says that among the Navajo descent is in the female line, and that, although the names of the Navajo clans are not now totemic, the legend to which he refers in an article on the Navajo social organization seems to indicate that some of them once were of that character. On the other hand, among the Athapascan tribes

found by Dorsey in 1884 on the Siletz reservation, Oregon, descent is reckoned in the male line. A list of the Navajo clans is given by Matthews. In the tradition recorded by him it is said that the present Jiearilla Apache are supposed to be descended from part of the Navajo. The same tradition tells of bands of Apache, Ute, and Zuñi who joined the Navajo, and among the present clans are several which are supposed to have sprung from the captive Mexicans and refugees from alien tribes.

Apaches.—According to Corbusier, *Apache* is a term of the Yuma linguistic family, applied to southwestern tribes which differ in origin, race, and language. Its real meaning is "hostile man." To prevent confusion the term is confined to tribes of the warlike Athapascan stock. The first recorded use of the term is that of Oñate in 1598.

Habitat.—Joutel, in 1687, referred to the Apache as Chancres or Chanzes, placing them in Texas W. or N. W. of Louisiana and the Maligne river. Margry gives a list (A. D. 1700) which speaks of the Canessy territory, 35 or 40 leagues from the Naouadiches tribe. It is spoken of as lying about 145 or 150 leagues W. of the mouth of the Mississippi river, a longitude corresponding to that of the Choumans or Quivira. Jefferys, in 1763, placed the Canney in Louisiana between 95° and 100° W. of London, and between 35° and 37° N. latitude. Gatschet now identifies these people, the Cancees, Cancy, etc., with the Lipan and other Athapascan Apache, who are called *kantsi*, or "deceivers," by the Caddo. José Cortez, writing in 1799, defines the boundaries of the Lipan and Apache as extending N. and S. from 29° N. to 36° N., and E. and W. from 99° W. to 114° W.; in other words, from Central Texas nearly to the Colorado river in Arizona, where they met tribes of the Tuman stock. He located the Lipan in the eastern part of the above territory, extending in Texas from the Comanche country (above Red river) S. to the Rio Grande (Cortez in *Pac. R. R. Rept.*, iii. pt. 3, pp. 118, 119, 1856). In more recent times the Apache, as well as the Lipan, have gradually moved southward into Mexico, where they extend as far as the province of Durango.

Lipan.—According to Bandelier, the original name of this people is said to have been "Ipa-nde," of which "Lipan" is a corruption.

Habitat and Population.—According to Margry, the Lipan were first mentioned in 1699 as allies of the Comanche, and as probably living in Texas. The Apaches and Lipan were in the cañons of San Saba and on the Rio Colorado of Texas in 1792, at which time the Tonkawe and Towakarehu (the latter a Caddoan tribe, often called Towocconie or Tawakoni) intended making war on the Lipan. Cortez, in 1799, stated that the Lipan habitat was bounded on the W. by that of the Llanero Apache, on the N. by the Comanche territory, on the E. by the Mexican province of Coahuila, on the S. by the left bank of the Rio Grande, and on the right by the military posts of Coahuila—which would make the Lipan habitat about coterminous with that part of Texas between the Pecos river and the province of Chihuahua. In 1805 the tribe was divided into three bands of 300, 350, and 100 men, respectively. In 1816 the Lipan numbered 800, and ranged from the Rio Grande to the interior of Texas. Whipple spoke of the Lipan as a tribe which ranged over the country from Tucumeari creek, along the Canadian river, and occasionally to the Rio Pecos. In 1884 the Lipan were chiefly in Old Mexico, near the Rio Grande, some being in the Santa Rosa Mountains. In 1886 there were 90 Tonkawe and Lipan on the Ponca, Pawnee, and Otoe reservation, in the Indian Territory, but the number of the Lipan alone was not stated. A Mexican document of 1828 distinguishes between the Lipanes del Sur (Southern Lipan) and the Lipanes Llaneros (Prairie Lipan) or Lipanes del Norte (Northern Lipan). Orozco y Berra divides the Lipan into three parts: Lipajenne or Lipanes (in Coahuila), Lipanes de Arriba, and Lipanes de Abajo. He places them in the provinces of Nuevo Leon, Coahuila, and Tamaulipas, in Old Mexico.

Language and Customs.—The relationship of the various tribes of Athapascan Indians to one another is clearly shown by a comparison of their languages, social organization, and mythology. In many cases there are words in the languages of the Northern group which differ only in one or two sounds from their equivalents in the languages of the Pacific group. This is applicable in some degree to the Southern group as compared with the Pacific. These languages are highly consonantal, and they exceed the Siouan languages in the use of classifiers, duals, pronouns, and conjugations. The

tribes of the Northern group subsist chiefly by hunting and fishing, and on this account they are compelled to wander over a larger territory than that which is traversed by their kindred of the Pacific group, who are the most sedentary of the Athapascan Indians. With the exceptions of the Hupa and some of the "Rogue river tribes," those of the Pacific group have not been very warlike. In this respect the tribes of the Southern group stand pre-eminent.

PRINCIPAL TRIBES.

A. Northern group:

Ah-tena.	Nagailer (Chin).
Kaiyuh-khotana.	Sarsi.
Kealtana.	Slave.
K'naia-khotana (Kenai).	Sluacus-tinneh.
Koyukukhotana.	Takulli (Carriers).
Kutchin (Loucheux).	Tahl-tan (1).
Montagnais.	Unakhotana.
Montagnards.	

B. Pacific group:

Átaäkút.	Naltúnne túnñé.
Chasta Costa.	Owilapsh.
Chetco.	Qwinctúnnetún (Pistol river).
Dakube tēde (on Applegate creek).	Saiaz.
Euchre creek.	Taltúctún tūde (on Galice creek, Oregon).
Hupá.	Tcémé (Joshuas).
Kalts'erea túnñé.	Tcētlēstcan túnñé.
Kenesti (Wailakki).	Terwar.
Kwalhioqua.	Tlatskanai (Claxtar).
Kwatami.	Tolowa.
Micikqwútme túnñé (or Upper Coquille).	Tutu túnñé (Tou-tou-ten, Lototen).
Mikono túnñé.	

C. Southern group:

Arivaipa.	Mescalero.
Chiricahua.	Minbreño.
Coyotero.	Mogollon.
Faraone.	Na-isha.
Gileño.	Navajo.
Jicarilla.	Pinal Coyotero (Tonto).
Lipan.	Tchikún (Pinaleno).
Llanero.	Tchishi (Hot Springs Apache).

Population.—The present number of Athapascan Indians is about 33,000, of whom about 8,595, constituting the Northern group, are in Alaska and British America, according to Dall, Dawson, and the *Canadian Indian Report* for 1888. About 895, comprising the Pacific group, are in Washington, Oregon, and California. About 23,409, belonging to the Southern group, are in Arizona, New Mexico, Colorado, Indian Territory, and Oklahoma. Besides these are the Lipan and some refugee Apache, who are in Mexico. These have not been included in the above enumeration, as there are no means of ascertaining their number.

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A'theism [Fr. *athéisme*, from Gr. *ἄθεος*, without god; *ἀ-*, not + *θεός*, god]: the denial of the existence of God, or the doctrine that there is no God. Atheism may be either speculative or practical; the former consists in denying the existence of God; the latter in living as if there were no God. Speculative atheism is, strictly speaking, impossible, for the denial of the Divine existence necessarily affirms it. For if one deny God's being, his denial is worthless unless it rests upon some reason; but this reason must be absolute, or it can be no sufficient warrant for his denial, and this will only be to adduce absolute reason to declare that the Absolute Reason can not be, which is the very absurdity of all absurdities. To suppose the existence of some nature of things whose chain of invincible necessity stretches above and around the Deity is to suppose what, if it have any meaning, must itself be invested with the being and the attributes of the Godhead. Strictly speaking, the belief in a God would seem to imply a belief in his personality—that is, in his existence as a *conscious* being. But, according to its modern acceptance, atheism is understood to deny not merely the existence of a personal Deity, but also the presence in the universe (apart from *individual* intelligences) of any Principle of intelligence, beauty, or goodness. (See PANTHEISM.) Perhaps the most remarkable phase of systematic atheism is that which is set forth in the writings of Epicurus and his followers; for although that philosopher nominally acknowledged the existence of gods, he doubtless did so (as Cicero suggests) merely to avoid the popular odium which by a denial of their existence he was certain to incur. In his system of philosophy there is no all-pervading Intelligence, as in that of Anaxagoras—no principle of order, no law except the law of chance. All possible forms of existence have been tried in the fortuitous concourse of the primitive atoms, and those beings only which had at last attained, by repeated accidental trials, a certain regularity and completeness of parts possessed any permanent existence. Among many of the ancient nations in very early times to deny the gods was much the same as to deny all religious and moral obligations; hence the name "atheist" became a term of the greatest reproach; at length those who had political ends to serve came to use it, not very unfrequently, as a convenient method of exciting popular odium against an opponent; and it has been repeatedly applied to worthy and virtuous men, both in ancient and modern times. See the articles GOD and AGNOSTICISM.

Atheling [O. E. *ætheling*, belonging to a noble family; *æthel*, noble family; cf. Germ. *Adel*]: a title of honor among the Anglo-Saxons, applied first to the descendants of the first nobles, then to princes of the royal house, and finally (ninth and tenth centuries) only to sons and brothers of the reigning king.

Ath'elstan, or **Æthelstan**: an able Anglo-Saxon King of England; b. about 895 A. D.; the natural son of Edward the Elder, and a grandson of Alfred the Great. He began to reign in 925, and was the first actual sovereign of all England. On the death of Sihtric, King of Northumbria, Athelstan annexed that country. A league was formed against him by the Welsh, Scots, and Picts, whom he defeated in a great battle at Brunanburh, 937 A. D. He reigned over nearly all the island, except Scotland and Wales. He promoted learning and civilization, and was reputed one of the wisest of the Anglo-Saxon kings. He died without issue Oct. 27, 940, and was succeeded by his brother Edmund. See Freeman, *Norman Conquest*, vol. i.; Hume, *History of England*.

Athe'na (in Gr. *Ἀθηνῆ* or *Ἀθηνᾶ*), sometimes called *Pallas Athena*: the goddess of wisdom, and one of the principal divinities of the Greek mythology. According to an ancient legend she was the daughter of Jupiter, from whose head she issued in full armor. She was the favorite national di-

vinity of the Athenians, whose capital was named in her honor. She presided over the sciences, inventions, arts of peace, laws, etc., and was supposed to have invented every kind of art or work proper to women. *Athena* corresponds to the Roman MINERVA (*q. v.*).

Athenæ'um: in classical archaeology, a school founded by the Roman Emperor Hadrian at Rome for the cultivation of Greek learning. In modern time a term used somewhat loosely for literary institutions, such as support libraries, conduct courses of lectures, and the like.

Athenæ'us (in Gr. *Ἀθήναιος*): Greek man of letters and antiquary; b. at Naucratis, in Egypt; otherwise unknown except by his great work, which must have been composed after the death of Commodus (192 A. D.), who is ridiculed in it. The title of this work, *Δειπνοσοφισταί*, means *Banquet of the Learned* or *Professorial Dinner*, but the table-talk is a mere excuse; the literary faculty of Athenæus is naught, and his account of the imaginary banquet given by a noble Roman to a number of eminent men is nothing but an unwieldy vehicle for a rich fund of anecdotes, criticisms, and extracts from the works of about 700 poets and historians, most of whom would be practically unknown to us but for the learned compiler. Athenæus is simply invaluable as a repertory of literary, social, and domestic gossip, and our vision of whole ranges of antique life is due to him. Commentary by Casaubon (1597) and Schweighäuser (1801-07). Most recent critical ed. by Kaibel (3 vols., 1887-90). English translation in Bohn's Classical Library.

Revised by B. L. GILDERSLEEVE.

Athena'goras (in Gr. *Ἀθηναγόρας*) of **Athens**: a Greek philosopher and Christian writer; flourished about 170 A. D. We have by him an elaborate treatise *On the Resurrection of the Dead*; also an *Apology* (or rather *Legation*) addressed to Marcus Aurelius and Commodus about 177 A. D. Athenagoras has some pretensions to style. Edited by Otto (Jena, 1857). Am. ed. by W. B. Owen, New York, 1876 (in the Douglas series of Christian Greek and Latin writers). Translated by B. P. Pratten in the Ante-Nicene Christian Library (1867); ed. Coxe, New York, Christian Literature Co., vol. ii.

Ath'ens (*Ancient*): a celebrated Hellenic city (called in Gr. *Ἀθῆναι*, in Lat. *Athēnæ*) and republic, distinguished for unrivaled achievements in art and literature, and immortal in the records of Greek statesmanship and military glory. No state, ancient or modern, has produced in proportion to its size so many statesmen, orators, authors, and artists of the first order, or has had so lasting an influence on the civilization and culture of posterity.

Topography.—Athens is situated about 4 miles N. E. of the Saronic Gulf, in the portion of the Attic peninsula known as the plain (*πεδιάς*); lat. 37° 58' N., lon. 23° 44' E. The plain forms a grand natural theater, inclosed by mountains on every side except the south, where it opens seaward. It is bounded N. by Mt. Parnes, N. E. by Mt. Pentelics, S. E. by Mt. Hymettus, and W. by Mt. Ægaleos. About a mile north-east of the city rises Mt. Lycabettus, an isolated peak (height, 900 feet), which is a striking and prominent feature in the landscape. Within the city walls were four lower hills, composed of the same hard gray limestone; namely, the Acropolis, with the Areopagus (Mars Hill) west of it, and the Museum southwest. The Acropolis, or citadel, an isolated rocky eminence about 1,000 feet long and 450 wide (measured on its flat top), is near the center of the space inclosed by the walls of Themistocles. It rises abruptly 300 feet from the plain. The outline of its walls follows the brow of the cliff, and roughly resembles the outline of a human eye. It is inaccessible on all sides except the west, where the ascent, however, is very steep. From the citadel nearly the whole of the Saronic Gulf is visible, with Salamis, Ægina, and other islands; also the coast of the Peloponnesus, and the once hostile fortress of ACRO-CORINTHUS (*q. v.*).

Athens stands on a bed of limestone, but thinly covered, even in the depressions of the plain, with a light and rather sterile soil. The olive and the vine, however, flourish wherever they have sufficient irrigation; the orange and fig, which thrive in Laconia, do not ripen in Attica; and the palm, as at Rome, figures only as a garden exotic. The climate of Athens is delightful, and its air is proverbial for its singular purity and transparency. This feature is beautifully touched upon in one of the choral odes of Euripides's *Medea*. Byron's lines on an Athenian sunset, in the third canto of *The Corsair*, are equally impassioned. On account of "the violet hue which Hymettus assumes in the evening sky, in contrast to the glowing furnace of Lycabettus and

the rosy pyramid of Pentelicus" (Stanley). Athens was saluted by poets as violet-crowned (*ἰοστέφανοι*). The plain of Athens is watered by the Cephissus, the course of which is fairly hidden in a continuous olive-grove, and by its tributary rivulet Ilissus, which is quite waterless in summer. The Piræus was a rocky peninsula near the mouth of the Cephissus, with three well-protected harbors, to which Themistocles transferred the naval station of Athens from the sandy roadstead of Phalærum. The harbors were protected by a fortified city and a citadel built on the eminence called Munychia. The walls of Athens in its most prosperous period inclosed not only the city proper, but also a long and narrow suburb which extended from the city (*τὸ ἄστυ*) to the Piræus. A third long wall extended to the beach at Phalærum, some miles east of Munychia.

conical sister height of Mt. Lycabettus. Homer in the *Iliad* mentions Athens, with the house of Erechtheus and a temple of Athena. This allusion, once credited to Attic interpolators, was brilliantly confirmed by the discovery on the citadel, in the excavations of 1886 and 1888, of the foundations of a royal palace of the Mycenaean type (see MYCENÆ), and also of a very early temple built of Acropolis stone. Theseus, the national hero of Attica, is said to have united the twelve independent townships (*dēmi*) of the peninsula into one political body, with Athens for its capital. The historic kings of Athens were descendants of Peloponnesian princes, who traced their ancestry back to the Achaean Nestor. The last was Codrus, who, in the Dorian invasion of 1068 B. C., sacrificed himself for Athens, in compliance with an oracle which foretold success to the side whose king should be slain. The aristocracy made the heroism of Codrus a pretext for abolishing the royal prerogative. The Neleidae thereupon emigrated to Miletus, where they maintained a royal or princely rank for many years. The youngest son of Codrus, Medon, had been elected *archon*. The government became an oligarchy, or aristocratic republic. Until the close of the eighth century (714 B. C.) only Neleidae were eligible to the office of archon; but the archon's term had been reduced (752 B. C.) from life (*ἄρχων ἰσόβιος*) to ten years. In 683 the civil, religious, military, and judicial authority of the archon was divided among nine archons. (See ARCHON.) The second of the nine exercised the priestly functions of royalty, with which he retained the kingly costume and name (*ἄρχων βασιλεύς*). His wife acted the part of queen (*βασιλισσα*). It was the archon-king, also, who presided over



FIG. 1.—Plan of ancient Athens.

History.—The inhabitants of Attica asserted themselves to be aborigines, "sons of the soil." The historian Thucydides, who adopts this view, considers that before the development of maritime commerce the soil of Attica was too poor to tempt immigration or conquest. But the Athenians acknowledged the ties that bound them to the Ionians of the Peloponnesian peninsula and of Asia Minor. The relation of the Attic dialect to the Ionic branch of the Greek language is well known. Legendary traditions imply an ancestral worship of the tribal gods Apollo and Poseidon (Neptune). And the localization in Attica of the giant-stories which symbolize struggles between natives and immigrants (as in Canaan and Cornwall) indicates the subjugation of an earlier stock by Hellenic conquerors. The discrepancies of tradition are reconciled by assuming a gradual acquiescence of the Pelasgian or Protohellenic inhabitants of Attica in the rule of an Ionian aristocracy, which probably entered the peninsula from the north by way of Eubœa and Marathon. According to legend, Athens was founded by Cecrops, and was first called Cecropia or Cranaë. The name was changed later to *Athênæ* owing to the prominence acquired by the worship of Athena (Minerva), or, mythically speaking, in virtue of that goddess's triumph over Poseidon in a contest for the position of chief divine patron of Attica. It is more probable that the storm-goddess Pallas was surnamed the *Athenian* (*Ἀθηναία* or *Ἀθηνᾶ*, contr. *Ἀθηνᾶ*) from the seat of her most fervid worship. In this case the name of the city might well be derived from *ἄθ*, signifying point or peak. Before its artificial flattening the citadel rock rose some 100 feet higher than at present, so as to resemble the

the venerable court of the Areopagus, which dealt with all offenses regarded as sacrilegious, including bloodshed. The constitution of Athens at this period was based on the Ionic division of the people into four tribes (*φυλαί*). The names of the tribes were derived from the four sons of Ion (*Γελέωντες*, *Ὀπλητες*, *Αἰγικορέις*, *Ἀργάδεις*), but their signification implies an original division by the occupations of landholders, warriors, herders, and laborers. The proverbially severe legislation of Draco (archon 621 B. C.) brought no relief from the oppressive rule of the landlord class. Villeinage and serfdom for debt became crying evils. Political and class feeling crystallized into the sectional parties of the Plain (*πεδῖεις*, conservatives), the Hills (*διάκριοι*, radicals), and the Shore (*πάραλοι*, moderates). Solon, a descendant of Codrus, whom his birth and record made acceptable to all parties (archon 594 B. C.), undertook to remove the causes for dissension. Serfdom for debt was abolished, mortgages were largely canceled, the value of the silver drachma, the unit of currency, was reduced 27 per cent. The citizens were reclassified on a property basis, by the amount of their real estate, or their ability to pay taxes proportionate to an annual yield of 500, 300, 150 Attic bush. (*πεντακοσιομέδιμνοι*, *ἰππεῖς*, *ξενγίται*). Citizens of these classes were eligible to the Council (*βουλή*) of 400, and to most offices; but the archons and judges of the Areopagus could be of the first class only. The Areopagus, to which the auditorship of all public offices was assigned, became a powerful instrument on the conservative side. A fourth class of *θῆτες* paid no taxes, and was not eligible to offices, but rendered military service and sat in the popular Assembly

(ἐκκλησία). The ordinary courts were controlled by popular juries selected from a body of 6,000 jurymen. Solon also drew up a code of Attic law. His constitution, but not his legislation, was overthrown by the usurpation of Pisistratus (560 B. C.), a leader of the Hill faction, who managed, although twice ejected, to recover and transmit his dictatorship (τυραννία) to his sons, Hippias and Hipparchus (527 B. C.). The period of the Pisistratidæ was one of great public prosperity and excellent government. They paid great attention to public roads, which were even embellished with statuary; organized the Panathenaic athletic festival after the model of the Olympic games; caused the Homeric lays to be collected, critically edited, and regularly recited; and began the largest temple in Greece proper, that of Zeus Olympius, which remained unfinished for 700 years. The liberation of Athens from this mild despotism was popularly dated from the murder of Hipparchus by Harmodius and Aristogiton in 514 B. C. Hippias was unseated only in 510, when he retired to Sigœum on the Hellespont, a place which he held as a fief from Persia. He is credited with a large share in instigating Persia to make war on Athens. Herodotus tells with characteristic dry humor that a tooth the aged Hippias sneezed out in the course of the Persian landing at Marathon was the only one of his bones that found the coveted resting-place in Attic soil. The Solonian constitution was re-established in principle, but greatly expanded by Cleisthenes, an aristocratic leader of the Attic democracy (509 B. C.). The four classes were retained, but large numbers of



FIG. 2.—Restored view of Acropolis.

aliens and freedmen were enrolled as citizens in ten new tribes, which Cleisthenes substituted for the old-time four. The ten tribes were named after ancient Attic heroes (Κεκροπίς, Αἰγυίης, Αἰαντίς, etc.). Each was equally represented in the Council of 500; and, by a more curious than happy device, each batch of fifty senators from one tribe constituted an executive committee (πρυτάνεις) for one-tenth of the year, when it presided in parliament, dealt with embassies, etc., until relieved. Ten townships (δῆμι), not adjacent, appear to have been assigned to each tribe; later there were 174 in all. A Spartan attempt to overthrow this democratic constitution, with the assistance of Chalcis (Eubœa), resulted immediately only in the annexation of the Chalcidian territory to Attica as an Athenian colony, but was the prelude of the later protracted struggle between Athens and Sparta. In 499 Athens lent her aid to the revolt of the Ionian cities from Persia. The ancient Lydian capital, Sardes, was sacked and fired by the Athenian auxiliaries. After the defeat of the Ionian fleet, and the collapse of the confederacy with the fall of Miletus, the richest of the Ionian cities, Darius determined to subjugate Greece, and to punish the Athenians in an especial manner. The Persians sailed through the Ægean Sea, confirming their supremacy over the Greek islands, destroyed Eretria, and effected a landing at Marathon. Here the Athenian troops under Miltiades defeated the Persians signally (490 B. C.). The repulse of the Orientals on this occasion is commonly accounted one of the most momentous events in the history of the world. No further attempt against Greece was made for ten years. In the meantime, under the inspiration of Themistocles, Athens gave all her attention to the equipment of a strong

fleet. The army of Xerxes entered Greece by way of the Hellespont and the Thracian coast, forcing the pass of Thermopylæ after a memorable seven days' defense by a band of some 6,000 Greeks under King Leonidas of Sparta, who was finally surrounded and slain with all but two of his 300 Laedaemonians. The Athenians promptly evacuated Athens, removing their women and children to neighboring islands. Athens was occupied and destroyed by the Persian army, but a Greek fleet of 280 triremes utterly defeated and routed the Persian navy of 1,000 vessels in the Straits of Salamis (480 B. C.), into which the simulated treason of Themistocles, the Athenian commander, had entrapped Xerxes. An army of 300,000, remaining in Greece under Mardonius, was defeated at Plataeæ, in Bœotia, in the following year. This event was followed by the rapid development of the maritime power of Athens. Themistocles fortified the city and the Piræus, and the navy was so strengthened that Athens soon became the head of an important island confederacy, and ventured on daring expeditions against other Greek states and the maritime dependencies of Persia as far as Cyprus and Egypt. The Athenians also began to rebuild their capital, and to erect those masterpieces of architecture which have excited the admiration of succeeding ages. The able administration of Cimon, son of Miltiades, was excelled in brilliancy by that of Pericles, whose power became nearly absolute in 444 B. C., after his conquest of Eubœa, the negotiation of a thirty years' truce with Sparta, which relinquished the hegemony or leadership of the Greeks by land, the death of Cimon, and the banishment of Thucydides, the head of the aristocratic party. The citizens of the fourth class had been made eligible to public offices a generation before, and Pericles had himself broken the power of the Areopagus. The name of Pericles is almost a synonym for the most brilliant achievements of Athens in politics, literature, and art. During his long and able administration Æschylus, Sophocles, and Euripides trod the Attic stage, while Phidias in sculpture and Ictinus and Mnesicles in architecture were converting Athens and its Acropolis into a perfect museum of Greek art at its prime. In 431 Sparta, at the instigation of Corinth and other Dorian allies, but chiefly moved by her apprehension of further expansion on the part of Athens, resolved on war with the Athenian republic. This struggle was called the Peloponnesian war. It continued with little interruption for twenty-seven years, and resulted disastrously for the Athenians. The year 404 finds Athens with her walls dismantled, her navy surrendered to Sparta, and an irresponsible oligarchy of thirty reactionary politicians in possession of the government, under the protection of the Spartan Admiral Lysander. The darkest incidents of the war were the outbreak of the plague at Athens in the second year of the war, to which Pericles succumbed, and the capture and massacre of the whole fleet and army with which the Athenians had undertaken to conquer Syracuse, in the eighteenth (413 B. C.). Nearly all the principal Athenian commanders came to an ill end, being slain in battle, executed by the enemy or by their fellow-citizens, or exiled (Thucydides, Kleon, Demosthenes, Nicias, Lamachus, Alcibiades, and six of the last's successors). The Athenian democracy was re-established by the exploit of Thrasybulus, who expelled the Thirty Tyrants in 403. Strangely enough, the heyday of Attic comedy (Cratinus, Eupolis, Aristophanes) coincides with the Peloponnesian war. The same may be said of the philosophic teaching of Socrates, whose execution for irreverence to the gods and corruption of the young occurred in 399 B. C. The following period of military and political decline continues to be marked by the intellectual, literary, and artistic supremacy of Athens. It is illustrated by the genius of Plato, the orator Demosthenes, and the sculptor Praxiteles. The grandest eloquence of Demosthenes was called forth in his determined opposition to Philip of Macedon (the Philipics, delivered 351 to 341 B. C.), and after the victory of Philip over the alliance of Thebes and Athens at Chæronea, in his fulminant defense of his policy, in the oration *On the Crown*, delivered 330 B. C. Athens did not entirely succumb to Macedonia until the year after Alexander the Great's death in Babylon (322 B. C.), when Antipater garrisoned Munychia, abrogated the constitution, banished more than half the citizens, levied a war indemnity, and procured the death sentence of Demosthenes, who escaped execution by taking poison in the island of Calauria. Athens was unable to make itself more than temporarily independent of Macedonia (287 to 262 B. C.) after this. The beginning of her subjection is signalized by the comedies of Menander, in

literature, and she continued to be the chief home of culture and the fine arts in Greece proper. On the subjugation of Macedonia by Rome, Athens allowed herself to be incorporated in the Roman "sphere of influence" without serious resistance, which would have been futile after the fall of the Achaean league and of Corinth in 146 B. C., when Greece became a Roman province under the name of Achaia.

Athens enjoyed much municipal prosperity under Rome. Its monuments survived Sulla's occupation of the city (86 B. C.) in tolerable perfection. The Athenian schools of eloquence and philosophy attracted great numbers of students from Rome and all parts of the civilized world. Here Cicero, Vergil, and Horace received part of their education. The Emperor Hadrian favored Athens greatly. The completion of the temple of Zeus, and many other architectural improvements, dated from his reign. There exists a description of the city written shortly after (174 A. D.) by Pausanias of Magnesia in Asia Minor. The last calamities to overtake Athens were its occupation by the Goths under Alaric, A. D. 396, and the closing of its schools of philosophy, as strongholds of paganism, by the Christian Emperor Justinian, A. D. 529. This edict definitely extinguished the importance and renown of ancient Athens.

The population of Athens at the time of its greatest prosperity, just before the Peloponnesian war, was estimated by Leake at 192,000, including the Piræus. It is doubtful whether, even with slaves and aliens, the total population of Attica ever reached 500,000.

Monuments and Antiquities.—The walls of Athens were 60 stadia (6 miles) in circumference; their line can still be made out. The oldest extant vestiges of the city are on the rocky eminences within the walls, and serve to distinguish between the four chief divisions of the city, viz.: the town proper, on the Muses hill, the citadel, occupied by the royal residence and later reserved for sacred buildings, the court and assembly grounds on Areopagus and Pnyx, and the market-place in the depression between the hills. A northwest quarter was called the Ceramieus, on the way toward Eleusis, near the burial-ground; a southwest quarter bore the name of Melite; Diomeia extended northeast in the direction of Lycabettus; Limnæ was near the bed of the Ilissus, southeast. Much controversy has raged about the identification of two terraced esplanades, of which the lower has the form of a great semicircle with a stepped cube of rock at the central point, with the place of assembly of the Athenian people, or Pnyx. Ernst Curtius, the historian, contends that it was a Pelasgian sanctuary and altar dedicated to Zeus; but the former view is now again prevalent among scholars. On a narrow lane of the old town to the south of the Pnyx is a row of seven seats cut in the rock, supposed to mark the site of an early judicial court. Of the court on the Areopagus, on the other hand, nothing is left but a platform on the top of the rock or boulder which bears this name, and a flight of sixteen steps ascending to it. Some vestiges of the hexastyle Doric temple of Zeus, begun by Pisistratus, were brought to light by Penrose in his recent excavation of the foundations of the Corinthian Olympiæum finished by Hadrian. The Panathenaic stadium, or race-course, lies across the Ilissus back of this temple, again denuded of the marble seats with which it was furnished by the orator Herodes Atticus, a contemporary of Hadrian. For any other remains as old as the sixth century B. C. it is necessary to discriminate among the tombstones of the Ceramieus, or to examine the lower strata of the accumulations within the walls of the Acropolis. This work has lately been done with great thoroughness by the Greek Archaeological Society. It has been shown (1) that the earliest structures on the citadel date from the royal period; (2) that several ring-walls of early date preceded the outer one which is still extant and visible; (3) that ambitious attempts to embellish the old temple and sanctuary of Athena with colonnades and sculptures had already been made in the time of Pisistratus; (4) that the Athenians of the fifth century renovated the citadel, after the Persian invasion, with great disregard for the monuments of art partly destroyed by the enemy. Thus some twenty marble statues, some of them by artists of the highest repute at the beginning of the fifth century, were found built up in a terrace to the west of the Erechtheum, and are now among the choicest treasures of the Acropolis Museum. The majority appear to be dedicatory offerings to Athena of her own image, clad not in the usual martial array, but in the raiment of peace, befitting the patroness of artisans and artists (*Ἀθηνᾶ Ἐργάνη*). They are remarkable not only for the altogether new light

they have cast on the condition of sculpture in Athens about 540 to 480 B. C., but also for an unusually fine preservation of the ornamental coloring with which the Greeks habitually enlivened their works of sculpture. The Acropolis acquired an entirely new physiognomy under Cimon and Pericles. A small Ionic temple of Athena Victory, of Pentelie marble, to the right of the western ascent to the citadel, has been wrongly ascribed to the time of Cimon. Its small frieze bears a representation of combats between Greeks and Persians. The masterpiece of Periclean architecture was the grand gateway which Mnesicles designed



FIG. 3.—Ruins of the Parthenon.

to stretch entirely across the citadel rock just behind this, the Propylæa, left unfinished in 432 B. C. It consisted of a wall pierced by five unequal doorways, with two Doric hexastyle fronts, and an interior vestibule of the Ionic order. The central portion was flanked by smaller porticos of the Doric order, of which the northern served as a picture gallery. Passing through the Propylæa, still tolerably preserved, we ascend to the Parthenon, or temple of Athena Parthenos, regarded as the most perfect specimen of architecture ever executed. It was designed by Callicrates and Ictinus, was built in the Doric order of white Pentelie marble, and was dedicated in 438 B. C. It consisted of a walled cella, surrounded by a peristyle of 46 columns, which are over 6 feet in diameter and 34 feet high. The dimensions of the temple were 228 feet long, 101 feet wide, and 66 feet high to the top of the pediment. The Parthenon was adorned with exquisite sculpture, of which some parts are preserved. (See PARTHENON.) Within stood the statue of the virgin goddess Athena, by Phidias, of ivory and gold, fully armed and holding a figure of Victory, 6 feet high, on her extended right hand. The Erechtheum was a beautiful Ionic temple to Athena, standing north of the Parthenon, with two elegant porticos, still in fair preservation. It was completed in 393 B. C. The exact date of the Theseum, a handsome Doric temple in the lower town, is not known. The exterior is in excellent preservation, including a portion of the decorative sculptures. Other structures cluster about the Acropolis. The oldest is the theater of Dionysus, at the east end of the southern slope, forming a great semicircle of seats rising to the foot of the citadel cliff, around what was originally a circular space for the dramatic and choral performances, much built over in Macedonian and Imperial times with the high stages that had then come into fashion. Here the plays which reflect such literary glory on Athens, the tragedies and the comedies already touched upon, were given. Above the theater are two columns and vestiges of another monument commemorating dramatic victories. To the W. is a terrace once occupied by the sanctuary of Æsculapius. Further on a second theater, the Odeum, erected by Herodes Atticus in the age of the Antonines. Across the valley, on the Muses hill, rises the monument of Antiochus Philopappus, a titular prince of Comnagene, who had resided in Athens under the Roman régime. Burial within the city gates was illegal. The cemetery of the Ceramieus, in which many funeral monuments and relics of the Hellenic period have been brought to light, was out of bounds. Public buildings of a more municipal character are distributed north of the Acropolis. The most ex-

quisite is one long known as the "Lantern of Demosthenes," really the commemoration of a dramatic victory by one Lysicrates, in the form of a circular Corinthian temple, surmounted by a bronze tripod. It bears the date of 334 B. C. Other structures belong to the Macedonian and Roman periods. Such are the clock or dial-tower of Andronicus (Tower of the Winds), an octagonal pavilion adorned with the figures in bas-relief of eight wind-gods (164 B. C.), and the great Stoa, or court-house, of Attalus of Pergamum, in which St. Paul addressed the Athenian Areopagus; and for the Roman period a market-gate built under Augustus, a great portico similar to the imperial fora in Rome itself, erected by Hadrian, and the same emperor's arch, which marks the boundary between old Greek Athens and its eastern suburb of Roman or quasi-Roman country-houses. Of the temple of Zeus Olympius, which a Roman architect completed in the Corinthian order, a cluster of sixteen huge marble columns remains in one corner of the vast temple area, resembling the bunch of men left standing on a chess-board when the game is done (Wordsworth). The remains of a wall encircling only the central portion of the city, and abutting against the east and west extremities of the citadel, with the hasty repair of the citadel walls and gates by Diocletian, are witnesses of the last decline of the city which had once come near establishing its empire over the whole Mediterranean.

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Athens (*Medieval and Modern*): the first European city of importance in which the new doctrines of Christianity were preached by St. Paul, and espoused by Dionysius, a member of the Areopagus, afterward canonized as St. Dionysius Areopagita. The Parthenon and other temples were early (sixth century) converted into Christian churches, and the see became an archbishopric in 857. Great deference was paid to the name of Athens under the Eastern emperors, even to formally acknowledging the city's autonomy. In 1019 Basil II. celebrated a feast of victory in the Parthenon. But in 1040 the Normans, under Harold Haardrada, captured the Piræus. Northmen cruising homeward from Byzantine service had before this covered an antique lion at this port with runic inscriptions. This lion, which afterward gave the name of Porto Leone to the Piræus, is now in front of the naval arsenal at Venice. The Latin conquest of Constantinople in 1204 resulted in the investiture of a French family, the De la Roche, with the newly created duchy of Athens. In 1312 the duchy became a dependency of Naples. In 1394 Rainerio Acciaiuoli of Corinth, a Florentine adventurer, ejected the Catalan garrison and made himself independent duke. In 1456 the Turks, after a hard siege, wrested Athens from his second successor. The siege and capture of Athens by the Venetian general Morosini was disastrous to its monuments, above all to the Parthenon, which, being at the time the Turkish powder-magazine, was wrecked by a shell skillfully dropped on it by a Hessian gunner. Morosini himself shattered some of its best sculptures in an attempt to remove them for transportation to Venice. The Turks soon recovered the stronghold and city, and flaunted the crescent banner from the minaret they had planted on the Parthenon, while the town sank deeper and deeper in utter insignificance and degradation. Rare visits by foreign explorers, like Stuart and Revett and Lord Byron, are the best part of its history, until within three months of the outbreak of the Greek revolution in the Peloponnesus the Greeks made themselves masters of the Acropolis (June 21, 1822), mainly by famine. The year 1826 saw a sharper struggle of the Greek garrison against the assaults of Kioutagi Pasha. The forced entrance of 650 Philhellenes, under Fabvier, with fresh ammunition, was a dramatic episode of this siege, but could not prevent the surrender of the Acropolis on June 5, 1827. This signaled the virtual collapse of the Greek war of independence, had it not been for the foreign intervention which followed. Athens was not evacuated by the Turks until the entry of the Bavarian troops with King Otho (1833). In 1835 it became the capital of the new kingdom of Hellas. The city was laid out anew, not very regularly, with broad boulevards, and a fair number of handsome public buildings, more or less classical in design. The royal palace and park, between Lycabettus and Hadrian's arch (1843), and the university

(1837) and cathedral (1855), are the most conspicuous landmarks of Othonian Athens. A collegiate institute for girls (Arsakeion), a school of arts, the National Museum, the Academy of Sciences, Parliament building, theater, and exposition building have been added since. The French, German, American, and British archaeological schools, and the embassies, are centers of the considerable foreign colony in Athens. The boulevards are well lined with attractive private residences and club-houses or hotels, and the town itself has quite lost its old-time Oriental character, except perhaps in the quarter toward the north foot of the Acropolis. The sites of ancient monuments are protected from encroachment and guarded. The city has macadamized streets, street-car service, and three railway stations. It lacks serious industries or commerce, in which particular it may be compared to Washington, D. C. The Piræus boasts a stock exchange and a governmental naval school. It is feebly fortified. Population of Athens in 1889, 107,251; Piræus, 34,327. See Bäder's *Greece*, pp. 33–90; Κωνσταντινίδης, *Ἱστορία τῶν Ἀθηνῶν* (1876); Gregorovius, *Geschichte der Stadt Athen*; Curtius, *Stadtgeschichte* (1891).

ALFRED EMERSON.

Athens: on railroad; capital of Limestone co., Ala. (for location of county, see map of Alabama, ref. 1–C); 27 miles W. N. W. from Huntsville. On Sept. 23, 1864, the Confederate general Forrest, with a large body of cavalry, invested the town, held by Col. Campbell of the 110th U. S. Colored Troops and 600 men, and demanded its surrender, which was finally made just as re-enforcements were on their way. The place was again occupied by U. S. forces, and again attacked by the Confederate general Buford Oct. 2–3, 1864, but this time the place was firmly held by Col. Slade, of the Seventy-third Indiana, and Buford repulsed. Pop. (1870) 887; (1880) 1,011; (1890) 940; (1900) 1,010.

Athens: city; railroad junction and capital of Clarke co., Ga. (for location of county, see map of Georgia, ref. 2–H); on Oconee river. It is the seat of the University of Georgia, the State College of Agriculture, the Luey Cobb Institute, several other schools of a high grade, and a number of common schools. It has cotton-mills and other manufactures, electric lights, sewers, a paid fire-department, water-works, and good streets. Pop. (1880) 6,099; (1890) 8,639; (1900) 10,245.

MANAGING EDITOR OF "BANNER."

Athens: village (founded in 1780); on W. S. R. R.; in Greene co., N. Y. (for location of county, see map of New York, ref. 6–J); situated on the west shore of Hudson river, opposite the city of Hudson. It has 7 churches, 2 grammar schools, 2 shipyards, limestone quarries, and manufactories of bricks, ice-tools, and glue. Pop. (1880) 2,106; (1890) 2,024; (1900) 2,171.

EDITOR OF "NEWS."

Athens: capital of Athens co., O. (for location of county, see map of Ohio, ref. 7–G); on four railroads (the Col., Hock. V. and Tol., the Tol. and Ohio Central, the Kanawha and Mich., and the Baltimore and Ohio Southwestern), and on the Hockhocking river, 41 miles W. S. W. of Marietta. Here are the Ohio University, founded in 1804, and the Southeastern Ohio asylum for the insane. Pop. (1880) 2,457; (1890) 2,620; (1900) 3,066.

EDITOR OF "HERALD."

Athens: on railroad, Bradford co., Pa. (for location of county, see map of Pennsylvania, ref. 2–G); embraces the junction of the North Branch of the Susquehanna with the Chemung (once called Tioga) river. Athens was early known as "Tioga," or "Tioga Point," and was the most important trading-post in the region. The borough is 15 miles N. of Towanda, the county-seat, and 4 miles S. from Waverly. Athens has the oldest academy in the section. Pop. (1870) 965; (1880) 1,592; (1890) 3,274; (1900) 3,749.

Athens: on railroad; capital of McMinn co., Tenn. (for location of county, see map of Tennessee, ref. 7–I); 55 miles S. W. of Knoxville. It is the seat of Grant Memorial University (formerly the East Tennessee Wesleyan University), Pop. (1870) 974; (1880) 1,100; (1890) 2,224; (1900) 1,849.

Athens: town on railroad; capital of Henderson co., Tex. (for location of county, see map of Texas, ref. 3–J); situated in a cotton-raising district, 75 miles from Dallas. The clay industry is the only business carried on, brick, tile, and pottery being manufactured here. Pop. (1870) 545; (1880) 368; (1890) 1,035; (1900) not returned separately.

EDITOR OF "REVIEW."

Atheri'na: a genus of fishes of the family *Atherinidae*, related to the mullets. They have a broad silvery band

along each flank. The genus comprises many species which abound in both America and in Europe. Those of the U. S. coast are called "silversides" and "smelt" and "Pesce Rey." They are good food-fish when not too small.

Atherosperma'ceæ [from *Atherosperma*, one of the genera]: a natural order of incomplete aromatic exogenous shrubs found in New Holland and South America, remarkable for having their flowers in a cup-shaped involucre, and the peculiar anthers of *Lauraceæ*.

Ath'erton, JOSHUA: b. at Harvard, Mass., June 20, 1737; graduated at Harvard University 1762; practiced law, became register of probate of Hillsborough co., N. H., and removed in 1773 to Amherst, N. H.; was for a time a loyalist, but took the oath of allegiance to the U. S., and was admitted to practice in the superior court in 1779; became a member of the convention to adopt the Federal Constitution; was afterward elected to New Hampshire House of Representatives and Senate, and was made attorney-general of the State in 1783. D. at Amherst, N. H., Apr. 3, 1809.

Ath'lete, plur. **Athletes**, or **Athletæ** [from Gr. ἀθλητής, deriv. of ἄθλον, prize in a contest]: among the ancient Greeks, a person who contended for a prize in public games as a wrestler, pugilist, or runner; a man who competed for honor or awards in contests of physical strength or agility.

Athletics: See SPORTS, ROWING, etc.

Athlone (*Athluhan*, i. e. ford of the moon): a market-town of Ireland, on both sides of the river Shannon, about 67 miles W. of Dublin (see map of Ireland, ref. 9-F); is chiefly in the county of Westmeath and partly in Roscommon. It is on the railway from Dublin to Galway, and about 2 miles S. of Lough Rea. Athlone Castle, built in the reign of King John, has been converted into an important military position. Pop. 6,755.

Ath'ol: town (incorporated in 1762); Worcester co., Mass. (for location of county, see map of Massachusetts, ref. 3-F); situated 26 miles from the city of Worcester, at the junction of Hoosac Tunnel R. R. and B. and A. R. R. It has 24 public schools (including a high school), 8 churches, and other public buildings. Silks, woolens, lumber, woodenware, castings, shoes, and many other goods are manufactured. Pop. (1870) 3,517; (1880) 4,307; (1885) 4,758; (1890) 6,319; (1895) 7,364; (1900) 7,061.

EDITOR OF "WORCESTER WEST CHRONICLE."

Ath'ole, DUKES OF, and Marquesses of Tullibardine (1703), and of Athole (1676); Earls of Tullibardine (1606), of Athole (1629), and of Strathtay and Strathardle (1703); Viscounts of Balquhider (1676), of Glenalmond and Glenlyon (1703); Barons Murray (1604); Barons Balquhider (1606); Barons Balvenie and Gask (1676, in Scotland); Barons Strange of Knoeklyn (1628, in England); Barons Percy (1722, in Great Britain); Barons Murray of Stanley (1786, in Great Britain); Earls Strange (1785, in Great Britain); Lords Glenlyon (1821, in the United Kingdom).—JOHN JAMES HUGH HENRY STEWART-MURRAY, the seventh duke, was born Aug. 6, 1840, and succeeded his father in 1864.

Athor, **Aythor**, **Het-her**, or **Hathor**: an Egyptian goddess, the daughter of Ra, supposed to correspond to the Aphrodite of the Greeks. The cow was regarded as her symbol.

A'thos, **Mount** [called *Hagion Oros* by the modern Greeks, and *Monte Santo* by the Italians, both names signifying holy mountain]: a celebrated mountain of Greece, at the extremity of the peninsula of Chalcidice, 80 miles S. E. of Salonica. It rises abruptly to the height of 6,350 feet above the sea, and is cut in various directions by deep ravines, which, covered with old luxuriant forests, present the most striking natural scenery. With the mainland it is connected only by the narrow isthmus through which in olden times Xerxes dug a canal to avoid the dangerous navigation around the promontory. In the Middle Ages Mt. Athos was occupied by numerous monasteries and was a celebrated seat of learning. The origin of some of those monasteries is by legend dated back to the time of Constantine. In the eleventh century they numbered 180, and exercised a decisive influence not only on the ecclesiastical and literary, but also on the political, affairs of the Byzantine empire. In the fourteenth century the deadness began. Nevertheless, here were preserved the remains of famous libraries which furnished to scholars many valuable Greek manuscripts. In 1892 there were twenty monasteries containing 6,000 monks.

See A. A. Neyrat, *L'Athos* (Paris, 1880); Athelstan Riley, *Athos, or the Mountain of the Monks* (London, 1887).

At'kins, JOHN D. C.: b. in Henry co., Tenn., June 4, 1825; was educated at the University of East Tennessee, and graduated there in 1846; was elected to the lower branch of the Legislature in 1849 and 1851, and to the State Senate in 1855; was a presidential elector on the Buchanan ticket in 1856, and a member of Congress from Tennessee from 1857-1861; then resigned and espoused the cause of the Confederates, serving in the field part of the time, as well as in the public councils. He was a member of the Confederate Congress at the time of the general surrender in 1865; was again returned to the Federal Congress 1872-74, and was re-elected to the 45th, 46th, and 47th Congresses. He was U. S. Commissioner of Indian affairs 1885-88.

Atkinson, EDWARD, Ph. D., LL. D.: economist; b. at Brookline, Mass., Feb. 10, 1827; educated in private schools and at Dartmouth College; has become widely known through the numerous articles on economic subjects which he has contributed to current literature, covering the topics of banking, competition, cooking, tariff laws, mechanic arts, and insurance. He organized a fire-insurance company on new principles, and invented an improved cooking-stove, called the "Aladdin Cooker." Among his longer works are *The Distribution of Products* (New York, 1885); *The Industrial Progress of the Nation* (1889); *The Science of Nutrition* (1892). C. H. THURBER.

Atkinson, JOHN: See the Appendix.

Atkinson, THOMAS, D. D., LL. D. (*Cantab.*): third Bishop of North Carolina; b. in Dinwiddie co., Va., Aug. 6, 1807; was graduated at Yale 1825; practiced law for nine years; was ordained deacon 1836 and priest 1837, and served in Norfolk and Lynehburg, Va., and Baltimore, Md.; was consecrated 1853 at Wilmington, N. C. Published sermons, charges, and polemic pamphlets. D. Jan. 4, 1881.

Atlan'ta: capital of Georgia and of Fulton co. (for location, see map of Georgia, ref. 3-G); situated 1,100 feet above the sea, on a high ridge dividing the Gulf and Atlantic slopes. It is the largest city in the State and the chief railroad center of the South. By rail it is 171 miles from Augusta and 95 from Macon.



State Capitol, Atlanta, Ga.

In 1845 the Georgia and the Western and Atlantic R. Rs. were completed to this point. Besides these roads, the Central, Richmond and Danville, Atlanta and West Point, Atlanta and Florida, Georgia Pacific, East Tennessee, Virginia and Georgia, Marietta and North Georgia, and the Georgia, Carolina and Northern, all center here. Atlanta has 132 miles of street-railway lines. The city has no water-transportation, the Chattahoochee river being 7 miles distant.

There are 24 public schools (separate schools for white and colored children), with 230 teachers, and a total attendance of 10,399. There are located here the State Technological School, several colored universities and seminaries of high standing, medical colleges, and a law school. There are 82 churches (70 for white people and 12 for colored people), 2 hospitals, an orphans' home, and a Young Men's Library Association, now merged into the Public Library, the gift of Andrew Carnegie.

Business Interests.—Atlanta has been a port of delivery for many years. The wholesale houses number 217; banks, 20 (with a capital and surplus of \$4,532,500); loan and build-

ing associations, 24; manufactories, 700, with a capital of \$18,000,000, and employing 16,000 hands. There are in operation 3 large cotton-factories, 9 furniture-factories, 25 foundries, machine-shops, and agricultural implement works, 4 cottonseed-oil mills, 7 fertilizer-factories, 1 glass-factory, and 4 ice-factories. There are 23 newspapers—3 dailies, the *Constitution* (morning paper), and the *Journal* and the *Daily News* (afternoon papers). The taxable wealth is \$54,480,228, and within the past ten years \$10,000,000 have been invested in buildings.

The first house was built in 1836. The place was called Terminus until 1843, when its name was changed to Marthasville, and it was incorporated as a town. In 1847 it was incorporated as the city of Atlanta. The population was then about 2,500. Atlanta has sometimes been called the "Gate City." According to the U. S. census the population was (1870) 21,789; (1880) 37,409; (1890) 65,533; (1900) 89,872.

At the beginning of the war period the city was growing rapidly, with a population of 15,000. The Confederates made it a manufacturing center and a *dépôt* of supplies. The siege, beginning with the battle of July 21, 1864, found it a city of 30,000 inhabitants. Sherman's bombardment lasted forty days, and many citizens were killed by the shells. The Federals captured the place Sept. 2, and held it until the middle of November, when they destroyed it and started on their "march to the sea." (See SHERMAN, WILLIAM TECUMSEH.) The city was burned with the exception of about a dozen buildings in the center and 450 dwellings. After the surrender the rebuilding of the city was very rapid. The new Capitol and the Equitable building cost \$1,000,000 each. A very successful Cotton States' Exposition was held here Sept. 18–Dec. 31, 1895. The attendance on some occasions exceeded 100,000.

The health record of Atlanta is very satisfactory. The mortality report for the decade shows a death-rate of 19 in 1,000 in the general population, but of only 12 in 1,000 whites. The climate is mild and equable, the mercury rarely rising to 95° in summer or falling below 12° in winter.

Atlanta has 225 miles of streets, many of them paved with Belgian block. The buildings are of brick, granite, and marble, and are of a very substantial character. Within a radius of 15 miles are numerous popular suburbs. Fort McPherson, the army-post, is about 4 miles distant, and steam and electric lines connect it with the city. For many miles around the enterprise of many market-gardeners and progressive farmers has developed the country, and made it resemble the more thickly settled portions of the Northeastern and Middle States. A new Federal prison has just been completed at a cost of \$1,500,000.

WALLACE P. REED.

Atlanta: city and railroad junction, Logan co., Ill. (for location of county, see map of Illinois, ref. 6–E); 39 miles N. N. E. from Springfield. Atlanta is the trading-point for a highly productive grain and stock growing district. It has one of the largest and best school-buildings in Central Illinois. Pop. (1880) 1,368; (1890) 1,178; (1900) 1,270.

EDITOR OF "ARGUS."

Atlanta: town; Cass co., Tex. (for location of county, see map of Texas, ref. 2–K); on Texas and Pac. R. R., 28 miles from Jefferson, in a lumbering district. It is a shipping-point for cotton. Pop. (1880) 396; (1890) 1,764; (1900) 1,301.

Atlant'ic: city; capital of Cass co., Ia. (for location, see map of Iowa, ref. 6–E); on the East Nishnabotone river; 79 miles W. by S. from Des Moines. Has numerous manufacturing interests, including starch-works, pork-packing, soap-factory, canning-factory, and two machine-shops; a water-works plant valued at \$100,000, and fine electric-light and gas plants. Atlantic has four large ward schools, and a fine high-school building. Pop. (1880) 3,662; (1890) 4,351; (1900) 5,046.

EDITOR OF "TELEGRAPH."

Atlantic Cable: See CABLE (ELECTRIC).

Atlantic City: railroad center and fashionable watering-place, Atlantic co., N. J. (for location of county, see map of New Jersey, ref. 7–C); on the Atlantic Ocean, 60 miles S. E. of Philadelphia. Pop. (1880) 5,477; (1890) 13,055; (1900) 27,838. The summer population at times exceeds 100,000. Forty express trains run daily to and from Philadelphia. Numerous hotels and boarding-houses are open both winter and summer, with modern facilities for sea-water bathing. The town is lighted by electricity, and has electric street-cars. A plank-walk extending 4 miles along the ocean-front is a special feature. Boating and fishing facilities are unexcelled.

The public schools employ forty-six teachers, and are first class. There are good churches of several leading denominations.

EDITOR OF "DAILY UNION."

Atlantic Ocean: that part of the aqueous envelope of the earth which separates America from Europe and Africa. Where it adjoins other oceans its boundaries are indefinite, and geographers have arbitrarily assigned them various positions. Good usage separates it from the Arctic Ocean at the north by lines from Northern Labrador to Greenland and from Greenland to Iceland and Southern Norway; and separates it from the Southern Ocean by a line joining the southern extremities of America and Africa. In common parlance the term includes open bays, such as the Bay of Biscay and the Gulf of Guinea, but does not include the Gulf of St. Lawrence, the Gulf of Mexico, the Caribbean Sea, the Mediterranean and Black Seas, and the North and Baltic Seas, all of which are landlocked dependencies. With the addition of these dependencies the Atlantic has an extent of 30,000,000 sq. miles, nearly one-fourth the water area of the globe; without them its area is about 27,000,000 sq. miles, and its mean depth 2,220 fathoms. The length of the Atlantic from north to south is 7,500 miles, and its average width 3,600 miles. Midway it is constricted to about 1,800 miles by the approach of the eastern angle of South America to the prominence of the African coast north of the Gulf of Guinea. The great lobes thus separated are nearly equal in area and depth, and are called the North Atlantic and South Atlantic Oceans.

Topography of Bed.—With small exception the continental coasts of the Atlantic are margined by broad shoals, deep water beginning somewhat abruptly at a distance of several hundred miles. These shoals, sometimes called the continental shelves, are broadest on the American side. Their greatest development at the north is called the Banks of Newfoundland. Between the continental shelves the bottom exhibits a diversity of configuration comparable with the greater features of a continental area. In the northern part of the North Atlantic, from Great Britain to Labrador, the bottom lies at moderate depth, and has been called the Telegraphic plateau. An irregular plateau extends thence southward to the Azores, and then southwestward, and afterward northwestward to Bermuda, traversing the middle of the ocean. A great trough, from 2,000 to 3,000 fathoms deep, lies east of it, and extends to the coast of Brazil, where it is joined by another great trough, margining North America from Newfoundland to Florida and thence skirting the West Indies. The deepest sounding of the Atlantic, 4,561 fathoms, was obtained a few miles N. of Porto Rico island. The South Atlantic is traversed midway from N. to S. by a submerged plateau, from which spring St. Paul, Ascension, and Tristan de Cunha islands. A broad trough, 2,500 to 3,000 fathoms deep, follows the African coast, and a less regular trough the coast of South America.

Circulation.—The easterly trade-winds of the inter-tropical region drive the surface water of the ocean westward, the westerly winds of middle latitudes drive the water eastward, and there results in each oceanic lobe a great circular movement. In the North Atlantic the circulation is from left to right; in the South Atlantic from right to left. By the configuration of the bottom the rate of movement is locally accelerated, and currents are produced to which individual names are given. Of this class are the Guiana current, the GULF STREAM (*q. v.*), the North African current, the Brazil current, and the South African current. The Greenland current follows the east coast of Greenland southward; the Labrador current also moves southward; the Arctic current, formed by their combination, follows the east coast of the U. S., and finally disappears under the Gulf Stream. The Guinea current, an eddy or back-water current of the equatorial current, follows the Guinea coast eastward. Near the middle of each oceanic lobe is a great tract without definite or continuous current. In the North Atlantic it is characterized by the abundance of floating seaweed, and is called the Sargasso Sea. See also OCEAN.

REFERENCES.—*Three Cruises of the Blake*, Alexander Agassiz; *The Depths of the Sea*, Wyville Thompson.

G. K. GILBERT.

Atlantic Telegraph: See TELEGRAPH.

Atlant'ides (in Gr. Ἀτλαντίδες): in classic mythology, the daughters of Atlas. They were also called Hesperides, Pleiades, and Hyades. See HESPERIDES.

Atlant'is: a large island which, according to an ancient tradition that was credited by the Greek geographers, was

situated in the Atlantic Ocean W. of Africa, just over against the Pillars of Hercules. In reality, this was a great continent, larger in extent than Libya and Asia put together, and yet it was only the passage to another continent, for which the Mediterranean was nothing but a simple harbor. One of the earliest writers who mentions Atlantis is Plato, who, in his dialogue *Timæus*, states that an Egyptian priest gave Solon a description of it. Plato gives a beautiful picture of this island, to which he adds a fabulous history. Nine thousand years before the time of Plato, Atlantis was (so the legend ran) populous and powerful, and conquered the western part of Europe and Africa. At one time its whole power was arrayed against the nations bordering on the Mediterranean, and every nation gave way for the tremendous force of the invaders, except alone the Athenians. Though abandoned by all, the Athenians fought bravely and were victorious. The gods finally came to the rescue of the earth. An earthquake afterward caused the whole island to sink in the ocean. This is the explanation of the shallows which are found in that part of the Atlantic Ocean. See Rudbeek, *Atlantica* (4 vols., 1675-98); Bailly, *Lettres sur l'Atlan de Platon*; Carli, *Lettres Américaines*; Donnelly, *Atlantis: The Antediluvian World*.

At'las (in Gr. Ἄτλας): a mythical personage, said to be a son of Japetus and Clymene, and a brother of Prometheus. He was represented by the ancient Greek legends as a leader of the Titans in the war against Jupiter, for which offense he was condemned to support the vault of heaven on his head or shoulders. According to some writers who have rationalized the myth, he was a king who acquired great skill in astronomy.

Atlas: in anatomy, the first cervical vertebra; the piece of the vertebral column nearest to the skull. It forms, with the occipital bone, the joint on which the head moves in bowing. It turns on the pivot of the second cervical vertebra, the "axis," when we look from side to side.

Atlas [so called because some early collections of maps had prefixed a picture of Atlas upholding the sphere]: a volume containing a collection of maps, usually including more or less descriptive letterpress. The name was probably first applied as the proper title of such a book by Gerard Mercator (1512-94) to his *Atlas*, published in the year of his death. Among the best atlases are the works of Stieler (in German, French, Swedish, Finnish, Italian, etc.), of Menke, Spruner, Berghaus, Sydow, Andrees, and others, illustrating not only geography proper, but history, ethnography, geology, astronomy, botany, and other sciences; the works of A. K. Johnston, Black, Bartholomew, Stanford, and numerous others in Great Britain; and of Colton, Morse, Bradley, Johnson, Rand, McNally & Co., and D. Appleton & Co., and many others in the U. S.

Atlas Mountains: a mountain-system of Africa; mostly in Morocco and Algeria; extends from Cape Gher on the Atlantic to Cape Bon on the Mediterranean. It is a congeries of mountains, sometimes isolated and sometimes connected, with many irregular branches. The system is divided into the Greater and the Lesser Atlas, the latter of which is nearer to the Mediterranean. The highest point of the system is in Morocco, and is estimated at 13,000 feet above the sea. Mt. Mitsin rises to 11,400 feet. Numerous metals are found in these mountains.

Atmometer [from Gr. ἀτμός, vapor + μέτρον, measure]: a hollow ball of porous earthenware joined with a graduated glass tube, used for measuring amount of evaporation. The ball and tube being filled with water and exposed to the free action of the air, the extent to which the water transudes through the porous material and is removed by evaporation is measured on the tube. The instrument was invented by Sir John Leslie.

Atmosphere [from Gr. ἀτμός, vapor + σφαῖρα, sphere]: the envelope of æriform fluid which surrounds and rests upon the earth, and in which we live, move, and have our being, or any similar envelope surrounding a heavenly body.

In chemical composition the atmosphere surrounding the earth is a mixture of oxygen and nitrogen, in the proportion, by measure, of 21 parts oxygen and 79 parts nitrogen. It also contains about 4 parts in 10,000 of carbonic acid, and usually some impurities, which vary from place to place, arising from local causes. Among these are ammonia and sulphuretted hydrogen. To ordinary observation it seems so light as to be almost immaterial, as is evinced by the phrase "as light as air"; yet 12 cubic feet weigh a pound,

and a single large room therefore contains more than an ordinary man could lift. The weight of the whole mass is such that it presses on every square inch of the earth's surface with a weight which averages 14.7 lb. The entire mass of the whole atmosphere may be found by multiplying this quantity by the number of square inches on the whole surface of the earth; the result is that the entire weight, in tons, would require sixteen digits for its expression. In round numbers we might say that it is five thousand millions of millions of tons. This mass is such that the combustion of all the coal which has been mined in a century, or is likely to be mined for centuries to come, would not appreciably increase the quantity of carbonic acid in the air.

To the ordinary vision air is invisible, and therefore does not reflect light. But the light of the blue sky can be nothing but light reflected from the great mass of atmosphere above our heads; and the glow of the evening twilight can also arise from nothing but reflected sunlight. But dust and other impurities may play an important part in the reflection of light.

The height to which the atmosphere extends has not been definitely fixed. The phenomena of twilight show that it certainly does not reflect the light of the sun at a height greater than 45 miles; perhaps not even at a height so great as this. But observations on meteors show that it really extends to a height of at least 100 miles, and indeed, at that height, is sufficiently dense to cause the rapid combustion of a meteor passing through it. Observations on the aurora lead at least to a suspicion that this phenomenon sometimes takes place at a height of three, four, or five hundred miles. We can hardly suppose it to occur in an absolute vacuum; though it would be unsafe to infer from this that the medium in which it occurs is an extension of the atmosphere proper.

For fuller details of the physical properties of air, see ACOUSTICS, BAROMETER, and PNEUMATICS; also CLIMATE, CYCLONE, METEOROLOGY, STORM, WINDS, etc. S. NEWCOMB.

Atmospheric Electricity: See LIGHTNING.

Atoll, or **Atoln**: a low, circular reef of coral, inclosing a lagoon, which in many instances communicates with the ocean by a narrow inlet, or by more than one. See CORAL ISLANDS.

Atom [from Gr. ἄτομος, indivisible; ἀ-, not + -τομος (τέμνειν), cut]: a minute, indivisible particle of matter. According to one theory of speculative philosophy, matter is infinitely divisible. On the other hand, chemists maintain that all matter consists of particles which do not suffer decomposition, whatever chemical influences the matter may be subjected to. They believe that all the atoms of each element have the same weight and form, but the atoms of different elements have unequal weights. This conception is based upon a very thorough study of an immense number of chemical phenomena, which can be satisfactorily interpreted only by its aid. It has nothing to do with the old metaphysical discussion as to the question whether matter is or is not infinitely divisible—a question which it is hardly profitable to discuss in the present state of our knowledge. See ATOMIC WEIGHTS, CHEMISTRY, MOLECULES, and STEREO-CHEMISTRY.

Revised by IRA REMSEN.

Atomicity: See CHEMISTRY.

Atomic Theory: See CHEMISTRY.

Atom'ic Weights, or **Chem'ical Equiv'alents**: the proportions by weight in which chemical elements unite. One element must be selected as the starting-point of the series, and an arbitrary value affixed to it, and thereafter all the other elements can have their values awarded to them according to the proportional amounts in which they combine. It can be demonstrated that a given amount of one element is equivalent to, and serves the same purpose in combining with, a second element as a greater or less amount of a third substance. Hydrogen is taken as 1, and all the other elements are represented by a quantity which is the minimum amount in which they unite with 1 of hydrogen. For a table of the atomic weights, see CHEMISTRY.

Atomiza'tion: in practical medicine, the very minute subdivision of liquids for inhalation or application to the throat. It was first introduced in France by Sales-Girons. It is effected by forcing a fine jet of liquid against either a solid body or a strong current of air, so as to convert it into diffused spray. Bergson, for instance, applied to this use the tubes used as *odorators* to spread perfumed liquids through the air. Two glass tubes with minute orifices are fixed at right angles to each other, so that the end of the

upright tube is near and opposite to the center of the orifice of the horizontal tube. The upright tube being placed in the liquid to be atomized, air is forcibly blown through the horizontal one. The current of air passing over the outlet of the upright tube rarefies the air in the latter, causing a rise of the liquid through it, and its very minute subdivision (atomization, nebulization, pulverization) as it escapes. Siegle has applied steam-power, generated by the heat of a spirit-lamp, to the propulsion of vapor for atomization. Richardson's *hand-ball* spray-producer is a simpler apparatus, constructed essentially upon the same principle. One of its uses is, by the rapid evaporation of ether or rhigolene, to produce a great degree of cold for local *anæsthesia* (i. e. to annul sensibility in a part for a surgical operation).

Atonement: I. THE WORD.—The *English* word is derived from "at-one-ment," and its earlier signification was "reconciliation." At present it is universally used in the sense of "satisfaction for an offense," "expiation." In the authorized *English* version of the Bible the word occurs only once in the New Testament (Rom. v. 11), and there represents *καταλλαγή*, "reconciliation." In the Old Testament it occurs frequently, translating *כָּפַר*, to "cover with sacrificial blood," and hence to "expiate," to "appease," to "purge away." The biblical equivalent of the word in the Old Testament is *כָּפַר*, "expiation." In the New Testament: (1) As it respects God, *ἱλάσκεσθαι*, to "propitiate" (1 John ii. 2 and iv. 10); (2) as it respects sin, to "expiate" (Heb. ii. 11); (3) as it respects the sinner, *ἀγοράζειν*, to "redeem" (by blood, Rev. v. 9), and *λυτροῦν*, to "ransom by substitution" (1 Pet. i. 18; 1 Tim. ii. 6).

II. THE DOCTRINE. 1. *Patristic*.—The biblical view above presented has always prevailed in the Church as the basis of religious experience. It was, however, but imperfectly discriminated as a logical conception by the early teachers. From an exaggerated conception of the independence and power of the kingdom of Satan, many of the Fathers, as Irenæus, Origen, and even Augustine and Jerome, etc., founded on such texts as Col. ii. 15 and Heb. ii. 14 the notion that Christ by his sufferings rendered satisfaction to Satan, who had acquired rights of conquest over the human race.

2. *The Anselmic*.—The doctrine which was from the beginning the living principle of the devotional writings of all Church teachers and of all liturgies and hymns, and which since his time has been taught in the authorized creeds of all sections of the Church, was first systematically unfolded by Anselm, Archbishop of Canterbury (1093–1109), in his tract, *Contra Deum Homo*. He teaches that the essential moral perfection of the divine nature, which is immutable, necessarily demands the punishment of sin—that sin is an intrinsic and infinite evil. The law is consequently unrelaxable, and the penalty must be executed upon the sinner unless a substitute (1) personally free of all legal demands and (2) of sufficient dignity is willing to be punished in his stead. This condition is answered only by a Person at once divine and human—i. e. a divine Person who has assumed a human nature. Christ made atonement for the sins of men by vicariously suffering the legal penalty of death to which they were condemned, and thus expiated the guilt of sin and propitiated the justice of God.

(1) This was in substance taught from the beginning. Athanasius (d. 373), *Contra Arianos*, i. 60, etc.: "Laden with guilt, the world was condemned of law, but the Logos assumed the condemnation, and suffering in the flesh gave salvation to all." Augustine (d. 430), *De Pec. Mer.*, i. 56; Gregory the Great (d. 604), *Mor. in Job*, 17: 46.

(2) The same doctrine is taught in the standards of the Roman and the orthodox Greek Churches, *Conc. Trent.*, sess. 6, e. 7: "Jesus Christ, who when we were enemies merited justification for us by his most sacred passion on the tree, and satisfied God the Father for us." *Cat. Rom.*, ii. 5, 63; *Orthodox Conf. of Apos. East. Church*, by Petrus Mogilas (A. D. 1642); Winer, p. 85.

(3) The same doctrine is taught in the confessions, liturgies, and hymns of every branch of the Lutheran and Reformed churches: *Formula Concordiæ* (Lutheran); Hase, *Libri Symbolici*, p. 684; *Heidelberg Cat.*, Ques. 60; *Second Helvetic Conf.*, ch. 15; *Gallie Conf.*, art. 18; *Belgic Conf.*, art. 22; *Westminster Conf.*, ch. 8, § 5; *Liturgy and Articles of the Church of England*, art. 28, art. 31: "The offering of Christ, once made, is that perfect redemption, propitiation, and satisfaction for all the sins of the whole world both original and actual."

3. Abelard (d. 1142) first systematically developed what has since been known as the "moral influence theory of the atonement." He regards the love of God as the sole principle determining him in his provision of redemption for sinners. All that God's nature or will requires of a sinner as prerequisite to forgiveness and happiness is repentance and reformation. As rebellious men are obstinately indisposed to this repentance, and are afraid to trust his favor, God by his alliance with human nature in Christ, and by his surrender of him to death, makes such an exhibition of his love for man as awakens man's love for and trust in him, and so disposes man to repentance. This view is essentially the doctrine of the Socinians of the fifteenth century (*Racovian Cat.*) and of modern Unitarians, and of such Trinitarians as Maurice, Jowett, and Bushnell.

4. The "governmental theory of the atonement" was first propounded by Hugo Grotius (d. 1645) in his work against the Socinians, *Defensio Fidei Catholice de Satisfactione Christi*. He taught that the moral law under which men are held, including precept and penalty, is a positive product of the divine will. The right of waiving or relaxing its demands is therefore an element of God's prerogative as moral sovereign. But since this gratuitous remission of the penalty in case of some sinners would weaken the motives restraining the subjects of the divine government in general from disobedience, by affording an example of impunity, the benevolence of God requires that he should make such an example of suffering in Christ as will indubitably exhibit his determination not to allow sin to pass in any case without signal marks of his displeasure. This doctrine has never been accepted by any historical Church as an adequate rationale of the atonement, nor has it been embodied in any creed, but it has been frequently adopted by several schools of theologians—e. g. the supernaturalists of the last age in Germany, as Stäudlin, Flatt, and Storr, and in America Jonathan Edwards, Jr., Smalley, Maxey, Dwight, Emmons, and Park.

5. The "mystical theory," which, existing in various forms, may be generally stated thus: That the reconciliation effected by Christ is brought about by the mysterious union of God and man accomplished by the incarnation, and not by his sacrificial death. This was held by the Platonizing Fathers, by followers of Scotus Erigena during the Middle Ages, by Oslander and Schwenkfeld at the Reformation, and by the school of Schleiermaeher among modern German theologians. See Prof. Edwards A. Park's *Atonement*; Dr. Shedd's *Hist. of Christ. Doctrine*; Ritschl's *Hist. of Doc. of Reconcil.*; Schaff's *Hist. Chr. Ch.*; Watson's *Institutes*; Winer's *Comp. of Docs. of Christendom*; Outram, *De Sac.*; Hase, *Libri Symbol.*; Niemeyer, *Collec. Conf.*; the recent works on the Atonement by Thomas J. Crawford (Edinburgh, 1871; 2d ed. 1874) and R. W. Dale (London, 1875; 9th ed. 1883).

A. A. HODGE.

Atonement: A statement of the ROMAN CATHOLIC DOCTRINE. 1. Sin is an offense against God; it deprives the soul of the friendship of God, makes it the slave of the devil, and is deserving of punishment. (*Council of Trent*, session vi. e. 1; also Colossians i. 13; ib. ii. 14.) 2. All men sinned in Adam. (Romans v. 12.) 3. In strict justice, God could have refused forever to pardon fallen man. In his mercy, he could have pardoned sin by a mere act of his free will without any satisfaction from man, but directly on man's simple repentance and purpose of amendment. The contrary opinion limits the free will and the infinite mercy and power of God. Yet the ordinary condition for the remission of sin is that the sinner should make reparation for the sin. God may be content with an incomplete reparation, or he may demand a complete, rigorous reparation equal to the offense. This is what God demanded. 4. Such reparation could be given only by a man, for man had sinned. At the same time it could be given only by God; for, the offense being infinite, only an infinite person could repair it. Hence no one but a person at once God and man, the God-man Jesus Christ, could give adequate satisfaction for sin. Hence, too, the incarnation of Christ was necessary only hypothetically. 5. The Son of God became man to satisfy for us, and instead of us. He is the natural mediator between God and man. By his incarnation he is our great High Priest. 6. As priest he could satisfy the justice of God for us by any expiatory act of his life. But he chose to do so by the most perfect act, by the sacrifice of his life on the cross. 7. By his sacrifice Jesus Christ has redeemed the whole human race, and freed man from the slavery of the

devil. Christ's sacrifice was offered to God the Father. "Jesus Christ, when we were enemies, merited justification for us by his most sacred passion on the cross, and satisfied God the Father for us." (*Roman Catechism.*) 8. The fruit of Christ's sacrifice is applied to each of us by sacraments, sacrifices, good works, etc. 9. The satisfaction of Christ was free, as all grace is free. It was vicarious. It was infinitely meritorious—i. e. of unlimited inherent dignity and value. It was superabundant—i. e. sufficient for the salvation of all men. It was universal—i. e. offered for all men. 10. From what is said above it follows: (1) That the atonement does not consist merely in the effect produced on the hearts of men by the doctrines, character, example, life of Christ; nor (2) merely in the hypostatic union of the two natures, the human and the divine, in one person; nor (3) merely in the fact that Christ taught the truth and sealed his teaching with his blood; nor (4) merely that he manifested by his death his self-sacrificing love; nor (5) merely that he died a martyr. It is something more. These opinions, held by some outside the Church, entirely omit what is essential to the atonement, i. e. the fact that Christ as Priest offered himself as victim to satisfy the justice of God the Father for the sins of the world. See H. N. Oxenham, *Doctrine of the Atonement* (London, 1865, 1869, and 1881).

JOHN J. KEANE.

Atra'to: a river of South America; in republic of Colombia; rises near the Cordillera, flows northward through Cauca, and after a course of about 280 miles (185 navigable) enters the Gulf of Darien by several mouths. It traverses a region rich in gold. In 1857 the Government of the U. S. sent an expedition to explore a route for a ship-canal from the Atrato to the Pacific. In 1870-72 the explorations under Capt. Selfridge, U. S. navy, were resumed, and all the routes between Panama and the Atrato examined, with results far from realizing the hopes entertained of a favorable route.

A'treus (in Gr. Ἀτρεΰς): an ancient and celebrated King of Mycenæ; was called a son of Pelops. He was the father of the famous *Atridae*—i. e. Agamemnon and Menelaus. The story of Atreus and his family was embellished by the ancient fabulists and tragic poets with many wild legends, involving horrible crimes and calamities.

Atri'des (in Gr. Ἀτρεΐδης), plural **Atridae** (in Gr. Ἀτρεΐδαι): a patronymic from *Atreus*; signifies a son or descendant of Atreus. The name in the singular is more usually applied to Agamemnon, but the plural is used to designate the two brothers, Agamemnon and Menelaus.

A'trium [Lat., a court, a hall]: in Roman architecture, an entrance-hall or central apartment, which was the principal part of a private house. In this room the family lived and took their meals. Here stood the Lares and Penates, and here the female servants were employed in weaving and other labors. The atrium was also used as a waiting-room for clients and other visitors. In ecclesiastical architecture the term denotes an open space before a church, forming part of the narthex or ante-temple.

Atrophy [from Gr. ἀ-, not + τρέφειν, nourish, feed]: wasting or decrease in size of parts of the body. This occurs normally at advanced age; also in the uterus after pregnancy, and in the thymus gland in early life. Atrophy is to be distinguished from *hypoplasia*, a condition in which full development has never been reached.

At'ropine, or **Atro'pia**: a peculiar alkaline principle obtained from the *Atropa belladonna*; is very poisonous. It exists in all parts of the plant. A very minute portion of it has the power to dilate the pupil of the eye. Atropine is composed of carbon, 70.98; oxygen, 16.36; hydrogen, 7.83; and nitrogen, 4.83.

Attacapan Indians: a numerous family of North American Indians who inhabited the district of Louisiana, still popularly styled the "Old Attacapa country" or "Tuckapa country," which included the parishes of Louisiana between the Red, Sabine, and Vermilion rivers and the Gulf of Mexico; also some adjoining counties of Texas. Very little beyond fragments of its language is now known of the family, but it is evident that the language is distinct from all others, except possibly the Chitimachan. The knowledge of it possessed by Gallatin was derived from a vocabulary and some scanty information furnished in 1805. More was obtained in 1885 by the Bureau of Ethnology from a few survivors in Calcasieu Parish, La. The Coco and Hiyeketi are the only tribes of this linguistic family the names of

which are identified. The Attacapa were mentioned by Pénicaut in his account of the exploration ordered by M. de Bienville in 1703. The name Attacapa is derived from a Choctaw word meaning "man-eater," and is merely a term of obloquy devised by enemies and never adopted by the family itself; but they have never appeared historically under any other except the two tribal names mentioned above. In the early colonial period the name was also applied to several Texan tribes accused of anthropophagy, with rather more evidence than can be produced against other North American Indians, but which is by no means conclusive. See INDIANS OF NORTH AMERICA.

GARRICK MALLERY.

Attach'ment [from Old Fr. *attachement* < *a-* (L. *ad-*) to + a verb from the same root as E. *tack*, a nail]: the apprehension of a person or seizure of a thing by virtue of a writ or order issued by a court or judge under authority of law. The word is sometimes used to denote the process itself. In respect to property, the term is usually applied to seizure on *mesne* process. Attachment was originally one of the common-law means of obtaining an appearance in an action by the defendant. In some of the States a plaintiff can at the commencement of any action to recover money attach the property of the defendant as a security for the payment of the judgment expected to be recovered; and in case of recovery the property is to be applied in satisfaction of the judgment. But the more usual rule is that there can be no seizure of property, except in specified cases, till the rights of the parties have been settled by judgment of the court. The exceptions are chiefly in cases where the defendant is a non-resident or a fraudulent debtor, or is attempting to conceal or remove his property for the purpose of defrauding or delaying his creditors. An attachment is said to be foreign where a creditor attaches property in the hands of a third person belonging to his debtor, or a debt due from a third person to such debtor. The name is said to arise from the fact that the proceeding is often resorted to for the purpose of collecting a debt against a non-resident. In some of the Eastern States this proceeding is called "trustee-process"; in other States it is generally known as "garnishment," meaning a warning. Foreign attachment was derived from local customs in London and other cities, and formed no part of the general law of England.

Attachment is issued against the officers of the court for any misconduct or neglect of duty, and against any person who has been guilty of contempt of court. The object of the attachment is to bring the guilty party actually before the court. He has then an opportunity to show cause why he should not be found guilty, or, in legal language, to "purge himself of the contempt." If he can not do this he is subject to such punishment as the law permits and the court may award.

T. W. DWIGHT.

Attain'der [subst. use of O. Fr. *ataindre*, touch, accuse < Lat. *attingere*, touch. The meaning "stain" is due to false association with Fr. *tindre* < Lat. *tingere*, dye]: in law, the extinction of civil rights as the consequence of a judicial sentence of death for a capital crime. From this moment the criminal was deemed to be legally dead, incapable of bringing an action, except to reverse the attainder, or of appearing in court as a witness. Its two most important consequences are forfeiture and corruption of blood. The effect of forfeiture upon the offender's land was such that it related back to the time of the commission of the offense, and avoided intermediate sales, even to purchasers in good faith. The consequence of corruption of blood was that the person attainted was incapable of inheriting himself or of transmitting an estate by inheritance to another. Thus if a grandfather owned land, and a son were attainted, his descendant could not inherit from the grandfather, even though the son were dead when the land passed from the grandfather. This harsh rule is now modified in England by statute. Forfeiture, except in cases of treason and murder, does not extend in the case of estates of land beyond the natural life of the offender. By the U. S. Constitution no attainder of treason shall work corruption of blood or forfeiture, except during the life of the person attainted. In case of rebellion the U. S. might regard the rebels either as belligerents or traitors. In the former aspect of the case they would not be bound by the restriction just referred to, but might, under the rules of public law applicable to a state of war, confiscate their property. If, however, they were treated as subjects and as guilty of treason, the restriction of the Constitution would become operative.

Attakapas, at-tuk'a-paw: a large and fertile district in the southern part of Louisiana, comprising, according to old maps, several parishes. It produces large quantities of sugar and molasses. Though often used in conversation, the name has no legal existence.

Atta'lea: a genus of palm-trees including about twenty species, native of tropical South America and the West Indies. The leaves are pinnate with a much-compressed principal rachis and drooping pinnules. The pistil of the flowers is tricarpellary, and the fruit, a smooth berry or drupe, generally contains three edible seeds. Some species are of much economic interest—e. g. *A. funifera*, the Piassabe or Coquilla palm of Brazil, which yields fiber and "Coquilla nuts," and *A. cohune*, the Cohune palm of Honduras, whose seeds yield a valuable oil. See PALM FAMILY. C. E. B.

Attal'la: town; Etowah co., Ala. (for location of county, see map of Alabama, ref. 2-D); on L. and N., E. T. Va. and G., and Queen and Crescent R. Rs.; at southern extremity of Lookout Mountain, 56 miles from Birmingham; has excellent public schools for white and colored children, 5 churches (3 white and 2 colored), water-works, electric lights, charcoal-furnace, and several iron and steel works. In the surrounding region, which is favorable to agriculture, are fine iron-ore deposits. Attalla has a large cotton-trade, and in the shipment of iron is the second place in the State. Pop. (1880) 351; (1890) 1,254; (1900) 1,692.

EDITOR OF "HERALD."

Attalus I.: King of Pergamus; b. 269 B. C. He succeeded his cousin, Eumenes I., in 241 B. C., defeated the Gauls who had occupied Galatia, and became an ally of the Romans in a war against Philip of Macedon. He was reputed a wise ruler and able general. D. in 197.

Attalus II., surnamed PHILADELPHUS: b. 210 B. C.; was the second son of Attalus I. He succeeded his brother, Eumenes II., in 159 B. C., was a constant ally of the Romans, and patronized arts and sciences. D. in 138.

Attaman, or **Het'man**: the title of the chiefs of the Cossacks, formerly elected by the people. (See COSSACKS.) After the revolt of Mazeppa the office was suppressed by the Czar of Russia until 1750. Catherine II. abolished the office among the Cossacks of the Ukraine; among those of the Don it still exists, but its prerogatives have been greatly reduced. The heir-apparent of the Russian crown is principal attaman of the Cossacks.

Attar of Ro'ses [from Pers. *atar*, loan-word from Arab. *itr*, perfume]: the oil or essence of *Rosa centifolia* and its varieties, *Rosa damascena* and *Rosa moschata*. It is prepared by distillation of the petals in Persia, India, and other Eastern countries, whence it is exported in small vials. It is very costly, and is often adulterated: 100,000 roses, from 10,000 bushes, are said to yield but 180 grains of attar. It is often called *otto* of roses. That of Adrianople is called the best. In 1887 25 acres were planted with roses near Leipzig, Germany, for the purpose of manufacturing the attar. In the first year about 4 lb. of the oil and 6,000 lb. of rose-water were obtained. From 1,000 lb. of rose-leaves 1 lb. of oil was obtained. IRA REMSEN.

Attention: See the Appendix.

Atterbom, PETER DANIEL AMADEUS: b. at Åsbo, in Southern Sweden, Jan. 19, 1790; studied (1805) at the University of Upsala languages and literature, history and philosophy; traveled in Germany and Italy 1817-19; was tutor to the Crown Prince Oscar 1819-21, and was appointed doцент in 1821 and professor in 1828 at the University of Upsala, where he died July 21, 1855. In 1807 he formed the literary association *Aurora*, and in 1810 he founded the critical periodical *Phosphoros*; and it was through these two institutions that the French or pseudo-classical taste which reigned in all Swedish literature and art received its first and its heaviest blows. The romantic ideas which started this whole movement were afterward developed by Atterbom in a long series of brilliant writings, poetical and historico-critical—*Lycksalighetens Ö* (2 vols., 1824-27); *Samlade Dikter* (2 vols., 1836-37); *Svenska siare och skaldar* (6 vols., 1841-55); and *Poesiens historia* (4 vols., 1862); but the form of the romantic school represented by Atterbom did not become the model of modern Swedish poetry.

Atterbury, FRANCIS: English prelate, writer, and politician; b. at Middleton-Keynes, in Buckinghamshire, Mar. 6, 1662. He entered Christ Church, Oxford, in 1680, took holy orders in 1687, and became lecturer in St. Bride's

church, London, in 1691. Having gained distinction as a pulpit orator, he was appointed a chaplain to the king. He was the author of a witty but superficial *Examination of Dr. Bentley's Dissertations on the Epistles of Phalaris*, which appeared under the name of Charles Boyle, his pupil, in 1698. He was a Jacobite in politics, and a zealous defender of High Church doctrines. He was appointed chaplain to Queen Anne in 1702, Dean of Carlisle in 1704, and Bishop of Rochester in 1713. His turbulent and imperious temper several times involved him in difficulties, and his hopes of promotion were blasted by the death of Queen Anne in 1714. He was a friend of Pope, Swift, and Bolingbroke. In Aug., 1722, he was committed to the Tower on a charge of treason as an accomplice in plots for the restoration of the Stuarts. He was convicted by the House of Lords in May, 1723, and was condemned to perpetual banishment. He became a resident of Paris, where he died Feb. 15, 1732. Four volumes of his sermons were published in 1740. His reputation as a writer is founded on his sermons and letters, which have great literary merits. See his *Epistolary Correspondence* (5 vols., London, 1783-90), edited by J. Nichols; *Memoirs and Correspondence*, compiled by F. Williams (2 vols., 1869).

Atterbury, WILLIAM WALLACE, D. D.: Presbyterian minister, distinguished as a leader in the Sabbath-reform movement; born of honorable Huguenot parentage at Newark, N. J., Aug. 4, 1823. At Yale he took the courses in arts and in theology, and a partial course in law. He was pastor to Presbyterian churches in Lausing, Mich., six years, and in Madison, Ind., twelve years. In 1869 he succeeded the Rev. Philip Schaff as secretary of the New York Sabbath Committee, and has since devoted himself to that work, traveling, preaching, lecturing, and writing for the press. His honorary degree was given him by the University of the City of New York in 1888. W. J. B.

Attfield, JOHN, M. A., Ph. D., F. R. S.: chemist and pharmacist; b. Aug. 28, 1835, in Hertfordshire, England; studied in the Pharmaceutical Society's School 1853-54, and was first prizeman in all subjects; Demonstrator of Chemistry at St. Bartholomew's Hospital 1854-62; appointed to the chair of Practical Chemistry in the Pharmaceutical Society's School 1862. He was dean till 1887, and senior professor till his retirement in 1896. His chief work is *A Manual of Chemistry, General, Medical, and Pharmaceutical*, of which seventeen large editions have been published. C. H. THURBER.

Attic [from Lat. *atticus*, pertaining to Attica; Gr. Ἀττικὸς]: pertaining to or characteristic of ancient Athens, or its people, language, literature, etc. In architecture an *attic base* is a form of base employed in the Ionic and sometimes in the Corinthian order, and consists of two toruses separated by a scotia, and resting upon a square plinth. An *attic story*, or, more briefly, an *attic*, is a subordinate story introduced into the uppermost frieze or immediately below the architrave, or added above the main cornice. It is of less height than the other stories, and usually has small, square, oval, or horizontally oblong windows. The attic is a feature of frequent occurrence in the Italian palaces, especially of Rome, Vicenza, and Venice. *Attic wit* and *Attic salt* signify a poignant and delicate wit specially characteristic of the Athenians. A. D. F. HAMLIN.

Attica [in Gr. Ἀττική]: a state of ancient Greece; bounded N. by Bœotia, E. by the Ægean Sea, S. W. by the Saronic Sinus, and W. by Megaris. It occupied a triangular peninsula, at the S. E. extremity of which is the promontory of Sunium. A range of hills called Mt. Cithæron extends along the northern border. The surface is diversified by limestone hills and plains, the soil of which is light and unproductive. About 10 miles N. E. of Athens rises Mt. Pentelicus, which has an altitude of 3,884 feet, and contains inexhaustible quarries of white marble of a superior quality. Among the prominent physical features of the country are Mt. Hymettus, about 3,500 feet high, and Mt. Laurium, whose silver mines have again attracted great attention. The principal streams are the Cephissus and Ilissus, which flow southwestward into the Saronic Gulf. The climate is dry and extremely pleasant. The chief productions are wheat, olives, figs, and grapes. Rich silver mines were worked at Laurium. Attica was very advantageously situated for commerce, and was at one time the greatest maritime power of the world. The people of Attica, who belonged to the Ionic division of the Hellenic race, planted colonies in various distant lands. The region which they colonized on the western coast of Asia Minor was called

Ionia. The capital of Attica was Athens (Athenæ), and the inhabitants of Attica were citizens of Athens, possessing the right to assemble in the capital, and take part in the legislative and judicial proceedings. The ancient population is estimated at 500,000, the majority of whom were slaves. Modern Attica is deficient in forest trees, and presents an arid and rather desolate aspect, except in spring. (For the history of Attica, see ATHENS.) ATTICA and BŒOTIA form a department of the modern kingdom of Greece, comprising Megaris and the islands of Egina and Salamis. It has an area of 2,472 sq. miles. The soil is less fertile than it was in ancient times, and is not well cultivated, but it still produces olives, grapes, and some wheat. Pop. (1889) 257,764.

Attica: city and railroad junction, Fountain co., Ind. (for location of county, see map of Indiana, ref. 6-B); on the Wabash R. R. and river; 21 miles W. S. W. of Lafayette; has various manufactures. Pop. (1890) 2,320; (1900) 3,005.

Attica: village and railroad junction; on Erie, N. Y. Central, and Buffalo, Attica and Arcade R. Rs.; Wyoming co., N. Y. (for location of county, see map of New York, ref. 5-D); 31 miles E. of Buffalo; is located in an agricultural district. Pop. (1880) 1,935; (1890) 1,994; (1900) 1,785.

Atticus: b. at Sebaste, Armenia; went to Constantinople; became a presbyter; was a leader in the conspiracy against Chrysostom, patriarch of Constantinople, and testified against him in the synod. Atticus was, after some months of intrigue, elected patriarch of Constantinople, Mar., 406, and held that office till his death, Oct. 10, 426. Pope Innocent I. refused at first to recognize him as patriarch. Atticus declined for a long time to put the name of Chrysostom on the diptychs of the Church.

Atticus, Titus Pomponius: an accomplished Roman of the equestrian order; b. in 109 B. C. During the war between Sulla and Marius he remained neutral, and passed many years (86-65) in Athens, to which city he rendered important services. He was an intimate friend of Cicero, whose letters to him are still extant. Having returned to Rome in 65 B. C., he declined to take part in political affairs, and distinguished himself by his moderation, generosity, and mediatorial spirit. He was on friendly terms with the leaders of both parties that divided the Romans. He wrote, beside other books, an epitome of Roman history called *Annalis*, but all his works are lost. His daughter was the wife of M. Vipsanius Agrippa, the eminent statesman. D. in 32 B. C. See Corn. Nepos, *Life of Atticus*; Hüllemann, *Diatribes in T. Pomponium Atticum* (1838); Boissier, *Cicero and his amis* (Paris, 1884).

Attila [Gr. Ἀττίλας; Ger. *Et'zel* or *At'zel*; Hung. *Ethele*]: a famous barbaric conqueror and King of the Huns; was a son of Mundzue (or Mundzuccus). He succeeded his uncle Ruas as King of the Huns in 434 A. D., his subjects being nomadic hordes who occupied Pannonia and Sarmatia. He extended his dominion by conquest over Germany and Scythia, and obtained the surname of THE SCOURGE OF GOD. The Vandals, Ostrogoths, and Gepidæ fought under his banner. In 447 he invaded the Roman empire of the East, and defeated the armies of Theodosius II., who obtained peace (448) by the payment of an annual tribute of 2,100 lb. of gold, after the Huns had devastated Thrace and Macedonia. Marcian, who succeeded Theodosius II. in 450 A. D., refused to pay tribute to Attila, saying, "I have gold for my friends and iron for my enemies." In 451 A. D. Attila invaded Gaul with an army estimated at 700,000 men, and besieged Orléans (*Aurelianum*), which was relieved by the approach of a Roman army commanded by Aëtius. Attila retired to Champagne, and awaited the enemy on the Catalaunian plain, near the site now occupied by Châlons-sur-Marne. Here he was defeated in a great battle by the combined armies of Aëtius and Theodoric, King of the Visigoths, in June, 451 A. D. It is stated that 250,000 men or more were killed in this battle. Attila then retired into Germany. In 452 he led an army into Northern Italy, which he ravaged, and threatened Rome. The Emperor Valentinian III., unable to defend his capital, invoked the mediation of Pope Leo I., who had an interview with Attila, and persuaded him to grant the Romans a truce. Attila retired from Italy, and died in Pannonia in 453 A. D., on the night after his marriage with Ildico. He was buried by night, and the prisoners who dug his grave were killed, in order that the place of his burial might be kept secret. He had two sons, named Ellac and Dengezie. He is described as short, somewhat misshapen, with broad shoulders, a large head, flat nose, and small, deepset and singularly

piercing eyes. See Jornandes, *De Rebus Geticis*; Amédée Thierry, *Histoire d'Attila et ses successeurs* (Paris, 1864; 6th ed. 1884).

Attius: See ACCIUS.

Attleborough: Bristol co., Mass. (for location of county, see map of Massachusetts, ref. 5-I); on Old Colony R. R., 12 miles from Providence, R. I., and 30 S. S. W. of Boston; has extensive manufactures of jewelry, calicoes, clocks, metal, buttons, braids, and straw bonnets. Pop. of township (1880) 11,111; (1890) 7,577; North Attleborough having been set off as a separate town subsequent to 1885, when Attleborough had a population of 13,175; (1900) 11,335.

Attorney [O. Fr. *atorné*, past partic. of *atourner*, assign, i. e. one assigned to a function]: one who acts for or on behalf of another. Attorneys are of two kinds—in fact and at law. An attorney in fact is an agent, though the term is commonly applied to one who is authorized to act for another by a writing called a power of attorney. An attorney at law is one who is authorized by law to act in the place of another in the management or conduct of law proceedings. In England the term is employed to denote a class of legal practitioners whose duties are preliminary to those of the barrister, who conducts the cause in court. An attorney is admitted there after a prescribed term of study, on passing an examination directed by the court. Barristers come to the bar through the action of voluntary societies of lawyers which have existed for several centuries. In the U. S. the same person is in general admitted both as counselor (answering to barrister) and attorney, and examined in the same manner and under the same authority as to his qualifications to perform both classes of duties. An attorney is an officer of the court, and liable to be punished for a breach of duty, and in aggravated cases to have his name stricken from the roll, and thus lose his right to practice. His duties to his client require the exercise of reasonable care. He is responsible for negligence or willful default whereby his client sustains loss; for example, for the disclosure by him of confidential communications. He is entitled to compensation, and has a lien upon his client's papers or securities in his possession, and upon any judgment obtained through his exertions.

Attorney-General: an officer in England whose duty it is to prosecute for the king in criminal matters, and to manage civil actions or proceedings where his revenue or other property is concerned, as well as to enforce public rights. The U. S. and the respective States have a public officer of the same name, with similar duties.

Attorney, Power of: See POWER OF ATTORNEY.

Attraction [Lat. *tractio*; *ad.* to + *tra'here*, draw]: the tendency of bodies to approach each other and unite; the force which brings bodies together and resists their separation. The principal kinds of attraction are—the attraction of gravitation (see GRAVITATION); capillary attraction; chemical attraction (see AFFINITY); the attraction of cohesion, which unites the particles of a body, and operates only between two portions of matter that are in contact; and magnetic attraction (see MAGNETISM). These attractions are divisible into two classes—1, those which act at sensible and measurable distances, as gravitation and magnetic attraction; and 2, those which extend only to extremely small or insensible distances, as chemical attraction and the attraction of cohesion.

Attraction of Mountains.—In 1774 Maskelyne made an experiment on the mountain Schehallion, in Perthshire, to ascertain the attraction of mountains. This and subsequent experiments have established the fact that mountains are capable of producing sensible deflections of the plumb-lines of astronomical instruments.

Attucks, CRISPUS: a mulatto or half-breed Indian who was the leader of the mob which attacked the British troops in Boston, Mar. 5, 1770. Attucks and a number of others were killed in this affray, which was called "the Boston Massacre." It was the outcome of several previous quarrels between the people and the soldiery, and served to incite revolutionary feeling among the people. A monument to him was dedicated in Boston, Nov. 14, 1888.

Attwood, GEORGE: See ATWOOD, GEORGE.

Atwater, LYMAN HOTCHKISS, D. D., LL. D.: b. at Hamden, Conn., Feb. 23, 1813; graduated at Yale in 1831; tutor and theological student at Yale (1833-35); pastor of First Congregational church in Fairfield, Conn. (1835-54); became in

1854 Professor of Mental and Moral Philosophy at Princeton, N. J. In 1869 the department of Economics and Politics was given to him, and from that time he was Professor of Logic, Metaphysics, Ethics, Economics, and Political Science. He was an editor of the *Princeton Review*, 1869-78. He published a *Manual of Elementary Logic* (Phila., 1867). D. at Princeton, Feb. 17, 1883.

Atwater, WILBUR OLIN: agriculturist; b. at Johnsburgh, N. Y., May 3, 1844; graduated as A. B. at Wesleyan University in 1865 and as Ph. D. at Yale in 1869; studied for two years in the universities of Leipzig and Berlin, and elsewhere in Germany; became Professor of Chemistry in East Tennessee University and in the Maine State College, and has occupied the like position in Wesleyan University since 1873. He was director of the first agricultural experiment station in the U. S., the work of which was done in 1875-77 in the chemical laboratory of Wesleyan University. When the experiment station enterprise was made national by the establishment of stations throughout the U. S. under act of Congress, and the office of experiment stations was organized in 1888 as a central bureau in connection with the U. S. Department of Agriculture, he was made the first director of the office, and is still associated with it. He is also director of the Storrs (Connecticut) Agricultural Experiment Station. His specialty is biological and agricultural chemistry. Of his publications, the articles in the *American Chemical Journal*; *Report of the United States Fish Commission*; *Annales de Chimie et de Physique*; *Comptes Rendus* of the French Academy of Sciences; *Zeitschrift für Biologie*; *Berichte der Deutschen Chemischen Gesellschaft*; and *Landwirthschaftliche Jahrbücher* have the most scientific interest. Those in the *Century Magazine* are doubtless better known to the general public than any others.

Atwill, EDWARD ROBERT, D. D.: first Bishop of West Missouri; b. at Red Hook, N. Y., Jan. 18, 1840; graduated at Columbia College 1862, and at the General Theological Seminary 1864; ordained deacon 1864, and priest 1865. He served in the dioceses of New York, Vermont, and Ohio, and was consecrated Oct. 14, 1890. He has published sermons and addresses, and a tract on confirmation. W. S. P.

Atwood, GEORGE, F. R. S.: English mathematician; b. in London in 1746. He was a fellow of Trinity College, Cambridge, where he lectured on natural philosophy. He published a *Treatise on the Rectilinear Motion and Rotation of Bodies* (1784); a *Dissertation on the Construction of Arches* (1801), and other works. D. at Westminster, July, 1807.

Atwood, ISAAC M.: See the Appendix.

Atwood's Machine: a machine invented by George Atwood to demonstrate the laws of uniformly accelerated motion, and illustrate the relations of time, space, and motion in the case of a body falling under the action of gravitation. This machine is so constructed, by means of pulleys and wheels that turn with the least possible friction, that a weight (or falling body) suspended from one of the pulleys descends much more slowly than a body falling in free space, yet increases in velocity in the same ratio as when falling in the air. See FALLING BODIES.

Aubanel, ô'bañ-nel', JOSEPH MARIE JEAN BAPTISTE THÉODORE: Provençal orator and poet; b. at Avignon, Mar. 26, 1829; one of the most active of the group of men who have aimed to restore the Provençal tongue to its old-time literary dignity. In 1854 he was one of the seven persons who founded the Society of *Felibrige*, whose object has been the purification and renewal of the degraded dialects of Provence and Catalonia; and in March, 1876, when Mistral reorganized the society as an academy, with three grand divisions of its activity (Provence, Languedoc, and Catalonia), Aubanel was chosen majoral, and syndic for Provence. Under his guidance were founded almost all the schools of Felibres now in existence. Meanwhile he was publishing from time to time poems in the new Provençal tongue: *La Miougrano entraduberto* (1860); *La Perlo, vers* (1880); *La Ventoux, vers* (1882); *Lou Castelas, vers* (1883). He has published also a drama, *Lou Pan dcu peccat* (1883). Aubanel has been called "the French Petrarch."

A. R. MARSH.

Aube, ôb: a river of France; rises in Haute-Marne, flows northwestward through the department of Aube, passing Clairvaux, Bar-sur-Aube, and Arcis, and after a course of 140 miles enters the Seine about 24 miles below Troyes.

Aube: a department in the northeast part of France; formed of the southern portion of the province of Champagne and a small part of Burgundy (see map of France, ref. 4-G). It is bounded N. by the department of Marne, E. by Haute-Marne, S. by Côte-d'Or and Yonne, and W. by Seine-et-Marne. Area, 2,317 sq. miles. It is intersected by the rivers Seine and Aube. The surface is nearly level; the soil is fertile, especially in the southeast part, which produces grain, wine, etc. It has manufactures of cotton and woolen stuffs, hosiery, glass, and leather. It is divided into five arrondissements. Capital, Troyes. Pop. (1896) 251,435.

Auber, ô'ber, DANIEL FRANÇOIS ESPRIT: French composer; b. at Caen, Jan. 29, 1782. He was a pupil of Cherubini, and produced in 1813 *Le Séjour Militaire*, an opera which was not successful, but his comic opera called *La Bergère Châtelaine* (1820) was warmly applauded. In 1821 he composed *Emma*, an opera which was much admired. His works are remarkable for grace, originality, and ingenious combinations. The opera of *La Muette de Portici*, or *Masaniello* (1828), is called his masterpiece. He was elected a member of the Institute in 1829. Among his most popular operas are *Fra Diavolo* (1830); *Le Domino Noir* (1837); *Haydée* (1847); and *Manon Lescaut* (1856). He was director of the Paris Conservatory of Music (1842-1870) and chapel-master under Louis Philippe and Napoleon III. D. in Paris, May 12, 1871. See FÉTIS, *Biographie Universelle des Musiciens*; L. de Loménie, *Galerie des Contemporains*.

Au'berlen, KARL AUGUST, D. D.: German orthodox theologian; b. at Fellbach, in Württemberg, Nov. 19, 1824; educated at Tübingen; became professor at Basel 1851. D. at Basel, May 2, 1864. He is known to English readers through his able work *The Divine Revelation, an Essay in Defense of the Truth*, translated and published in Edinburgh, 1867.

Aubert, ô-bâr', JEAN LOUIS, Abbé: French poet and fabulist; b. in Paris in 1731. He edited a journal called *Les Petites Affiches*, and published in 1756 a collection of fables which gained a European reputation. They were highly commended by Voltaire, who wrote to Aubert, "You have placed yourself beside La Fontaine." He became Professor of French Literature in the Collège Royal, Paris, in 1773. D. in 1814.

Aubert du Bayet, JEAN BAPTISTE ANNIBAL: French general; b. in Louisiana, Aug. 29, 1759. He fought for the U. S. under Rochambeau, and was chosen in 1791 a member of the French Legislative Assembly, in which he supported the same principles as La Fayette. He commanded at the siege of Mentz, which was taken by the Prussians in 1793, and was Minister of War for several months in 1795. D. at Constantinople, where he was ambassador, Dec. 17, 1797.

Aubervilliers, ô-ber-vec'yā: a town in France; department of the Seine; 4 miles N. of Paris, and one of its suburbs (see map of France, ref. 3-F). Pop. (1881) 19,437; (1886) 22,223; (1896) 27,332.

Aubigné, Merle, d': See D'AUBIGNÉ, JEAN HENRI MERLE.

Aubigné, THÉODORE AGRIPPA, d' (dô-been-yā'): French Protestant historian and soldier, distinguished for his wit, learning, and audacity; b. in Saintonge, France, Feb. 8, 1550. He studied at St. Maury, Geneva, under Beza, and at an early age joined the Huguenot army, then waging a civil war against the court. He afterward entered the service of Henry of Navarre, whose favor he enjoyed. He fought for Henry against the Catholic League, and distinguished himself at the battle of Coutras (1587). His chief work is a history of his own times, entitled *Histoire Universelle, 1550-1601* (3 vols., Maillé, 1616-20). He left autobiographic memoirs, *Sa vie à ses enfants* (1557-1618), published under the title *Histoire secrète de T. A. d'Aubigné* (Amsterdam, 1731) and as *Memoires* (Paris, 1854; 2d ed. 1889). His complete works appeared in Paris, 1873-77, 4 vols; the 5th vol. promised. D. at Geneva, Apr. 29, 1630. His son Constantine was the father of Madame de Maintenon. See his biography by A. V. Salis (Heidelberg, 1885), and by G. Guizot (Paris, 1890). Revised by S. M. JACKSON.

Aubin, ô-bañ': a French town; department of Aveyron; 20 miles N. E. of Villefranche, in a mining region, with furnaces, etc. (see map of France, ref. 8-F). It contains a church of the twelfth century with remarkable sculpture, and has considerable trade in sheep, iron goods, etc. Pop. about 10,000.

Aublet, ô-blā, ALBERT: contemporary genre, history and portrait painter of the French school; b. in Paris; pupil of

Gérôme; first-class medal, Paris Exposition, 1889; Legion of Honor, 1890. His first notable work was *The Wash-room of the Reserves in the Cherbourg Barracks*, Salon of 1879. His best historical work is the *Meeting of Henri III. and the Duc de Guise*, Salon of 1880. W. A. C.

Auburu: on railroad; Lee co., Ala. (for location of county, see map of Alabama, ref. 5-E); 60 miles E. N. E. of Montgomery. It is the seat of the Alabama Agricultural and Mechanical College. Pop. (1870) 1,018; (1880) 1,161; (1890) 1,440; (1900) 1,447.

Auburn: city; on C. P. R. R.; capital of Placer co., Cal. (for location of county, see map of California, ref. 6-D); 33 miles N. E. of Sacramento and 126 miles from San Francisco. Auburn has the Sierra Normal College and a grammar school. Its principal industries are mining, fruit-raising, and general farming. It was founded as the county-seat in 1851. There are near the town very rich quartz and gravel mines, and many quartz-mills. Pop. (1870) 800; (1880) 1,229; (1890) 1,595; (1900) 2,050.

EDITOR OF "PLACER ARGUS."

Auburn: town (founded in 1836); capital of De Kalb co., Ind. (for location of county, see map of Indiana, ref. 2-G); on B. and D. R. R., Detroit div. of Wabash R. R., and the Jackson branch of the Lake Shore R. R.; 22 miles N. of Fort Wayne, Ind.; has 2 schools, 8 churches, a court-house, and jail; manufactures of buggies, church furniture, road-building machines, stoves, windmills, cigars, etc.; and has 2 wells of natural gas in use, besides 2 electric-light plants. Pop. (1880) 1,542; (1890) 2,415; (1900) 3,396.

EDITOR OF "COURIER."

Auburn: city on railroad; capital of Androscoggin co., Me. (for location of county, see map of Maine, ref. 9-B); 34 miles from Portland; on the Androscoggin and Little Androscoggin rivers, which furnish extensive water-power. It has manufactures of cotton and shoes. The shoe-product has greatly increased in recent years, and employs about 4,000 hands. The city has excellent public schools, is lighted by electricity, is growing rapidly, and many new industries are being introduced. Pop. (1870) 6,169; (1880) 9,555; (1890) 11,250; (1900) 12,951.

EDITOR OF "GAZETTE."

Auburn: city of Nebraska; capital of Nemaha County (for location of county, see map of Nebraska, ref. 11-H); on the Little Nemaha river; 65 miles by rail S. of Omaha and 72 miles S. E. of Lincoln; on the Missouri Pacific and Burlington and Missouri R. Rs. Has 7 churches, 3 newspapers, a public library, and several factories. Pop. (1890) 1,537; (1900) 2,664.

PUBLISHER OF "GRANGER."

Auburn: city and important railroad center; capital of Cayuga co., N. Y. (for location of county, see map of New York, ref. 4-F); 174 miles W. of Albany, and on both sides of the outlet of Owasco Lake, 2½ miles distant, which supplies its manufactures with water-power and is also the reservoir for the Auburn Water-works Company (the Holly system). Many of the private houses display an elegant style of architecture, and are adorned with beautiful gardens. Auburn has twenty-two churches, and is the seat of a theological seminary under the direction of the Presbyterians, which has recently added large new buildings and is largely endowed. This city was long the home of the late Hon. William H. Seward. A fine bronze statue of him was unveiled here Nov. 15, 1888. Here is a State insane asylum and a large stone State prison, noted for its system of discipline. The convicts, numbering 1,285, manufacture pearl buttons, furniture, stove-hardware, horse-collars, etc.

The city has manufactures of wool, cotton, iron, threshing-machines, agricultural implements, etc. Here are also very large manufactures of reapers, mowers, and binders. The census of 1890 showed 209 manufacturing establishments, with a capital of \$10,382,611, employing 6,001 persons, to whom wages were paid during the year amounting to \$2,472,574; value of product, \$9,064,093. Pop. (1880) 21,924; (1890) 25,858; (1900) 30,345. EDITOR OF "ADVERTISER."

Au'burndale: a part of the city of Newton, Middlesex co., Mass. (for location of county, see map of Massachusetts, ref. 2-H); on Charles river and B. and A. R. R.; 10 miles W. of Boston. It has two churches, and is the seat of Lasell Seminary. Pop. (1895) 2,816; (1900) not given separately.

Auburudale: village; Lucas co., O. (for location of county, see map of Ohio, ref. 1-E); on Mich. Cent. and Lake Shore and Mich. So. R. R. (Wagon Works station); near the west side of Toledo; wagon manufacturing is a thriving industry. Pop. (1890) 1,609; now (1900) a part of Toledo.

Auburu Theological Seminary: an institution founded in 1818 by the Presbyterian Synod of Geneva, and incorporated in 1820 under the name "The Trustees of the Theological Seminary of Auburn in the State of New York." A board of trustees has immediate control, but the trustees and the professors are appointed by a board of commissioners, which also exercises general control and has a concurrent vote in all appropriations of funds. The commissioners are elected by certain presbyteries, at present eighteen in number, each presbytery electing three.

The seminary occupies a group of handsome stone buildings on a large campus in the city of Auburn, and has an invested endowment of about \$570,000. There are ten professors. The total number of students (1900) is not far from 1,500. The theological position of the seminary is that of a strict, though tolerant, orthodoxy. W. J. BEECHER.

Aubusson, PIERRE, d' (dō'bū-soi'): grand-master of the order of St. John of Jerusalem; born of a noble French family in 1423. At an early age he joined the order, the headquarters of which was at Rhodes. He distinguished himself by his energy and courage in fighting against pirates, and was employed on important missions to several courts. In 1458 he formed a league between the Kings of France and Hungary against the Sultan Mahomet II. He was elected grand-master of his order in 1476, and fortified Rhodes as an advanced post for the defense of Christendom against the victorious Turks. The great aim and idea of his life was the formation of a league of Christian princes against the infidels. In May, 1480, Mahomet II. commenced the siege of Rhodes with an army of about 100,000 men. The Turks were repulsed in several desperate assaults, in which Aubusson was severely wounded, and they were forced to abandon the enterprise in July, 1480. In 1489 he was appointed a cardinal. In 1501 he was chosen general-in-chief of the armies of the German Emperor, the King of France, and the pope, who had formed a league against the Turks. His success was hindered by the jealousy and discord of these allies. D. July 13, 1503. He is regarded as one of the ablest Christian statesmen and commanders of his time. See Dominique Bouhours, *Histoire de Pierre d'Aubusson* (Paris, 1676; 3d ed. La Haye, 1739; Eng. trans. London, 1679). Revised by S. M. JACKSON.

Aubusson, dō'bū-soi': a town of France; department of Creuse; on the river Creuse; 22 miles S. E. of Guéret (see map of France, ref. 6-F). It has a celebrated manufactory of carpets. Velvets and woolen stuffs are also made here, as well as tapestries. Pop. about 7,000.

Auch, ōsh (anc. *Augusta Ausco'rum* or *Elimberis*): an old town of France; capital of the department of Gers; on the river Gers; 43 miles by rail S. of Agen (see map of France, ref. 8-E). In the time of Cæsar it was the capital of the Ausci or Auscii. It has a beautiful Gothic cathedral, an archbishop's palace, a royal college, a public library, a museum of natural science, and a town-hall. Here are manufactures of linens, cotton stuffs, leather, etc. Armagnac brandy is exported from this town, which was once the capital of Armagnac. Pop. (1881) 14,186; (1896) 14,838.

Auche'nia [from Gr. *αὐχὴν*, neck; in allusion to the length of their necks]: a genus of South American animals of the order *Ruminantia* and family *Camelidae*. The genus comprises the alpaca and the llama, and other species, all of which inhabit the mountain-ranges of the Andes. They are nearly allied to the camel, which they resemble in general form and in the structure of the stomach. They differ from the camel in having no hump; also in dentition, and in the more cloven feet and movable toes. Some naturalists think that the alpaca is not a distinct species, but a variety of the llama. See ALPACA.

Auchinleck, awch'-in-lek': Ayrshire village, 15 miles E. of Ayr (see map of Scotland, ref. 13-F); seat of the Boswell family. Sir Alexander Boswell, son of Johnson's biographer, established here in 1815 the Auchinleck Press for the printing of MSS. and rare works.

Auchmuty, awk'mōō-te, SAMUEL, D. D.: Episcopal clergyman; b. at Boston, Jan. 16, 1722; was graduated at Harvard in 1742. He was ordained to the diaconate in 1747 by the Bishop of London, and was appointed missionary of the Society for the Propagation of the Gospel in Foreign Parts; acting as assistant, and as catechist to the Negroes of Trinity parish, New York. In 1764 he succeeded Rev. Dr. Barclay as rector of Trinity. In 1766 he received the degree of D. D. from the University of Oxford, which honor was re-

peated by King's (now Columbia) College the following year. He adhered to the royalist party in the Revolution. D. in New York, Mar. 4, 1777. Revised by W. S. PERRY.

Auchmuty, Sir SAMUEL: British general; a son of the preceding; b. in New York, June 22, 1756, and graduated at King's (now Columbia) College in 1775. He fought against the U. S. in 1776-78, served many years in India, and in 1806 obtained command of an army sent to South America. He took the fortified city of Montevideo from the Spaniards in 1807, and captured Java from the Dutch in 1811. D. in Dublin, Aug. 11, 1822.

Auck'land: a seaport-town; former capital of the British colony of New Zealand; situated on the northeast coast of the island of New Ulster or northern island of New Zealand; lat. 36° 50' S., lon. 174° 50' E. (see map of World, ref. 7-D). It has two fine harbors and considerable trade. It is connected by steamships with Sydney, Melbourne, Honolulu, and San Francisco. It is the see of an Anglican bishop, and has four banks, several newspapers, and many fine buildings. The mean temperature of the coldest month is about 50° F., and that of the warmest about 68°. Auekland was founded in 1840. Pop. (1891) 28,773; (1896) with suburbs, 41,758.

Auckland, GEORGE EDEN, Earl of: an English peer; b. at Eden Farm, Beckenham, Kent, Aug. 25, 1784; inherited the title of baron at the death of his father in 1814. He acted with the Whigs, became President of the Board of Trade in 1830, First Lord of the Admiralty in 1834, and Governor-General of India in 1835. He was created Earl of Auckland in 1839, and returned to England in 1841. He died without issue at the Grange, near Alresford, Hampshire, Jan. 1, 1849.

Auckland, WILLIAM EDEN, Lord: an English diplomatist and lawyer: was born in Windlestone Hall, Durham, Apr. 3, 1744. He was one of the three commissioners appointed in 1778 to negotiate with the revolutionists in the U. S. Having been sent as ambassador to France in 1785, he negotiated a commercial treaty with that nation. He published *Principles of Penal Law* (1772) and other works. In 1793 he received the title of baron. D. at Eden Farm, Beckenham, Kent, May 28, 1814. See his *Journals and Correspondence*, ed. by his son, 4 vols., London, 1860-62.

Auckland Islands: a group of islands of volcanic origin; discovered in 1806 by the British in the South Pacific, about 180 miles S. of New Zealand (see map of World, ref. 7-D). The largest island is about 30 miles long and 15 miles wide, and has two good harbors. This group is valuable as a whaling-station.

Auc'tion [Lat. *auctio*, increase, sale by increase of bids, from *auge're*, increase]: in law, the act of exposing property for sale by open competition to the highest bidder by a person called an auctioneer. Every bid is deemed to be an offer, which is accepted by the auctioneer when his hammer falls. On general principles of the law of contracts, the offer may be withdrawn by the bidder at any time before acceptance. The acceptance of a higher offer is the rejection of the lower one. Such a sale must be fairly conducted by both seller and buyer. The secret employment of "puffers" or fictitious bidders by the owner to unduly enhance the price is a fraud on the purchaser, who may avoid such a sale. The same rule applies to secret agreements between purchasers to stifle competition. Such sales frequently take place under conditions made known at the time of sale. These must be followed by the party to whom they are applicable. An auctioneer is to some extent an agent for both parties—as, for example, to sign on their behalf a written memorandum of sales, where that is required by law. The conduct of auctioneers is sometimes regulated by statute. In what is known as a *Dutch auction*, the auctioneer starts with a high price and comes down till he meets with a bidder.

Audæus, or **Audius** (in Syriae *U'do*): the founder of a religious sect called Audians; was a native of Mesopotamia. He was banished to Scythia in 338 A. D., and died about 370 A. D. He incurred the enmity of the clergy by censuring their luxuries and vices. The Audians are accused of professing anthropomorphism.

Aude, *ōd*: a maritime department in the S. of France: bounded N. by the departments of Tarn and Hérault, E. by the Mediterranean, S. by the Pyrénées-Orientales, W. by Ariège and Haute-Garonne, and has an area of 2,437 sq. miles. It was formerly part of the province of Languedoc. The surface is partly mountainous, being near the foot of the Pyrenees; the soil of the valleys is fertile and calcare-

ous. It is intersected by the river Aude and the canal of Languedoc (or Canal du Midi). Among the mineral resources of Aude are iron, coal, and marble. The staple productions are grain, olives, wine, and fruits. It has manufactures of silk and woollens, etc. Capital, Carcassonne. Pop. (1891) 317,372; (1896) 310,513.

Audebert, *ōd'bār'*, JEAN BAPTISTE: an eminent French artist and naturalist; b. at Rochefort in 1759. He first acquired distinction as a miniature-painter, and subsequently applied himself to natural history, the love of which became his ruling passion. He published in 1800 a *Natural History of Apes, Lemurs, and Galeopithecæ*, with sixty-two admirably colored plates, printed in oil-colors by a new method which he invented. He was the first to use gold-leaf in illustrating the plumage of birds. His splendidly illustrated *History of Humming-birds, Flycatchers, Jacamars, etc.*, appeared in 1802. He died in Paris, Dec. 5, 1800.

Audenarde, *ō'den-aard'*, or **Oudenarde**, *ow'den-aard'*: a town of Belgium; in East Flanders; on the Scheldt; 14 miles S. S. W. of Ghent. It has a fine Gothic town-hall (see map of Holland and Belgium, ref. 10-C). Pop. 5,000. Here Prince Eugène defeated the French army in July, 1708.

Audiffret-Pasquier, *ō'dēe-fray-pās'kēe-āy*, EDMÉ ARMAND GASTON, *Duc d'*: French politician; b. at Paris, Oct. 23, 1823; elected to the National Assembly, Feb. 8, 1871, where he soon acquired a strong position. He was the first person elected life senator by the Assembly. In 1876 he was elected president of the Senate, which office he held until Jan., 1879. Elected member of the French Academy in 1878. C. H. T.

Au'diphone [malconstructed of Lat. *audi're*, hear + *φωνή*, tone]: an instrument for the deaf; is shaped like a large fan, and made of a sheet of vulcanized rubber about $\frac{1}{2}$ of an inch thick, fastened to a handle of the same substance. This sheet is curved at the farther end, when used, by pulling a cord which is put through holes in the upper edge, and passes along the inner side of the sheet into a slot in the handle. The curve required is very small, but the more deaf the person using the instrument the tighter must the rubber be drawn. When in use the straight or lower end of the sheet is kept in contact with the upper jaw-teeth, and any sound striking against the rubber sheet is communicated to the nerve of the ear through the teeth and bones of the head, so that ordinary conversation can be heard. The same result is produced in the case of artificial teeth if well fitted.

Au'ditor [from Lat. *audi're*, hear]: a person whose duty it is to examine and pass upon the accounts of those who have been intrusted with money, or to examine a particular account and certify the result. Most public and private corporations have such officers. An auditor is appointed by courts in the course of some actions to examine and state accounts, and report them to the court for further proceedings. The U. S. Treasury has six auditors who have charge of the accounts of (1) the civil service, customs, judiciary, etc.; (2) Indian affairs, etc.; (3) quartermaster-general, etc.; (4) navy; (5) internal revenue, State Department, and Patent-Office; and (6) the Post-Office.

Au'ditory Nerve [*auditory* is from Lat. *audito'rius*, pertaining to hearing; *audi're*, hear]: the special nerve of hearing, sometimes called the *acoustic* nerve. It is the seventh nerve rising from the base of the brain, and lies in close association with the facial nerve, or the nerve supplying the muscles of the face. It originates in the nucleus lying on the floor of the fourth ventricle of the brain, and it makes its exit from the skull through the internal auditory meatus, where it enters into the petrous portion of the temporal bone, and is divided into fine filaments, supplying the vestibule and cochlea of the ear. See EAR and ACOUSTICS.

Audley, Sir JAMES: follower of the Black Prince, and one of the original knights of the order of the Garter; displayed such courage in the battle of Poitiers in 1356, in which he was wounded, that the Black Prince immediately retained him as his own knight, and later appointed him Governor of Aquitaine. D. at Fontenay-le-Comte in 1369.

Audley, THOMAS, LORD AUDLEY OF WALDEN: an English lawyer; b. in Essex in 1488. He became Speaker of the House of Commons in 1529, Keeper of the Great Seal in 1532, and Lord Chancellor of England in 1533. He presided at the trial of Sir Thomas More. According to some authorities, he disgraced himself by his subservience to the arbitrary

will of Henry VIII. D. in London, Apr. 30, 1544. See Lord Campbell, *Lives of the Lord Chancellors*.

Audouin, ô'doō-an', JEAN VICTOR: an eminent French naturalist and comparative anatomist; b. in Paris, Apr. 27, 1797. He was one of the founders of the *Annales des Sciences Naturelles*, first issued in 1824, and co-operated with Milne-Edwards in researches into the *Crustacea* and *Annelida*. He succeeded Latreille as Professor of Entomology at the Museum in 1833, and was chosen a member of the Institute in 1838. Among his works is a *History of the Insects which Infest the Vine* (1840-43). D. in Paris, Nov. 9, 1841.

Audran, ô'dran, EDMOND: opera-composer; b. at Lyons, France, Apr. 11, 1842; educated at the École Niedermeyer, Paris; in 1861 organist of St. Joseph church, Marseilles; composed overtures, marches, masses, and motets, but achieved his greatest fame as a composer of light operas, which are almost as well known in England and the U. S. as in France. His best as well as best-known works are *Olivette* (Paris, 1879; London, 1880); *The Mascot* (Paris, 1880; London, 1881); and *Gillette de Narbonne* (Paris, 1882; London, 1883). D. E. HERVEY.

Audran, GÉRARD: a French engraver of the first order; b. at Lyons, Aug. 2, 1640. He studied under Carlo Maratti at Rome for several years, and returned to Paris about 1670. Having been appointed engraver to the king, he engraved for him the masterpieces of Le Brun, *The Battles of Alexander*. Among his works are two cartoons of Raphael, representing the *Death of Ananias* and *Paul and Barnabas at Lystra*, and *Coriolanus*, after Poussin. D. in Paris, July 26, 1703. (See Strutt, *Dictionary of Engravers*.)—Others of the Audran family attained eminence as engravers: as Benoît (1661-1721); Claude père (1592-1677); Claude fils (1640-84); Germain (1631-1710); and Jean (1667-1756).

Audubon: railroad junction: capital of Audubon co., Ia. (see map of Iowa, ref. 5-E, for location of county); is in Le Roy township; a stock-raising and farming region. Pop. (1880) 792; (1885) 1,152; (1890) 1,310; (1900) 1,866.

Audubon, JOHN JAMES: naturalist; b. near New Orleans, La., May 4, 1780. He was the son of an opulent French naval officer who owned a plantation in the then French colony. In his childhood he became deeply interested in the study of birds and their habits. He was educated partly in Paris, whither he was sent about 1794, and he studied design under David, the eminent painter. He returned to the U. S. about 1798, and settled on a farm which his father gave him, on the Perkiomen creek, in Eastern Pennsylvania. Here he found time and opportunity for his favorite study. He married Lucy Bakewell in 1808, sold his farm, and became a merchant at Louisville, Ky. About 1810 he began to make extensive excursions through the primeval forests of the Southern and Southwestern States, in the exploration of which he passed many years. He made colored drawings of all the species of birds that he found. He resided with his wife and children for several years at Hendersonville, on the Ohio river. In 1824 he visited Philadelphia, where he met Charles Lucien Bonaparte, who encouraged him to publish a work on ornithology. Before this date he is said to have failed in trade and been reduced to poverty, and to have successively followed the occupation of portrait-painter and dancing-master. He went to England in 1826, and commenced in London the publication of his great work, for which he obtained a large number of subscribers at \$1,000 a copy. This admirable work was entitled *The Birds of America* (10 vols. folio, 1830-39), and was illustrated with 448 beautiful colored plates of 1,065 species of birds, of the natural size. The work is divided into five volumes of letterpress, and five of engravings designed by the author. This was pronounced by Cuvier "the most magnificent monument that art ever raised to ornithology." Audubon returned to America in 1829, and again explored the forests, lakes, and coasts from Canada to Florida to collect materials for another work. This was his *Ornithological Biography, or an Account of the Habits of the Birds of the United States, etc.* (Edinburgh, 5 vols., 1831-39). He revisited England in 1831, and returned home in 1839, after which he resided at Minniesland, now called "Audubon Park," on the Hudson river, now part of the city of New York. He published a cheaper edition of his *Birds of America* (7 vols. 8vo, 1844), and was associated with Dr. Bachman in the preparation of a work on *The Quadrupeds of North America*, with plates (6 vols., 1846-50), the drawings of

which were made by his sons, Victor Gifford and John Woodhouse Audubon. He died in New York city, Jan. 27, 1851. See *Life and Adventures of John J. Audubon*, edited, from materials supplied by his widow, by Robert Buchanan (New York, 1867-69).

Auenbrugger (ow'en-bröoch'-ger) von Au'enbrug', LEOPOLD (called AVENBRUGGER by the French): a German physician who introduced percussion of the chest as a means of diagnosis; b. at Gratz, in Styria, Nov. 19, 1722. He studied at Vienna, and practiced there. He announced his discovery in a work called *Inventum novum ex Percussione Thoracis Humani* (New Discovery by the Percussion of the Human Chest, 1761). D. in Vienna, May 17, 1809.

Auer, ow'er, ALOIS: b. in Wels, Austria, May 11, 1813; learned the printer's trade; occupied himself with the study of languages; 1841 appointed director of the state printing establishment in Vienna; discovered spontaneous impression, or nature-printing, in photography, and invented several presses. Author of *Discovery of Spontaneous Impression* (1854); *History of the Vienna State Printing Establishment* (1851); issued the Lord's Prayer in 603 languages in Roman type (1844); and the same in 200 languages with the national alphabets (1847). D. in Heitzing, near Vienna, July 10, 1869. C. H. T.

Auer, JOHN GOTTLIEB, D. D.: second missionary bishop of Cape Palmas and parts adjacent, on the west coast of Africa; b. at Neubulach, in Württemberg, Nov. 18, 1832. After studying several years at the mission school at Basel, Switzerland, he became (1858) a missionary at Akrapong, among the Akrapim Mountains, in Africa. In 1862 he connected himself with the American Episcopal mission at Cape Palmas, and was ordained deacon and priest on Apr. 20, 1862, by Bishop John Payne, whom he succeeded Apr. 17, 1873. D. at Cavalla, in Africa, Feb. 16, 1874.

W. S. PERRY.

Auerbach, ow'er-baach, BERTHOLD: German author; very popular during his lifetime; b. at Nordstetten in the Black Forest, Württemberg, Feb. 28, 1812. He was intended for the synagogue, and was educated at Carlsruhe, Tübingen, Heidelberg, and Munich universities, but at eighteen announced his intention of devoting himself to literature. His earliest work was *Judaism and Modern Literature*, but his merit was not recognized until he issued his *Village Tales of the Black Forest*. During the Franco-Prussian war he was correspondent for one of the Berlin papers. Among his novels are *Baarfüssle*, *Edelweiss*, *On the Heights*, *Joseph in the Snow*, and *Waldfried* (1874). *The Professor's Lady* is perhaps his most characteristic work. In all his writings the influence of Spinoza can be traced, whose works he translated into German. D. at Cannes, Feb. 8, 1882.

Auersperg, ow'ers-perkh, Prince ADOLPH WILHELM DANIEL: b. July 21, 1821; a son of Prince Wilhelm Auersperg and brother to Prince Carlos; entered the army very early, and was a major in Prince Eugene's dragoons when he left the military service in 1870. In 1867 he was elected a member of the Bohemian Diet, and in the same year was appointed president of the assembly on the resignation of Count Hartig. In 1868 he was elected a member for life of the upper chamber of the Austrian Reichstag, and in 1870 was made governor of Salzburg. Finally he succeeded Count Beust as president of the Austrian ministry, Nov. 25, 1871. Like his brother, who at an earlier date was president of the Cisleithan ministry, he represented the German interest in Austria, and supported the present organization of the empire, established by Benst, and comprising an Austrian division, in which the German element predominates, and a Hungarian, in which the Magyars rule. In 1879 he became president of the highest chamber of accounts. D. in his castle, Goldegg, near Vienna, Jan. 5, 1885.

Auersperg, ANTON ALEXANDER, Count von: a German poet whose *nom de plume* was ANASTASIUS GRÜN; b. at Laybach, April 11, 1806. He displayed much wit and humor in a poem called *Spaziergänge eines Wiener Poeten* (Promenades of a Poet of Vienna, 1831). Published a volume of poems (*Gedichte*, 1838), which must be considered the principal work of his life. An ardent promoter of liberal ideas in feudal Austria, he died at Graz, Sept. 12, 1876. Revised by JULIUS GOEBEL.

Auersperg, Prince CARLOS WILHELM: an Austrian statesman; b. May 1, 1814. In 1867-68 he was president of the

Cisleithan ministry. He was a member of the Reichstag, of which he was president, and of the Bohemian Diet, where he acted with the German party. D. in Prague, Jan. 4, 1890.

Auerstädt, ow'er-stet: a village of Prussian Saxony, 10 miles W. of Naumburg (see map of German Empire, ref. 5-F), noted as the scene of an important victory gained by the French general Davoust over the Prussians, commanded by the Duke of Brunswick, Oct. 14, 1806, which was also the date of the battle of Jena.

Au'fidus: the name of an ancient river in Italy, near the mouth of which was fought the great battle of Cannæ, 216 B. C. See OFANTO.

Aufrecht, ow'frect, THEODOR: Orientalist; b. at Leschnitz, Upper Silesia, Jan. 7, 1822; became Professor of Sanskrit at Edinburgh 1862, at Bonn 1875; retired to live at Heidelberg 1889. He published at Berlin, 1861-63, the *Hymns of the Rig-Veda* (see SANSKRIT LITERATURE), the first complete edition of this great monument (Max Müller's, begun in 1849, was finished in 1874). Besides many other important works, Aufrecht published a catalogue of the Sanskrit MSS. in the Bodleian Library (Oxford, 1864), and *Catalogus Catalogorum, an Alphabetical Register of Sanskrit Works and Authors* (Leipzig, 1891). C. R. LANMAN.

Au'geas (in Gr. *Αὔγέας* or *Αὐγέας*): a mythical King of Elis, who is said to have owned 3,000 oxen. One of the twelve labors imposed on Hercules by Eurystheus was to cleanse in one day the Augean stables, in which the dung of these oxen had accumulated for many years. Hercules turned the river Menios or Alpheus through the stables, and killed Augeas because he refused to pay his wages, which was one-third part of the herd.

Augereau, ô'zher-ô', PIERRE FRANÇOIS CHARLES (DUC DE CASTIGLIONE): a French marshal; b. in Paris, Nov. 11, 1757; became a fencing-master at Naples before the Revolution; enlisted as a private in the French army in 1792, and gained the rank of general of division in 1796. In 1796 he contributed to the victories of Lodi, Castiglione, and Arcola. He enforced the will of the majority of the Directory in the *coup d'état* of the 18th Fructidor of the year 5 (Sept. 4, 1797), and was chosen a member of the Council of Five Hundred in 1799. He became a marshal of France in 1804, Duke of Castiglione in 1805, served with distinction at Jena in 1806, and was wounded at Eylau in 1807. In 1813 he displayed intrepid courage at Leipzig. He transferred his allegiance to Louis XVIII. in 1814. D. in La Houssaye, June 12, 1816.

Au'gian Co'dex: a defective uncial manuscript of the Pauline Epistles; was found in the monastery of Augia Dives or Major, at Reichenau, Lake Constance, Switzerland; was purchased by Dr. Bentley in 1718, and is now in Trinity College, Cambridge. It is known as F in the list of uncials of the N. T., has the Latin Vulgate in parallel columns to the Greek, and dates from the ninth century. Scrivener issued a transcript of it, Cambridge, 1859. See F. H. A. Scrivener's *Introduction*, pp. 167-69; C. R. Gregory, *Prolegomena*, pp. 424-26.

Augier, ô'zheë-ay', GUILLAUME VICTOR ÉMILE: French dramatist; b. at Valence, Sept. 17, 1820; has contributed a great number of pieces to the modern French stage. His first success was *La Ciguë*, represented at the Odéon in 1844. In 1848 his play *L'Aventurière*, after the manner of the Romantic school, was acted with great success, and is still by many considered his masterpiece. In 1849 *Gabrielle* was not merely a great success upon the stage, but also obtained from the French Academy the Montyon prize because of its moral tendency. Other plays by Augier are *Le Gendre de M. Poirier*, written with M. J. Sandeau in 1855; *Maître Guérin* (1864); *Paul Forestier* (1868); *Jean de Thommeray* (1873); *Madame Caverlet* (1876); *Les Fourchambault* (1875). Augier became a member of the French Academy in 1857. He is the chief representative of the school of French dramatists which, succeeding the Romanticists, gave up the extravagances of these, though not striving for the complete realism of the moderns. Thus his dramas have generally a moral or political tendency. D. at Croissy, Oct. 25, 1889. A. R. MARSH.

Au'gite [from Gr. *ἀγίτης*, name of a stone; *ἀγλή*, luster]: a crystalline mineral sometimes called **Pyroxene**, is nearly allied to hornblende. It often occurs in volcanic rocks, is composed of silica, lime, and magnesia, and is usually of a greenish color. It crystallizes in six or eight sided prisms

variously modified, and is an essential component of basalt, dolerite, and augite porphyry.

Augs'burg (anc. *Augusta Vindelicorum*): an ancient and important city of Germany, in Bavaria; capital of the province of Swabia and Neuburg; is situated on the river Lech, at the mouth of the Wertach, 39 miles by rail W. N. W. of Munich; lat. 48° 21' 42" N., lon. 10° 54' 16" E. (see map of German Empire, ref. 7-E). Several railways extend from it toward the four cardinal points, and connect it with Munich, Nuremberg, etc. The Roman Emperor Augustus planted a colony here in 12 B. C. It became a free imperial city in 1276, after which it was an important commercial emporium. This city was also one of the chief centers of German art, and the native place of Holbein. It was also the native place of the Fugger family, at one time the richest family in Europe. Some decline in its prosperity occurred after 1500, but it still has an extensive trade and many large manufactories of cotton, silk, machinery, and paper. Augsburg is one of the principal money-markets of the Continent, and owes much of its importance to its banking business and operations in stocks. The *Allgemeine Zeitung*, issued in Augsburg, is one of the most celebrated and widely circulated journals of Germany. Pop. (1895) 80,798, one-third Protestant.

Augsburg Confession: the first Protestant Confession of Faith; presented to the Emperor Charles V. at the Diet of Augsburg, June 25, 1530. When the Elector John of Saxony was summoned to the Diet, he requested the Wittenberg theologians, Luther, Melancthon, Jonas, and Bugenhagen, to prepare a paper setting forth the complaints to be made concerning abuses in the Church. This was done by them with considerable haste in the memoranda known as the Torgau Articles, from the name of the place where the last notes were made. Portions of these memoranda were elaborated with great care. Other portions consist simply of disjointed words and phrases, intended to suggest the thought to the composer. These articles may be found in English in the *Book of Concord*, Jacobs, Philadelphia, 1883, vol. ii., pp. 75-98.

Luther having been left at Coburg, Melancthon accompanied the Elector of Saxony to Augsburg as his chief theological adviser. As they reached Augsburg on May 2, and the emperor delayed appearing until June 15, abundant time was given by Melancthon, in consultation with Jonas, Regius, Osiander, Brenz, and other theologians, and the princes and representatives of the states and free cities, to formulate the confession. A pamphlet of Dr. Eck having been found in circulation, charging the Lutherans with some of the gravest heresies that had ever appeared, and confounding their doctrines with those of the Reformed and Anabaptists, rendered it necessary for Melancthon to formulate an explicit and complete statement of the doctrines taught by the Lutherans. The Confession therefore consists of two parts. The Articles on Abuses, prepared on the basis of the Torgau Articles, constitute about two-thirds of the Confession. To this were prefaced twenty-one doctrinal articles. Of these the last two are based on the Torgau Articles, and the other articles principally upon the Marburg Articles, revised at Schwabach in Oct., 1529. These articles may also be found in English in the volume above mentioned, pp. 69-74. During the preparation of the Confession it was repeatedly submitted in rough drafts to Luther and approved by him, and discussed sentence by sentence before the princes and theologians. The introduction was written by the Saxon Chancellor Brück. It was read in German before the emperor, and given to him in both German and Latin. Both of the originals soon disappeared. As, during the preparation, numerous transcripts had been made, and unauthorized editions at once appeared, Melancthon prepared an edition in both German and Latin, which was printed even before the adjournment of the Diet, but not issued until the following year. Melancthon afterward undertook in editions published in 1540 and 1542 to make radical changes in the interests of Church union upon a less definite doctrinal basis. These editions are known as those of the *Variata*, in distinction from the *editio princeps* of 1531, known as *Invariata*. The latter alone has symbolic authority in the Lutheran Church, the former being only an interesting private document, and, with the exception of the parts intended to affect the terms of confessional obligations, an important exposition and defense of the original document. Dr. Schaff has given a correct estimate of it: "It best exhibits the prevail-

ing genius of the German Reformation, and will ever be cherished as one of the noblest monuments of faith from the pentecostal period of Protestantism." It formed the basis not only of ecclesiastical but also of political guarantees, the Reformed, until the Peace of Westphalia (1648), enjoying toleranee in Germany, according to the terms of the Peace of Augsburg (1555), only because of a certain degree of agreement with the Augsburg Confession. The efforts of Henry VIII. of England, from 1535 on, to enter the Smalcald League were met by the Lutheran princes with the presentation of the Augsburg Confession and its Apology for adoption as the necessary ecclesiastical preliminary for civil negotiations. This led to protracted conferences concerning the Augsburg Confession and discussions of its articles, in connection with which English theologians (Fox, Heth, and Barnes) were sent to Wittenberg, and Lutheran theologians (Myconius, etc.) were sent to England. The Thirty-nine Articles, and the various confessions framed after them, have their historical origin in these negotiations. (See Jacobs, *The Lutheran Movement in England*, Philadelphia, 1891.) The earliest translation of the Augsburg Confession into English was made by Richard Taverner, the translator of the Bible, in 1536; republished in Philadelphia, 1888. The most recent is the thorough revision, on the basis of Taverner, prepared for the Common Service for English-speaking Lutherans, and published first in the *Church Book of the General Council*, Philadelphia, 1891.

LITERATURE.—In English: Krauth, *Augsburg Confession, with Notes* (1868); *The Conservative Reformation and its Theology* (1871); *A Chronicle of the Augsburg Confession* (1878); Jacobs, *The Book of Concord, with Historical Introductions*, etc. (1882-83); Schaff, *Creeeds of Christendom*, vol. iii. (1877); B. M. Schmucker, *English Translations of the Augsburg Confession* (1887). In German: G. L. Plitt, *Einleitung in die Augustana* (1867); O. Zöckler, *Die Augsburgische Konfession als Symbolische Lehrgründe* (1870); A. W. Vilmar, *Die Augsburgische Konfession erklärt* (1870). Among the earlier commentators, Carpzov, *Isagoge in Libros Symbolicos*, will be found most satisfactory.

HENRY E. JACOBS.

Au'gur: among the ancient Romans, a soothsayer, a diviner, a person who professed to foretell events by the flight of birds or other omens. The augurs were supposed to be capable of interpreting the will of the gods, and divinely gifted with special qualifications for this service. Their office was considered as very important in the state, no public enterprise being undertaken unless they declared the omens favorable. Their divinations were called auguries or auspices, the latter of which terms, though properly applied to the inspection of the flight of birds, was extended by the Roman writers to other signs. In the earliest period of Roman history the number of augurs was only two, one from each of the tribes, Ramnes and Tities; in 300 B. C., when the Ogulnian law was passed, there were four, who must be patricians. The law rendered the plebeians eligible to the office of augur, and increased the number to nine. Sulla increased the number to fifteen; Julius Cæsar appointed a sixteenth, but after him the college remained at fifteen. The augurs held office for life, and had the power of filling vacancies that occurred in their college.

Revised by S. M. JACKSON.

Augur, CHRISTOPHER COLON: soldier; b. 1821 in New York; graduated at West Point in 1843; in infantry till Mar. 4, 1869, when he became brigadier-general U. S. army. He served chiefly at frontier posts 1843-61, in the military occupation of Texas 1845-46, in the war with Mexico 1846-48, engaged at Palo Alto, Resaca de la Palma, and as aide-de-camp to Brig.-Gens. Hopping and Cushing, scouting and on expeditions against Northern Pacific Indians 1855-56, engaged in several skirmishes, and as commandant of cadets at Military Academy 1861. In the civil war became, Aug. 9, 1862, major-general U. S. Vols., and served in the defenses of Washington 1861-62, in operations on Rappahannock and in the Shenandoah valley 1862, in command of a division in the Fifth Corps 1862, engaged at Cedar Mountain (severely wounded and brevet colonel), in Gen. Banks's expedition to New Orleans 1862; in command of the district of Baton Rouge 1863, in expedition to Port Hudson 1863 (brevet brigadier-general), engaged in action and siege of the place; in command of department of Washington 1863-66, of the Platte 1867-71, and of Texas from 1871. Brevet major-general Mar. 13, 1865, for gallant and meritorious services in the field. Retired July 10, 1885. D. Jan. 16, 1898.

Augur, HEZEKIAH: sculptor; b. at New Haven, Conn., Feb. 21, 1791; was also noted for mechanical ingenuity. He invented a carving-machine which is in general use, and as sculptor produced *Jephthah and his Daughter*. D. at New Haven, Jan. 10, 1858.

August [Lat. *Augustus*; in Fr. *août*]: the eighth month of the year, so named in honor of Augustus Cæsar. Before his time it was called *Sextilis*—that is, the sixth month, because the Roman year once began on the 1st of March. In the calendar of Julius Cæsar the first, third, fifth, seventh, ninth, and eleventh months consisted each of thirty-one days, and each of the other months of thirty, except February, which in common years had twenty-nine, and in leap-year thirty days. To gratify the vanity of Augustus, one day was taken from February and added to August.

Augusta: a seaport of Sicily. See AGOSTA.

Augusta: city and important railroad and commercial center; county-seat of Richmond co., Ga. (for location of county, see map of Georgia, ref. 3-J); the third city in size in the State; situated on the left bank of the Savannah river, 231 miles from its mouth, 120 N. N. W. of Savannah, and 136 N. W. of Charleston. It is at the head of steamboat navigation on the Savannah. Lat. 33° 28' N., lon. 81° 54' W. From its position it is actively engaged in the cotton-trade, receiving annually about 200,000 bales from a considerable portion of Georgia and South Carolina. Augusta also furnishes a good market for the general produce of its region. For many years it was the center of the wagon-traffic, sending out goods in all directions in the great lumbering wagons of that time, and receiving cotton and produce in return. After the railroads began to break up this trade the city declined for a time, but soon regained its trade, and is now enterprising and prosperous. The Augusta canal brings the waters of the Savannah river from above the city at such an elevation as to give a head of water-power of 33 feet.

Manufactures.—Augusta is one of the largest manufacturing centers of the South. The census of 1890 showed 417 manufactories; capital, \$7,075,996; average number of hands employed, 5,861; wages paid during the year, \$1,886,807; value of products, \$8,631,888. The city has now cotton-mills alone valued at nearly \$6,000,000, besides the Graniteville and Langley cotton-mills (across the river in South Carolina), which are practically a part of its manufacturing system. These cotton-factories employ 4,500 hands; pay \$1,000,000 in annual wages; operate 5,419 looms and 213,114 spindles, which spin annually 80,000 bales of cotton into 85,000,000 yards of cloth and 3,000,000 lb. of yarn, worth in the aggregate over \$6,000,000. These factory-buildings are very handsome, two of them being worth over \$1,000,000 each. Here are also extensive manufactures of fertilizers, flour, iron, lumber, ice, cotton-seed oil, tobacco, etc.

Education, etc.—Augusta has a medical school, the Medical College of Georgia, founded in 1830, a department of the State University at Athens. It has also an incorporated academy called the Richmond Academy, the Paine Institute, a private normal school, 3 high schools (one for colored pupils), and numerous grammar, intermediate, and primary schools. The city has 2 hospitals connected with the medical college, a Masonic hall, the Augusta Orphan Asylum, richly endowed, 2 Roman Catholic orphan asylums, a widows' home, and other charitable institutions.

Public Buildings and Monuments.—Among the principal are the city-hall, Odd Fellows' hall, the Masonic hall, Richmond Academy, the medical college, the opera-house, Independence and Confederate monuments, and several of the churches.

Streets, Avenues, etc.—These are spacious and elegant. The principal streets, Broad and Greene, have double rows of wide-spreading trees on each side of the commodious highways. Broad Street is paved with asphalt, and is 120 feet wide. The residences on lower Broad and Greene and other streets are tasteful and elegant. The streets cross each other at right angles. There is a well-regulated police force. The city cemetery, the Park, and the Augusta Exposition grounds near the city, are laid out in fine walks and drives, and are favorite places of resort. There is a horse-railroad from the city to Summerville, a beautiful suburb, which is one of the most noted resorts in the South for winter tourists and invalids. Water is supplied to the city from the Augusta canal, which has been enlarged and its power greatly increased. Augusta is lighted with electric lights. Pop. (1880) 21,891; (1890) 33,300 (a police census taken immediately afterward showed several thousand more); (1900) 39,441.

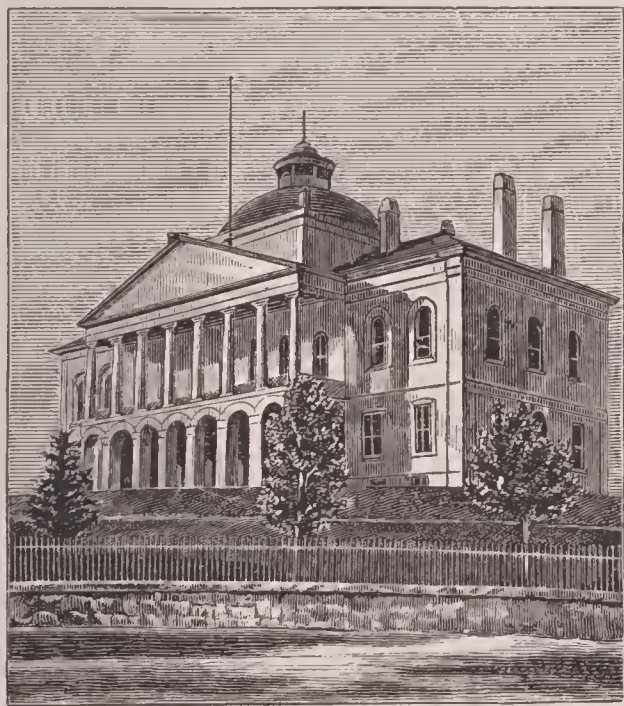
History.—Augusta was settled by English colonists under Oglethorpe, and laid out in 1735 under royal charter, and was named in honor of an English princess. It was again chartered in Jan., 1798, and incorporated as a city in Dec., 1817. It was for many years the most important inland town of the colony. It had acquired a considerable trade at the commencement of the Revolutionary war, but in the beginning of 1779 was captured by the British and loyalists, who held possession of it till the spring of 1781, when the British force there was commanded by a loyalist named Brown. On May 23, 1781, an American force under command of Gen. Henry Lee ("Light Horse Harry") laid siege to it, and on June 5 Brown surrendered. The Americans lost 51 killed and wounded; the British lost 52 killed, and 334, including the wounded, were taken prisoners. Augusta was the capital of Georgia for a number of years after the Revolutionary war. During the war of 1812 or the Indian wars it was not molested. In the civil war it was garrisoned by the Confederate troops, and twice threatened by Sherman—in his march to the sea, when he passed between it and Macon; and in his march through the Carolinas, when he made feints against both Augusta and Charleston—but it was not visited by a hostile force. PRESIDENT OF "THE CHRONICLE."

Augusta: town (founded in 1830); on C., B. and Q. R. R.; Hancock co., Ill. (for location of county, see map of Illinois, ref. 5-B); 37 miles N. E. of Quincy; has public schools and 3 churches. Its principal industries are stock-raising, farming, coal-mining, and flouring. Fine potter's clay and mineral paint are produced. Pop. (1880) 1,015; (1890) 1,077; (1900) 1,149. EDITOR OF "EAGLE."

Augusta: city; Butler co., Kan. (for location of county, see map of Kansas, ref. 7-H); 150 miles S. W. of Topeka, the State capital; is in a wheat-growing district. Pop. (1880) 922; (1890) 1,343; (1900) 1,197.

Augusta: city; Bracken co., Ky. (for location of county, see map of Kentucky, ref. 2-I); on railroad and on the Ohio river, 45 miles above Cincinnati; has 2 public schools, 2 private schools, a flouring-mill, a saw and planing mill, a harness-supply factory, 23 leaf-tobacco warehouses, and 2 newspapers. Pop. (1870) 960; (1880) 1,282; (1890) 1,447; (1900) 1,718. EDITOR OF "CHRONICLE."

Augusta: city; capital of the State of Maine, and seat of justice of Kennebec co. (for location of county, see map of Maine, ref. 9-C); on the Kennebec river, at the head of tidal navigation, 43 miles from its mouth, and 63 miles by railroad N. N. E. of Portland; lat. 44° 19' N., lon. 69° 50' W. The main division of the Maine Central R. R. passes through it.



State Capitol, Augusta, Me.

The chief part of the city is on the right (west) bank of the river, and many of the residences stand on ground which is much higher than the river. The State-house is a handsome granite structure, rebuilt and enlarged in 1890 at a cost of \$150,000. Among the public institutions are a hospital for the insane, a U. S. arsenal, and St. Catharine's school for young ladies. Augusta has abundant water-power, which is employed in manufactures of cotton-goods, paper, wood-pulp,

and lumber. The city has a free library and the Maine State Library. The National Military Asylum is outside the city limits. Nearly all the business portion of Augusta was consumed by fire in Sept., 1865. The city is growing rapidly, has fine water-works, electric light, electric street-railway, etc. A U. S. building, for post-office, pension office, U. S. court, etc., was erected in 1889 at a cost of \$191,000. Pop. (1870) 7,808; (1880) 8,665; (1890) 10,527; (1900) 11,683.

EDITOR OF "KENNEBEC JOURNAL."

Augusta: city; on C., St. P., M. and O. R. Rs.; Eau Claire co., Wis. (for location of county, see map of Wisconsin, ref. 4-C); 22 miles E. S. E. of Eau Claire; is situated in an agricultural and lumber region. Pop. (1880) 1,116; (1890) 1,187; (1900) 1,256.

Augustan Age: the reign of Augustus, first Emperor of Rome, under whom Roman literature reached its highest development. Ovid, Horace, Cicero, Vergil, and Catullus, are among the famous names of this period.

Augustana College and Theological Seminary: founded in Chicago in 1860; removed to Paxton, Ill., in 1863, and to Rock Island, Ill., in 1875. It is the educational center of the Lutheran Augustana Synod, and comprises six departments of instructions—theological, collegiate, preparatory, musical, commercial, and normal—with 27 professors and 575 students. It has a museum, and a library of 16,000 volumes and pamphlets. The seminary is designed to train young men for the Lutheran ministry. The collegiate instruction embraces the usual classical and scientific courses as well as post-graduate study. Presidents: L. P. Esbjoru, 1860; T. N. Hasselquist, 1863; O. Olsson, 1891-1900.

Augustan History: a collection of biographies of the Roman emperors, from Hadrian to Numerianus and Carinus, i. e. from 117-284, which in the MSS. bears the title *Vite diversorum principum et tyrannorum a divo Hadriano usque ad Numerianum a diversis compositæ*. While containing much valuable information, the biographies are uncritical, ill-arranged, with no sense of proportion, full of trivial anecdotes, and with no pretension to style or classical correctness. The work appears to have been compiled at the end of the third and the beginning of the fourth century by six writers, namely: Ælius Spartianus, Julius Capitolinus, Vuleacius Gallicanus, Trebellius Pollio, Ælius Lampridius, and Flavius Vopiscus. Of these writers no biographical details are known, and their very existence has recently been called in question by scholars who would brand the whole collection as the forgery of one individual, a view, however, which has been sufficiently refuted by E. Klebs in the *Rheinisches Museum* for 1892, vol. xlvii., pp. 1-52 and 515-549. Best edition by H. Peter (Leipzig, 1884). M. WARREN.

Augusti, JOHANN CHRISTIAN WILHELM: b. at Eschenberga, near Gotha, Germany, Oct. 27, 1772; studied at Jena, where he became a professor extraordinary in 1800, Professor of Oriental Literature in 1803, and Professor of Theology in 1807. In 1812 he became Professor of Theology at Breslau, and in 1819 at Bonn. In 1833 he became director of the Conservatory at Coblenz, where he died, Apr. 28, 1841. He was a man of great learning, an orthodox conservative Lutheran. His writings are valued as books of reference, though they are not without serious faults. His best-known works are *Denkwürdigkeiten aus der christlichen Archäologie* (12 vols., Leipzig, 1817-31); *Handbuch der christlichen Archäologie* (3 vols., 1836-37). He published various other works, historical and dogmatical.

Revised by S. M. JACKSON.

Au'gustine (in Lat. *Aurelius Augustinus*), SAINT: the most eminent of the Latin Fathers of the Church; b. at Tagaste, in Numidia, Nov. 13, 353 A. D. He was a son of a pagan father and a Christian mother (Monica or Monnica), an excellent and devout woman, by whom he was instructed in religion. Educated at the best schools of Madaura and Carthage, he learned rhetoric, the Greek language, philosophy, etc. When, at the age of seventeen, he entered the great city of Carthage to complete his education, he was an eager, ambitious student and a youth of ardent passions, with a propensity to sensual pleasure. About the age of nineteen he embraced the doctrines of the Manichæans, and returned to Tagaste, where he taught rhetoric and grammar. He adhered to Manichæism about nine years, during part of which he lectured on rhetoric at Carthage. In the meantime his mother, by her prayers and exhortations, strove to convert him to Christianity, without success. He wrote at Car-

thage in his twenty-seventh year a treatise, *De Apto et Pulchro*, which is not extant. At length he perceived that the mystical phrases and futile speculations of the Manichæans were not capable of satisfying the wants of his spiritual nature. Much perplexed with doubts and unrest, he removed in 383 to Rome, and thence to Milan, where he was appointed Professor of Rhetoric in 384. He was deeply interested in the Platonic philosophy, and after he renounced Manichæism studied the Bible from a Platonic point of view. The sermons of St. Ambrose, then Bishop of Milan, made a deep impression on him, and after severe spiritual conflicts he became a Christian and was baptized on Easter Eve, 387. In 388 he went back to Tagaste, was ordained presbyter at Hippo in 391, associate bishop in 395, and bishop in 396. Among his earlier writings was a treatise against the Manichæans (*De Genesi contra Manichæos*), and *On True Religion (De Vera Religione)*. He published about 397 his *Confessions*, in thirteen books, a very interesting autobiography. He was a zealous opponent of Pelagianism, against which he wrote two treatises, entitled *On the Grace of Christ* and *On Original Sin*. Semi-Pelagianism was opposed by him, in 428, in two famous treatises on *Predestination* and on *Perseverance*. He also wrote vigorously against the Donatists. He finished about 426 a work, *De Civitate Dei* (On the City of God), which is regarded as the greatest monument of his genius and learning. One aim of this book was to vindicate the Christian faith against those pagans who asserted that the capture of Rome by Alaric and other calamities were consequences of the prevalence of the new religion. Near the end of his life he wrote the *Retractationes*, in which he reviewed carefully all his own works. Other important treatises are the *De Doctrina Christiana* and the *De Trinitate*. He left behind him also exegetical treatises, sermons, and letters in great number. The best edition of his works is that published by the Benedictines at Paris (11 tom. in 8 vols. fol., 1679-1700). He died at Hippo while that city was besieged by the Vandals, Aug. 28, 430. His character and writings exerted an immense and durable influence on the Church. "Of all the Fathers of the Latin Church," says Villemain, "St. Augustine manifested the most imagination in theology, the most eloquence, and even sensibility, in scholasticism." For learning his reputation is not so high. He was a poor Greek scholar, and knew nothing of Hebrew. See the biography in Latin by Possidius (the original source, written 432, in Benedictine edition), the Benedictine editors (in their edition very elaborate), and by G. Moringo (Antwerp, 1533); in French by L. S. Le N. de Tillemont (*Mémoires ecclésiastiques*, tom. xiii.) and J. J. F. Poujoulat (Paris, 1844, 3 vols.; 5th ed. 1866, 2 vols.); in German by F. A. G. Kloth (R. C.; Aachen, 1840, 2 vols.) and C. Bindemann (Protestant; Berlin, 1844-69, 3 vols.); in English by W. R. Clark (London, n. d.) and Philip Schaff (New York, 1886) —there is an English trans. of his chief works (Edinburgh, 1872-76, 15 vols.), ed. by Philip Schaff, reprinted and enlarged (New York, Christian Literature Company, 1886-88, 8 vols.).

Revised by S. M. JACKSON.

Augustine, or Austin, SAINT: the "apostle of England" and first Archbishop of Canterbury. He was a Benedictine monk, connected with a monastery in Rome, when he was sent by Pope Gregory I. to convert the Anglo-Saxons, in 596 A. D. He was received amicably by King Ethelbert, whose wife Bertha was already a Christian. He converted Ethelbert, and is said to have baptized 10,000 of his subjects. Augustine was consecrated archbishop at Arles in France by the Metropolitan of Arles, Vergilius. Seeking an interview with the British bishops who claimed a direct succession from the apostles' days, seven of these prelates met Augustine on the borders of Wessex, accompanied by the monks from the great monastery of Bangor and a large number of British priests. These bishops refused to admit the primacy of Augustine, and the results of the conference were far from being satisfactory to either party. The permanent results of the labors of Augustine were limited to the kingdom of Kent, where they began. D. at Canterbury, May 26, 607. See W. F. Hook's *Lives of the Archbishops of Canterbury*. W. S. PERRY.

Augustinian Monks: a monastic order of the Roman Catholic Church. This order was formerly divided into three classes, of which two still remain: 1. *Canons Regular*. —This class of ecclesiastics originated at Avignon in the year 1038, by authority of Bishop Benedict of Avignon. They were called Canons Regular because their ranks were

recruited from the lay and clerical canons who had not previously taken monastic vows. They assumed the name and rule of Augustine in 1139. They had 170 houses in England and 28 in Scotland. 2. The so-called *Hermits of St. Augustine*, one of the four great mendicant orders of the Church. This body incorrectly claims to have been founded by St. Augustine. Its true origin was in 1256, when Pope Alexander IV. compelled eight small bodies of Italian monks to unite in one order under the rule of St. Augustine, and exempted them from the jurisdiction of bishops. The Hermits of St. Augustine have now about 200 houses. They are much diminished in importance. *The Special Congregations* consisted of those Augustinians who desired a severer rule and better discipline than commonly prevailed in the order. Martin Luther was a member of the Special Congregation of Saxony. 3. *The Barefooted Augustinians* originated in 1582, by command of the King of Spain. They have a very severe rule. The number of monasteries in 1860 was about fifteen. This class is nearly or quite independent of the former.

Augustinian Nuns date themselves back to the company of nuns gathered at Hippo by Perpetua, the sister of Augustine. They are now of four classes: First, those under the guidance of Augustinian monks; secondly, those under the control of diocesan bishops; thirdly, barefooted nuns; fourthly, Augustines of the Interior of Mary. See Migne's *Dictionnaire des ordres Religieux*, tom. iv.; Dugdale, *Onomasticon*, vi. 37.

Augustulus, ROMULUS: the last Roman emperor of the West; a son of Orestes, a rich patrician. He obtained the title of emperor in 475 A. D., and was deposed by Odoacer in 476.

Augustus: a Latin word equivalent to the Gr. *Σεβαστός*, and signifying "majestic," "sacred," "venerable." It was a name or surname conferred on Caius Julius Cæsar Octavianus by the Roman Senate, 27 B. C.

Augustus (or August) I.: Elector of Saxony; a son of Henry the Pious; b. at Freiberg, July 31, 1526, and succeeded his brother Maurice in 1553. He was an intolerant promoter of Lutheranism, and persecuted the Calvinists, but was a liberal patron of learning, and under his administration the manufactures, agriculture, and commerce of the country were greatly promoted and improved; he also introduced some valuable reforms in jurisprudence. He was chiefly instrumental in negotiating the peace of Angsburg (1555). He died at Dresden, Feb. 12, 1586, and was succeeded by his son, Christian I.

Augustus II. of Saxony (and Augustus I. of Poland): b. at Dresden, May 12, 1670; was second son of John George III., Elector of Saxony, and Anna Sophia of Denmark. He possessed extraordinary physical strength, and was not deficient in mental faculties. He became Elector of Saxony on the death of his brother in 1694, and was elected King of Poland in 1697, having, for the sake of the crown, adopted the Roman Catholic religion. His competitor in this election was the French Prince of Conti. Augustus formed about 1700 an alliance with Peter the Great against Charles XII. of Sweden, by whom he was defeated in several battles. By a treaty signed in 1706 he renounced the crown of Poland, which Charles XII. gave to Stanislas Leszczynski. In consequence of the defeat of Charles XII. by the Russians in 1709, Augustus recovered the throne of Poland, and as an ally of Peter the Great waged war against Sweden for several years. Augustus was luxurious, licentious, and fond of splendor. He squandered the revenues of Saxony on his mistresses and on alchemists, whom he patronized. He had many illegitimate children, among whom was the famous Maurice of Saxony (Marshal Saxe). He died in Warsaw, Feb. 1, 1733, leaving the throne to his son Augustus. See Fassmann and Horn, *Friedrich August des Grossen Leben* (1734); Desroches de Parthenay, *Histoire de Pologne sous le Roi Auguste II.* (4 vols., 1734.)

Augustus III., FREDERICK: King of Poland: b. at Dresden, Oct. 7, 1696; was a son of the preceding. He was inferior in talents to his father. Having joined the Roman Catholic Church, he married, in 1719, Maria Josephine, a daughter of Joseph, Emperor of Austria. In 1733 he became Elector of Saxony, and was chosen King of Poland by a party of the Diet. Favored by the courts of Austria and Russia, he prevailed over his rival Stanislas. In 1742 he formed an alliance with the Empress Maria Theresa against Frederick the Great, who defeated the Saxons in 1745 and

captured Dresden. This war was ended in 1746, but Augustus was soon involved in the Seven Years war, which began in 1755, and his army was again defeated by the Prussians. He died in Dresden, Oct. 5, 1763, and his son, Frederick Christian, then became Elector of Saxony.

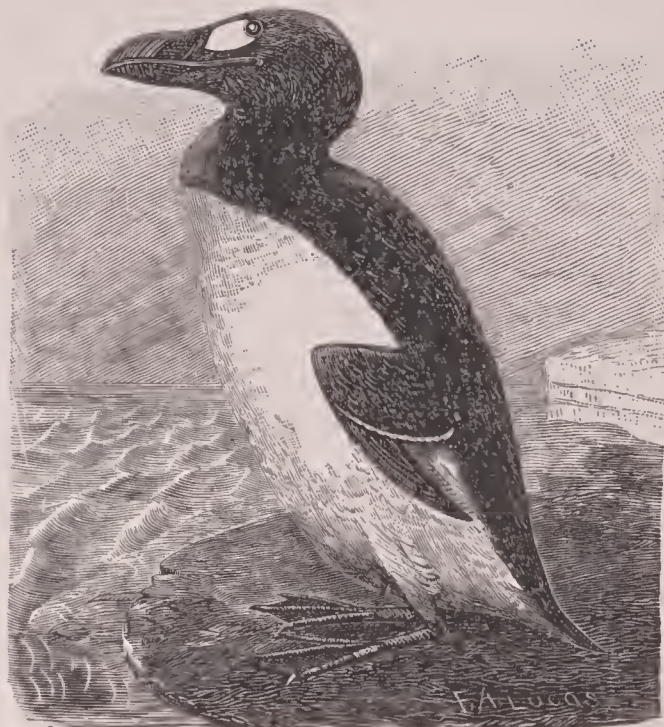
Augustus, WILLIAM: Prince of Prussia; a younger brother of Frederick the Great; b. at Berlin, Aug. 9, 1722. He distinguished himself at Hohen-Friedberg in 1745, became a general of infantry, and displayed skillful generalship at the battle of Lowositz in 1756. He died at Oranienburg, June 12, 1758, and left a son, who became King Frederick William II.

Augustus Cæsar, or simply **Augustus** (called in his youth **CAIUS OCTAVIUS**, and **CAIUS JULIUS CÆSAR OCTAVIANUS** after he became the heir of Cæsar the dictator): the first Roman emperor; b. at Velitræ, Sept. 23, 63 B. C. He was the son of Caius Octavius, a senator, and Attia, who was a niece of Julius Cæsar. His father having died 58 B. C., his mother was married to L. Marcus Philippus, who directed the education of young Octavius. At the age of sixteen he assumed the *toga virilis*, and was adopted as a son by Julius Cæsar, whom he attended in his expedition to Spain in 45 B. C. He became a pupil of Apollodorus of Pergamus, under whom he was pursuing his studies at Apollonia when Cæsar was killed, Mar. 15, 44 B. C. As he had been appointed the heir of the dictator, he hastened to Rome to claim his inheritance. Mark Antony, who then had the chief power in Rome, refused to deliver the property and papers of the late dictator. Octavius temporized, and in the turbulent and critical times that ensued exhibited the prudence and astuteness of a mature politician. He gained the favor of the Senate, which in Jan., 43 B. C., gave him the command of an army, which defeated that of Antony near Mutina (Módena). The adhesion of the army to his interest enabled him now to defy the authority of the Senate. He marched to Rome, was elected consul in Aug., 43, and formed a triumvirate with Antony and Lepidus against Brutus, Cassius, and the Senate. Antony and Octavius defeated Brutus and Cassius in the decisive battle of Philippi in 42 B. C., and, to confirm their power, proscribed and massacred thousands of their opponents in Italy. Augustus then obtained control of Italy by a new division of the provinces, but dissensions soon arose between him and Antony, who had command in Asia. An open rupture was, however, postponed, and Antony married Octavia, the sister of his great rival. About 38 B. C. the triumvirate was renewed for another period of five years, during which Octavius and Antony were virtually masters of the Roman world. Octavius defeated Sextus Pompey in battle in the year 36, and was chosen consul for the second time in 33. In the meantime, Antony, infatuated with Cleopatra, neglected his own interests, and by his ill-treatment of Octavia broke the only bond of union with his colleague. The contest for supreme power was decided by a great naval victory which Octavius gained at Actium in 31 B. C., after which he was the sole master of the Roman empire. He was subsequently chosen consul several times, and professed an intention to restore the republic, but he usurped absolute power, partly disguised under republican forms. In 27 B. C. the title of Augustus was conferred on him by the obsequious Senate, which retained the shadow of its former power. His favorite ministers and advisers were Agrippa, Mæcenas, and Asinius Pollio. He was thrice married; the names of his wives were Clodia, Scribonia, and Livia Drusilla. He had an only child, Julia. In 23 B. C. he accepted the *tribunitia potestas* (tribunitian power) for life. His reign was remarkably pacific and prosperous, and the Augustan Age was rendered the most brilliant in the Roman literature by the genius of Vergil and Horace, whom the emperor liberally patronized. He was a prudent and rather popular ruler, governing men with artful policy, and skillfully using their passions and talents to promote his own designs. The peace, order, and prosperity which his subjects enjoyed under his mild and modified tyranny reconciled them to the loss of their ancient liberty. He centralized the administration and enforced discipline in the armies. He adorned the city of Rome with public buildings, and made such improvement in that capital that it was said that he found it a city of brick and left it a city of marble. He was not happy in his domestic relations. His adopted sons, Caius and Lucius Cæsar, to whom he intended to leave the throne, died young. He was temperate in his diet and moderate and frugal in his style of living. He had studied oratory with some success, but on important occasions he would never speak with-

out careful preparation. He composed numerous works in prose and verse on various subjects. Having designated his stepson Tiberius as his successor, he died at Nola, Aug. 19, 14 A. D. See Suetonius, *Vita Augusti* (Life of Augustus); Nicolas Damascenus, *De Vita Augusti*; Tacitus, *Annales*; Beulé, *Auguste* (Paris, 1867; 3d ed. 1868); V. Gardthausen, *Augustus und seine Zeit* (Leipzig, 1891, *sqq.*, 4 vols.).

Revised by S. M. JACKSON.

Auk: the common name of several species of sea-fowl belonging to the family *Alcidae*. The auks are thickset, heavily built birds, with short wings and tail, and three-toed, webbed feet. They are found only in the colder por-



Great auk.

tions of the northern hemisphere, and many breed within the Arctic Circle, migrating southward in winter. They are strictly aquatic in their habits, visiting the shore only to breed: fly rapidly, though heavily, owing to the shortness of their wings, but are most expert swimmers and divers, using their wings as well as their feet when swimming under water. The most noted as well as the largest member of the family is the great auk or garefowl, *Alca impennis*, which has become extinct within the last fifty years. This bird was about the size of a goose; the head, neck, and upper parts were black, the under parts and a spot in front of the eye white. The wings were so small that the great auk was quite incapable of flight. It was a resident of the shores of Iceland and Newfoundland, but occurred in winter as far south as England and Virginia. At the time of the discovery of Newfoundland the great auk was found in immense numbers, and was largely used for food by the colonists and fishermen. At a later date the bird was killed for the sake of its feathers, and, as it bred only in a few localities and was helpless when on land, the species was soon extirpated. The ultimate cause of the extinction of the garefowl in Europe was the destruction of its most secure breeding place, a small islet off the southern coast of Iceland, by a volcanic eruption. The birds then moved to a more accessible spot, and were soon destroyed, the last specimens being taken for their skins. About 20 skeletons, 80 skins, and 70 eggs are known to be preserved in collections. Although by no means the rarest of birds, specimens of the great auk are very highly valued, an egg having been quite recently sold in London for £300, about \$1,500. The razor-billed auk, or razorbill, *Alca torda*, is a well-known species, common on both sides of the Atlantic, occurring at some localities in great numbers. Like the other members of the group, the razorbill lays a single, disproportionately large egg. It breeds on narrow shelves of rock, or under overhanging ledges, and its eggs, as well as those of the other species, are much sought after. Continued taking of the eggs has, in some localities, very perceptibly reduced the numbers of these birds. The term little auk is often applied to the dovekie, *Alle nigricans*, a small and abundant species found in great numbers on the eastern coast of Greenland as far north as lat. 82°. In winter it usually keeps well out at sea, unless driven inshore by gales. These two last-mentioned

species play an important part in the domestic economy of the Eskimo, supplying him with both food and clothing. See GUILLEMOT.
F. A. LUCAS.

Au'la Re'gia [Lat., king's hall or court]: a court established in England by William the Conqueror, and afterward regulated by Magna Charta.

Au'lic Council [*aulic* is from Lat. *aula*, court]: one of the two highest councils or courts of the former German empire, co-ordinate with the imperial chamber. The aulic council, which was organized in 1495, consisted of a president, vice-president, and eighteen councillors, six of whom were Protestants, whose unanimous votes could not be overruled by the Catholic majority. The members and officers of this council were appointed by the emperor, and had jurisdiction over all matters of feudality in which the emperor was directly concerned; all questions of appeal made by states from decisions in favor of the emperor in inferior courts; and Italian affairs in which the emperor was interested. After the dissolution of the German empire in 1806, the term aulic council was applied to the Emperor of Austria's council of state.

Au'lis: a town of ancient Greece, in Bœotia, on the Enripus. It had a temple of Artemis (Diana). According to the poetical legend, Agamemnon here assembled the Grecian fleet before the siege of Troy, and here he offered his daughter Iphigenia as a sacrifice. Aulis was in the territory of Tanagra, and is supposed to have been about 3 miles S. of Chaleis. Its present name is Vatchi.

Au'lus Gel'lius: a Latin author who lived during the reigns of the Antonines. Little is known of the events of his life. He resided much at Athens, where he composed his *Noctes Atticæ*, probably about 160 A. D. His book is a mass of curious information upon a great variety of subjects, and, though ill-arranged, is valuable to critics, from the light it throws upon many obscure points of ancient history and literature. The best edition is by M. Hertz (Berlin, 1883-85) and editio minor (1886). English trans., London, 1795; modern French trans., Paris, 1862, 2 vols.; German trans., Leipzig, 1875-76, 2 vols.

Aumale, ð-maal' (formerly **Albemarle**): a small town of France; department of Seine-Inférieure; 13 miles E. N. E. of Neufchâtel (see map of France, ref. 2-E). Pop. about 2,000. In the reign of Henry II. Aumale was erected into a duchy, and the title of Duke of Aumale was given to Claude, a brother of Francis, Duke of Guise.

Aumale, CLAUDE II., Duc d': French general; b. in 1526; was a brother of the famous Duke of Guise. He fought against the Huguenots at St. Denis (1567) and Montcontour (1569), and was one of the chief instigators of the massacre of St. Bartholomew (1572). He was killed during the siege of La Rochelle, Mar. 14, 1573.—His son, CHARLES DE LORRAINE, Duc d'Aumale, b. 1556, was an ardent partisan of the Catholic League. After the death of his cousin, Henry, Duke of Guise, 1588, Aumale and the Duke of Mayenne were the leaders of the League, and commanded the armies that fought against Henry IV. He had ill-success as a general. Having plotted treason with the King of Spain, he was condemned to death by Parliament in 1595, but escaped. D. at Brussels in 1631.

Aumale, HENRI EUGÈNE PHILIPPE LOUIS D'ORLÉANS, Duc d': the fourth son of Louis Philippe, King of the French; b. in Paris, Jan. 16, 1822. He entered the army in 1839, served several campaigns in Algeria, and was rapidly promoted. In May, 1843, having defeated Abd-el-Kader, whose camp and treasures became the spoil of the victors, he was raised to the rank of lieutenant-general. In Sept., 1847, he was appointed governor-general of Algeria, about three months after which Abd-el-Kader surrendered to him. On learning of the abdication of his father, he resigned his command, Mar., 1848, and went into exile, residing many years in England. He was chosen a member of the National Assembly in Feb., 1871, soon after which date that body annulled the decree or law which had excluded the Orleans princes from France. He was elected to the French Academy in the winter of 1871-72. He was banished in 1886, but the decree exiling him was revoked in 1889. In 1886 he gave his magnificent château at Chantilly to the Institute of France, with all its priceless contents, in trust for the French nation. In 1891 the University of Oxford conferred on him the honorary degree of doctor of laws. D. at Zucco, Sicily, May 6, 1897. Revised by S. M. JACKSON.

Aune [Fr. < O. Fr. *alne* < Late Lat. *alena*, loan-word from Teutonic; cf. Goth. *aleina*, Germ. *Elle*, Eng. *ell*, Lat. *ulna*, Gr. *ἄλμη*, elbow, forearm]: an old European cloth measure, having many values in different places, varying between 27 and 54 inches. The name survives only in Switzerland, where it signifies a measure equal to 4 feet in length, the foot being 30 cm. The Swiss aune is therefore about 47¼ inches long.

Au'ra [Lat., from Gr. *αἶρα*, breath]: a subtle vapor or exhalation.—*Aura electrica* (literally the electrical breeze), the sensation as of cold air experienced when electricity is received from a sharp point.—*Aura epileptica*, a peculiar sensation felt by epileptic patients as of a cold fluid ascending toward the head.—*Aura hysterica*, the sensation as of cold air ascending to the head, said to occur sometimes in hysteria.—*Aura seminalis* or *aura seminis*, the supposed vivifying principle of the *semen virile*, formerly believed to ascend through the Fallopian tubes, thereby impregnating the ovum in the ovarium.—*Aura vitalis*, a name for the principle of life.

Aurangzebe: See AURUNGZEBE.

Aurantia'ceæ [from Lat. *aurantium*, orange]: a family of dicotyledonous trees and shrubs, natives of the warm parts of Asia and Northern Africa. All parts of these plants contain a fragrant and volatile oil, which abounds especially in the leaves and in the rind of the fruit. The leaves are alternate, articulated with the petiole, and dotted or pellucid-punctate; the fruit is a kind of berry (*hesperidium*). The family comprises numerous species, some of which are remarkable for beauty and are highly prized for their fruits, as the orange, lemon, and citron. (See CITRUS.) The fruits of *Ægle marmelos*, *Cookia punctata*, *Glycosmis citrifolia*, and many others are also edible. The *Skimmia japonica*, a beautiful shrub of Japan, is more hardy than the other plants of this order, and flourishes in the open air in England. This family is commonly regarded as a sub-family of the *Rutaceæ*.
Revised by CHARLES E. BESSEY.

Aure'lian, or **Aurelia'nus**, CLAUDIUS LUCIUS VALERIUS DOMITIUS: a Roman emperor of humble origin; b. at Sirmium, in Pannonia, or, as some say, in Lower Dacia, Sept. 9, 214. He served with distinction in several campaigns, and raised himself by his merit to the highest rank in the army of Valerian. It is stated that he usually fought in the foremost rank. On the death of Claudius (270 A. D.), Aurelian was elected emperor by the army. Early in his reign the empire was invaded by the German tribe of Alemanni, whom he defeated. He abandoned Dacia to the Goths and Vandals, in order that the Danube might become the boundary of the empire. The most important and famous of his enterprises was an expedition against Zenobia, Queen of Palmyra, whose extensive dominions included Syria and Egypt. Having defeated her army in battle near Emesa, he captured Palmyra and its queen in 273 A. D., after which he received at Rome a triumph of extraordinary magnificence. He recovered Gaul from Tetricus, who had usurped royal power, and obtained the title of "Restorer of the empire." His memory is stained by the judicial murder of Longinus, the critic, and other acts of excessive severity. He was assassinated by his own officers between Byzantium and Heraclea in 275 A. D., and was succeeded by Tacitus. See Vopiscus, *Vita Aureliani*; Tillemont, *Histoire des Empereurs*; Gibbon, *Decline and Fall of the Roman Empire*, chap. xi.

Aurelius Antoninus, MARCUS: See ANTONINUS, MARCUS AURELIUS.

Aure'lius Victor, SEXTUS: a Roman historian who flourished about 360 A. D., under the Emperor Constantine and his successors. He was appointed prefect of Pannonia Secunda by Julian the Apostate about 360, and was prefect of Rome under Theodosius I. He wrote a series of biographies of the Roman emperors from Augustus to Constantine, entitled *De Caesaribus Historia*, which is extant and was first printed at Antwerp (8vo, 1579), with the commentary of Schottus; later ed. Schröter, Leipzig, 1829-31, 2 vols.; German trans. by Closs, Stuttgart, 1837. Two other works are falsely ascribed to him—namely, *The Lives of Illustrious Romans* and *Aurelii Victoris Epitome*.

Aurette de Paladines, CLAUDE MICHEL LOUIS, d' (dō-rel'-de-pal'-a-deen'): b. at Malzien, department of Lozère, France, Jan. 9, 1804; received a military education; served in Algeria 1841-48; distinguished himself and was made a general of division in the Crimean war, and was command-

er-in-chief of the ninth military division (Marseilles) at the outbreak of the Franco-German war. On Oct. 14 he was made commander-in-chief of the first army of the Loire. In the battle of Coulmiers (Nov. 9, 1870) he defeated Von der Thann, and compelled the Germans to retire from Orléans; but his attack on the left wing of the army of Prince Frederick Charles at Beaune-la-Rolande (Nov. 28) failed; on Dec. 2 he was defeated at Artenay by the Grand Duke of Mecklenburg, and on Dec. 3 and 4 was driven farther back by Prince Frederick Charles, who again occupied Orléans. Gambetta now instituted a committee of inquiry into the conduct of D'Aurelle, who immediately resigned his command, and afterward declined to accept any command under the Government. He sat in the National Assembly of Bordeaux, was one of the members associated with Thiers in the negotiations of peace, and was appointed commander first of the national guard in the department of Seine, afterward of the fourteenth military division (Bordeaux). In 1872 he published *La Première Armée de la Loire*. D. at Versailles, Dec. 17, 1877.

Aure'ola: See HALO.

Au'reus, or **Dena'rius Au'reus**: the standard and most ancient Roman gold coin, first struck in 217 B. C. The average weight of the aureus was about 121 grains—about the same as the Greek stater and the Persian daric.

Au'ricle [from Lat. *auri'cula*, dimin. of *auris*, ear]: the external portion of the ear. See EAR.

AURICLES OF THE HEART: those cavities of the heart which receive the blood returning from the veins, and convey it to the ventricles. The auricles are popularly called "deaf ears." See HEART.

Auric'ula (*Prim'ula auric'ula*): a plant of the family *Primulaceæ*, nearly related to the primrose, and much cultivated in flower-gardens. It is a native of the Alps and other mountains of Europe and Asia. It is prized for the beauty and fragrance of its flowers, which grow in the form of an umbel on a scape. The size and color of the flowers have been much improved by cultivation. Among the colors prevailing in the 1,200 or more cultivated varieties are red, pink, crimson, and mulberry. Some varieties present a single color, and others are variegated or are adorned with a green margin. The auricula blooms in April or May, and often has a second crop of flowers in autumn. It prefers a rich, light soil, and the finer varieties are usually cultivated in pots. The chief requisites of a good auricula are large flowers, which are nearly round, and have in the center a white or yellow eye which is distinct and round, its color not mixed with the ground color; and a long scape, strong enough to hold itself erect.

Auricula: a genus of *Auriculidæ*, a family of *Mollusca* of the class *Gasteropoda*. They have a spiral shell covered with a horny epidermis. The spire is obtuse or short, and the aperture elongated and narrow. They have respiratory organs adapted for breathing in air, and they frequent salt marshes or the vicinity of the sea. They are chiefly found in and near warm seas. Several species are fossil.

Auric'ular Confes'sion: private confession of sins to a priest. For certain offenses the early Church required confession. In the fifth century, owing to some scandals in public confession, Leo the Great (440-461) authorized the parish priest to receive confessions. By the twenty-first canon (*Omnia utriusque sexus fidelis*) of the Fourth Lateran Council, in 1215, under Innocent III., it is enjoined upon the faithful to confess their sins once a year, at least, to the parish priest, under pain of losing Christian burial. In the office for the Visitation of the Sick in the English Prayer-book the rubric directs that "the sick person be moved to make a special confession of his sins, if he feel his conscience troubled with any weighty matter. After which confession the priest shall absolve him (if he humbly and heartily desire it) after this sort," etc. This rubric and the absolution following it are not in the American Book of Common Prayer.

Revised by W. S. PERRY.

Au'rifaber, JOHANN [*Aurifaber* is a Lat. translation of Germ. GOLDSCHMIDT]: b. at Weimar or in the countship of Mansfeld, Saxony, in 1519; studied theology in Wittenberg 1537-40; tutor to the young count of Mansfeld 1540-44; became amanuensis to Luther in Wittenberg in 1545, and was with him when he died at Eisleben 1546; acted as army-chaplain during the Schmalkald war 1547; became court-chaplain at Weimar in 1551; deposed as a Flacianist 1561; fled to Eisleben; became minister at Erfurt in 1566,

where he died Nov. 18, 1575; edited the German writings of Luther (Eisleben, 1564-65, 2 vols.) and his *Epistolæ* (1556-65) and *Table Talk* (1566).

Auri'ga [in Lat., charioteer]: a northern constellation of the celestial sphere, sometimes called THE WAGONER. It contains Capella, a star of the first magnitude, which may be seen near the zenith in winter.

Aurigny: See ALDERNEY.

Aurillac, ô'-ree'yak' (anc. *Aureli'acum*): a town of France, capital of the department of Cantal; is pleasantly situated in a valley on the river Jourdanne, 272 miles S. of Paris (see map of France, ref. 7-F). It is well built and has wide and clean streets. The houses are covered with slate, which is quarried in the vicinity. Among its ancient and remarkable public buildings are the Church of Notre Dame, built in the thirteenth century, the castle of St. Stephen, and the college, which has a valuable library. Most of the town is of comparatively modern construction. It has manufactures of copper kettles, jewelry, paper, carpets, and woolens. Pop. (1896) 16,886.

Aurin: See ROSOLIC ACID.

Aurispa, GIOVANNI: (1370-1459); celebrated humanist and itinerant teacher (Venice, Bologna, Florence, Ferrara). He arrived in Venice from Constantinople in 1423, a memorable year for classical learning, for he brought with him 238 MSS., including the works of Plato, Lucian, Demosthenes, Dio Cassius, Arrian, Diodorus, Strabo, Æschylus, Sophocles, Apollonius Rhodius, Callimachus, Pindar, and many others, nearly all of these authors having been until then lost to Western Europe.

ALFRED GUDEMAN.

Aurochs, Germ. pron. ovr'oks [loan-word from Germ. *Aurochs* or *auerochs*, M. H. G. *urochse*, from Teut. **ūrus*, adopted into Lat. *ūrus*, wild ox + *ochse*: Eng. *ox*, etc.]: the common name for the European bison, *Bison bonassus*. Though once found in great numbers in many parts of Europe, it is now limited to the forests of Lithuania and the Caucasus. It bears many points of similarity to the American bison. It is a very powerful animal, being somewhat larger than an ordinary ox, and, though clumsy in appearance, can run rapidly for a short distance. The body of this animal exhales a strong odor, somewhat resembling musk. The aurochs is a good swimmer, and delights in dabbling in the water and rolling in the mud. Its food consists in a great part of lichens, of which it is especially fond. The Lithuanian herd has been preserved by imperial edict since 1820, and in 1860 numbered 1,700 individuals.



Aurochs.

Many were killed during the Polish uprising of 1863, and the official count of 1870 showed but 847. This number had dwindled to 600 in 1880, and is still on the decrease. The aurochs is protected by law in the Caucasus, as well as by the rough and unsettled nature of the country, and this locality will probably be the last stronghold of the once numerous bison.

The European bison furnishes a good example of the transposition of names. As the term penguin was originally given to the great auk, so the name *Aurochs* was given to the now extinct urus of Caesar's *Commentaries*, the *Bos urus* of scientific nomenclature, and a totally distinct animal from the bison. The name aurochs is, however, so firmly connected with the bison that it would be useless to attempt to make any change.

Revised by FREDERIC A. LUCAS.

Auro'ra: a Latin word signifying "morning," or the "goddess of morning," corresponding to the Greek *Ēos*. The poetical legend represents her as the daughter of Hyperion, the wife of the Titan Astræus, the mother of Hesperus, Boreas, Zephyrus, and Memnon. According to one mythical tradition, she loved Tithonus (a son of Laomedon), for whom she asked and obtained immortality, but forgot to ask perpetual youth. She lived with him at the end of the earth, on the banks of the Oceanus, and when he grew old she nursed him, until at last his voice disappeared and his body became dry and shriveled. She then transformed him into a cricket and locked him up in her chamber. After that time—the Greek mythology continues—she adopted the habit of carrying off young men distinguished for their

beauty, such as Orion, Cleitus, and others, until Father Zeus became angry and put a stop to that practice. She was sometimes represented as dressed in a saffron-colored robe, with a torch in her right hand.

Aurora: a luminous phenomenon common in certain regions surrounding the magnetic and geographical poles of the earth. In the northern hemisphere it is called the Aurora Borealis or Northern Lights, and in the southern hemisphere the Aurora Australis or Southern Lights. Nearly all our accurate knowledge of it is derived from studies of its manifestation in the northern hemisphere, because of the predominance of land areas there and of water areas in the southern hemisphere, but the same conditions seem to prevail in each. It is intimately associated with the electro-magnetic system of the earth, both as to its origin and visibility, although the causes and conditions of its intermittent manifestations are not yet fully understood. The most probable explanation, derived from recent investigations, is that the solar radiations possess electro-magnetic energy, which at the earth is distributed into two principal fields, one passing through the earth in a direction nearly parallel to the line joining the two magnetic poles, and the other nearly parallel to the plane of the ecliptic, the former acting by the law of magnetic induction, and the other by the law of magnetic refraction. The first field is peculiar to the polar regions, embracing the magnetic and the geographical poles, and the second is characteristic of the middle latitudes. Besides these fields there is the normal terrestrial magnetic field surrounding the earth, in which a freely suspended magnet comes to rest in definite positions according to the locality. There is an oval belt where these three fields come together, and overlapping each other produce an interference of vibrations which gives rise to the auroral luminosity. The light is apparently electrical, shooting out in long, thin streamers, which flash and quiver, though sometimes these become diffused and continuous over large spaces, here and there traversed by lines in certain directions, controlled by the magnetic fields. The special appearance at any time is the result of many complex conditions acting simultaneously, which depend upon the state of the atmosphere, especially the presence of aqueous vapor. The commonest optical effect is the long, low arch spanning the sky, of gray, green, purple, or red colors, sometimes brightening into the most magnificent display of evanescent tints, suffusing the whole heavens; there are also crisp, figured forms occurring in patches, which rapidly shift in position and give place to other weird and fanciful shapes; and finally, in the vanishing point of the terrestrial magnetic lines, the long streamers receding from the observer seem to unite in a glorious crown or halo called the *corona*. The geographical distribution of the auroras shows that there are certain well-marked lines of equal frequency, called *isochasmen*, which are closely related to the magnetic isoclinals and the meteorological isothermals, though not quite identical with them. The climatic conditions affect the relative frequency. If, for instance, the climate is dry and arid, or if it is excessively moist, the number of auroras seen will be a minimum, but a damp climate or the neighborhood of large bodies of water is favorable to a maximum number; low barometric pressures and their accompanying vapor conditions are also suitable to the appearance of auroras. The isochasmen extend downward over the ocean areas and contract along the edges of the northern continents. The belt of maximum frequency passes near Point Barrow, Hudson's Bay, Northern Russia and Siberia, the number soon falling off on each side, rapidly toward the pole and more slowly toward the equator. The maximum belt of frequency is observed to change its position in latitudes in several well-marked periods, depending upon the intensity of the solar energy. Thus, when the intensity increases, the polar field and the maximum belt spread out from the poles and embrace larger spaces on the earth. If the number of spots visible on the sun is taken as an indication of its electro-magnetic energy, then the frequency increases with the spots and the belt expands with them, this being seen obscurely in a 56-year period, but clearly in the 11-year period and in a period of about 27 days, that of the rotation of the sun on its axis. In the same way there is an annual period depending on the position of the sun relatively to the poles, having a maximum in March-April and September-October, and a minimum in December-January and June-July; also a diurnal period depending upon the local hour-angle of the sun, there being an increase in visibility from 6 p. m. to 11 p. m., a slow de-

crease from 11 p. m. to 2 a. m., and a rapid falling off from 2 a. m. till daylight, this law availing for the northern hemisphere. Many unsatisfactory attempts have been made to measure geometrically the heights of the aurora, but all the formulæ depend upon some assumption regarding its location in space, which really involves the result of the observation and computation. Hence we have heights of so great range as to make all such work untrustworthy, though it is generally thought that the aurora can occur anywhere within the limits of the atmosphere, from the surface of the earth to its final dissipation in space, according as the local state of it is favorable to the display. Each observer sees a ray or figure peculiarly his own, as is the case with the rainbow, and hence simultaneous observations from distant points are not capable of accurate combination. The spectrum of the aurora is likewise a very difficult thing to observe, because the faint, ever-shifting light can not be well retained in the focus of the instrument. But it is known that the auroral lines are quite the same as those occurring in the spectra of rarefied air and gases, such as oxygen in Geissler's tubes, and that it has some characteristic though inexact determined lines.

FRANK H. BIGELOW.

Aurora: town (incorporated in 1863); village of York co., Ontario, Dominion of Canada, on the Northern Division of the Grand Trunk Railway, 30 miles N. of Toronto (see map of Ontario, ref. 4-D). It has 5 churches, a high school, Mechanics' Institute with a large library, a bank, flour, saw, shingle, and planing mills, agricultural manufactories, a tannery, water-works, and electric lights. Pop. (1881) 1,540; (1891) 1,743.

EDITOR OF "BANNER."

Aurora: city and important railroad center; Kane co., Ill. (for location of county, see map of Illinois, ref. 2-F); on Fox river; 39 miles W. S. W. of Chicago. Besides the locomotive works and shops of the C., B. and Q. R. R., Aurora has many important manufacturing industries, including iron-works, wheel-scraper, buggy-top, sal-soda, silver-plated ware, road-carts, wood-working machinery, smelting, and other works and manufactures. The city owns its own water-works and electric-light plants, has fine electric street-railway, 5 banks, 25 churches, excellent schools, including Jenning's seminary, free public library, Y. M. C. A. building, etc. There are 5 daily, 1 semi-weekly, and 6 weekly newspapers. Pop. (1880) 11,873; (1890) 19,688; (1900) 24,147.

EDITOR OF "DAILY EXPRESS."

Aurora: Dearborn co., Ind. (for location of county, see map of Indiana, ref. 8-G); on Ohio and Miss. and Cl. Cin., Ch. and St. L. R. Rs., and the Ohio river; 25 miles W. by S. from Cincinnati, with which it is connected by steamboats. It has large barrel-factories and various manufactures, Ohio and Mississippi R. R. car-shops, an extensive grain and hay trade, and is engaged in milling, distilling, and coopering. Pop. (1880) 4,435; (1890) 3,929; (1900) 3,645.

Aurora: city; Lawrence co., Mo. (for location of county, see map of Missouri, ref. 7-E); on St. L. and San Fran. R. R.; 35 miles S. of Springfield, Mo.; is in a lead and zinc mining and a farming district. Pop. (1890) 3,482; (1900) 6,191.

Aurora: city (founded in 1872); capital of Hamilton co., Neb. (for location of county, see map of Nebraska, ref. 7-J); situated in an agricultural district, on the Wyoming branch of the B. and M. R. R.; 75 miles W. of Lincoln. It has 7 churches, 4 high schools, court-house, opera-house, large creamery, a foundry, machine-shops, water-works, and 3 newspapers. Pop. (1890) 1,862; (1900) 1,921.

EDITOR OF "REPUBLICAN."

Aurora: on railroad, Cayuga co., N. Y. (for location of county, see map of New York, ref. 4-F); is finely situated on the east side of Cayuga Lake, 25 miles N. W. of Ithaca. It is a place of summer resort, has many fine residences, some manufactures, and is the seat of Wells College for ladies and of Cayuga Lake Academy. Pop. (1870) 450; (1880) 444; (1890) 555; not returned separately in 1900.

Aurungabad (i. e. abode of Aurungzebe): a city of Hindustan; in the territory of the Nizam; 68 miles N. E. of Ahmadnagar, and 138 from Pu'na; lat. 19° 54' N., lon. 75° 33' E. (see map of S. India, ref. 3-D). It was a favorite residence of Aurungzebe. Among the monuments of its former grandeur are a ruined palace of Aurungzebe, and a mausoleum with domes of white marble erected by that monarch to the memory of his daughter. Many of the mosques and other public buildings are substantial, but signs of decay are visible. Pop. about 35,000.

Au'rungebe, or **Aurangzebe** (i. e. ornament of the throne), afterward called **Alum-geer**, or **Alamgir** (conqueror of the world); a famous Mogul Emperor of Hindustan; b. Oct. 22, 1618. He was a younger son of Shah Jehân, who ceased to reign in 1657. The elder sons, Dara and Shuja, then contended for the crown in battle, while Arungzebe affected indifference to temporal power, and craftily concealed his designs under the cloak of piety. Having procured the assassination of Dara and Shuja, he became master of the empire in 1658, and detained in prison his father until his death in 1666. As a bigoted Moslem he persecuted the Hindus and provoked the Mahrattas to revolt. He added Bejapoor and Golconda to his empire, and was one of the most powerful of the Mohammedan monarchs of India. His long reign was a period of outward and specious prosperity, but the empire was diseased at heart, and soon entered a state of decadence, which was partly the effect of his policy, duplicity, and intolerance. Conscious of the crimes by which he obtained power, he lacked confidence in his ministers, and is said to have lived in continual fear of treachery. D. Feb. 21, 1707. See Elphinstone, *History of India*; Bernier, *Voyages et Description de l'Empire Mogol*; J. Mill, *History of British India*.

Au Sa'ble (also called *Oscoda*): city and railroad junction, Iosco co., Mich. (for location of county, see map of Michigan, ref. 5-J); on Det., Bay City and Alpena R. R. and Au Sable and Northwestern R. R., and on Saginaw Bay, Lake Huron; 50 miles N. E. of Bay City. It has lumbering, salt-making, farming, and fishing industries. Pop. (1880) 1,328; (1890) 4,328; (1900) 1,116.

Auscul'tion [Lat. *auscul'tio*, listening; from *auscultare*, listen; cf. *auris*, ear, *auricula*, external ear]; the method of determining the condition of the heart and lungs by the sounds heard on applying the ear to the chest-walls, which was introduced by the celebrated French physician LAENNEC (*q. v.*) early in the nineteenth century. Some few observations had been made before his time, notably by Auenbrugger, of Vienna, who in 1761 introduced the art of PERCUSSION (*q. v.*), and by the French physician Piorry (*q. v.*), who invented the pleximeter, but it is to Laennec and particularly to his application of a hollow tube or STETHOSCOPE (*q. v.*) that we are indebted for the accuracy of auscultative processes. The diagnosis of pulmonary and cardiac diseases now rests very largely upon auscultation, and furthermore by this method much has been learned of the successive stages of various diseases, their progress, and the like.

Aus der Ohe, ADELE: See the Appendix.

Auso'nus, DECIMUS MAGNUS: an eminent Latin poet; b. at Burdigala (Bordeaux) about 310 A. D. He was liberally educated, practiced law in his early life, and gained distinction as a professor of rhetoric at Burdigala. In 364 A. D. he was appointed tutor to Gratian by the Emperor Valentinian. He held several high offices under the reign of Gratian, who raised him in 379 to the dignity of consul. He was a convert to Christianity, but better acquainted with the classical poets than with the Bible. He wrote epigrams, epistles, idyllia, etc., which were admired by his contemporaries, but display little genius, and are very faulty in style. His most happy performance is a description of the river Moselle in epic measure. D. about 394 A. D. See editions by K. Sehenkl (Berlin, 1883) and R. Peiper (Leipzig, 1886); of the Mosella alone by De Mirmont (Bordeaux, 1889). There is a German translation (Trier, 1885). M. WARREN.

Au'spices [from Lat. *auspicium*, for **avi-specium*, the observing of birds; *avis*, bird + *spec-*, observe]; among the ancient Romans, divinations founded on the flight of birds or other omens, by which the augurs or soothsayers professed that they could ascertain the will of the gods and predict events. (See AUGUR.) No important enterprise or business was undertaken without consulting the auspices. In performing this ceremony the augur with a wand marked out a portion of the sky for his observations, which portion, called a *templum*, was divided into right and left. If the birds appeared on the right hand, the omen was favorable; if they flew toward the left (*ad sinistram*), it was unfavorable. The chief magistrates also had the right to conduct this ceremony, and the commander of the army in time of war had the exclusive power of taking the auspices. If a victory was gained by his legate or lieutenant, it was said to be won under the auspices of the general-in-chief. Thus originated the common English phrase, "under the auspices" of some one. In such cases "auspices" signifies influence, patronage.

Aus'sig: an Austrian town; in Bohemia; on the Elbe; 46 miles W. N. W. from Prague (see map of Austria-Hungary, ref. 2-D); has coal mines in the vicinity, and manufactures of linen, gold, and silver work. Pop. (1880) 16,524; (1891) 24,083.

Aus'ten, JANE: authoress; b. at Steventon, in Hampshire, England, Dec. 16, 1775. She was educated by her father, who was rector of Steventon, and after his death she lived at Southampton and Chawton. Her first novel, *Sense and Sensibility*, appeared anonymously in 1811. She afterward produced *Pride and Prejudice* (1813), *Mansfield Park* (1814), *Emma* (1816); *Northanger Abbey* (1818), and *Persuasion* (1818); the first three were anonymous. These works represent with great fidelity the ordinary life of the middle classes of England. Many consider them the best novels ever written by a woman. D. at Winchester, July 18, 1817. See her memoir by her nephew, J. E. Austen Leigh; *The Story of Jane Austen's Life*, by O. F. Adams; and studies by Miss Thackery (*Book of Sibyls*), Mrs. Charles Malden (1889), and Goldwin Smith (1890).

Aus'terlitz: a small town in Moravia; on the Littawa; 12 miles E. S. E. of Brünn (see map of Austria-Hungary, ref. 4-F). It has a fine castle. Pop. about 3,000. It is celebrated as the scene of a great victory which Napoleon I. gained over the combined armies of Austria and Russia, commanded by their respective emperors, on Dec. 2, 1805. Napoleon had taken Vienna about Nov. 12, after which he fixed his headquarters at Brünn, where he had about 75,000 men. The armies of the allies, amounting to about 85,000, advanced in five columns to offer battle to the French, who occupied high ground partly covered by wooded eminences, morasses, and small lakes. The battle began about 7 A. M., when the allies attempted to turn the right wing of Napoleon, who attacked them in flank and at various points with great advantage. While a portion of the allied army was retreating across a frozen lake, the ice was broken by the French artillery, and nearly 2,000 men perished in the water. The allies lost about 30,000, killed, wounded, and prisoners, and the French about 12,000. Among the results of this victory was the treaty of Presburg, Dec., 1805.

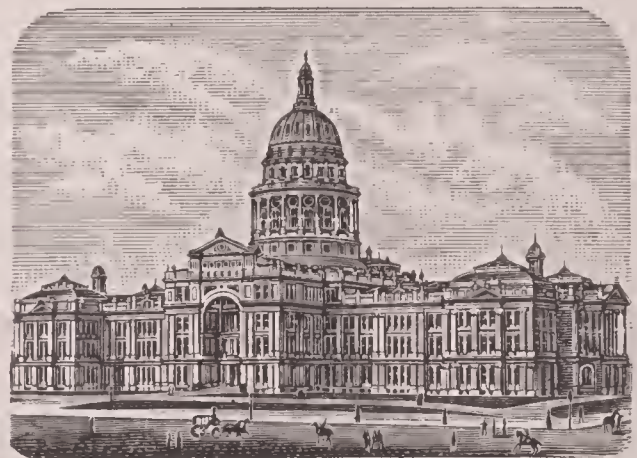
Austin: city and railroad junction; capital of Mower co., Minn. (for location of county, see map of Minnesota, ref. 11-F); on Red Cedar river. Austin has a fine court-house, a beautiful opera-house, water-works, a board of trade, railroad shops, canning and preserving factory, pressed-brick works, flouring-mills, plow-factory, foundry, machine shops, creamery, marble-works, two newspapers, etc. Pop. (1880) 2,305; (1890) 3,901; (1900) 5,474.

H. O. BASFORD, PUBLISHER OF "REGISTER."

Austin: city on railroad; capital of Lander co., Nev. (for location of county, see map of Nevada, ref. 5-H); on the eastern slope of the Toyabe range of mountains. There are several quartz-mills and many rich silver mines here. Pop. (1870) 1,324; (1880) 1,679; (1890) 1,215; (1900) 702.

Austin: borough, Potter co., Pa. (for location of county, see map of Pennsylvania, ref. 2-E); on Sinnemahoning Valley R. R.; 13 miles from Coudersport, the county-seat. It is in a farming district, and was organized in 1888 from part of Portage township. Pop. (1890) 1,679; (1900) 2,300.

Austin: city and important railroad center; capital of Texas and of Travis County; in lat. 30° 16' 25" N., lon. 97°



State Capitol, Austin, Texas.

43° 58' W. (for location of county, see map of Texas, ref. 5-H); on the left bank of the Colorado river, which is a clear and beautiful stream, but is not navigable. Austin is

surrounded by fine scenery, and became the capital of the republic of Texas in 1839; was chosen capital of the State in 1850, and in 1872 was made the permanent capital by vote of the people. The Colorado river is here spanned by two fine bridges.

Austin was originally built on a beautiful plateau in the bend of the river, but now extends back from the original front about 2 miles and along the river about 2½ miles.

Streets and Avenues.—It is intersected by two central avenues 120 feet wide, extending from the Capitol grounds (about 10 acres, situated on Capitol Hill, a beautiful eminence near the center of the city proper) E., W., N., and S. to the original city limits, which are bounded E. and W. by avenues 200 feet wide. Most of the other streets are 80 feet wide, and none less than 60 feet. The principal streets are shaded, and the hills and valley studded with live-oaks and other forest trees.

Public Buildings.—The old Capitol, which was destroyed by fire, has been replaced by a magnificent stone edifice, for the cost of which 3,000,000 acres of State lands have been appropriated. The chief public buildings besides the Capitol are the temporary State-house, the post-office, general land-office, and graded-school building (all handsome and commodious stone edifices), the asylum for lunatics, mutes, and blind, and the Governor's mansion. The State University, a fine brick building, is on College Hill, in the northern part of the city. Pop. (1870) 4,428; (1880) 11,013; (1890) 15,700; (1900) 22,258. The dam, 1,200 feet long, 60 feet high, and 60 feet thick at base, across the Colorado river at a point 2 miles above the city, furnishing 14,500 horse-power for manufacturing purposes, etc., was carried away April 7, 1900, during a flood, and caused great losses to life and property.

EDITOR OF "STATESMAN."

Austin, ALFRED: English poet; b. at Headingley, near Leeds, England, May 30, 1835; educated at Stonyhurst College and St. Mary's College, Oscott, taking his degree at the University of London in 1853; called to the bar of the Inner Temple 1857, entering the law only out of deference to his parents, being himself determined from an early age to follow literature; went to Italy in 1861, on the death of his father; published *The Season, a Satire* (1861); *The Human Tragedy* (1862); *The Golden Age* (1871); *Interludes* (1872); *Rome or Death* (1873); *Madonna's Child* (1873); *The Tower of Babel* (1874); *Savonarola* (1881); *English Lyrics* (1890); in addition to three novels, several other volumes of poetry, and numerous political articles. Appointed POET LAUREATE (*q. v.*) Jan. 1, 1896.

Austin, COE FINCH: botanist; b. at Mount Hope, Orange co., N. Y., June 20, 1831; published *Musci Appalachiani* and *Hepaticæ Boreali-Americaneæ*, and described many species of mosses and liverworts. D. at Closter, N. J., Mar. 18, 1880.

Austin, JOHN: jurist; b. at Creting Mill, Suffolk, England, Mar. 3, 1790; called to the bar in London 1818; became the intimate friend of Jeremy Bentham, James Mill, and other influential persons; was Professor of Jurisprudence in the University of London 1826-32, but his public life was, on the whole, a failure. His fame rests on his *Province of Jurisprudence Determined* (London, 1832; 5th ed. 1885). D. at Weybridge, Surrey, Dec., 1859.

Austin, SAINT: See AUGUSTINE, SAINT.

Austin, SAMUEL, D. D.: Congregational minister; b. at New Haven, Conn., Oct. 7, 1760; graduated at Yale in 1783; became pastor at Fair Haven, Conn., 1786, and at Worcester, Mass., 1790; president of the University of Vermont 1815, resigned 1821. D. at Glastonbury, Conn., Dec. 4, 1830.

Austin, SARAH: English writer and accomplished translator; a member of the eminent Taylor family of Norwich; b. there in 1793. She was married in 1820 to John Austin, a barrister of London (*q. v.*). She wrote, besides other works, *Characteristics of Goethe* (from the German of Falk, 3 vols., 1833), which was very successful, and *Sketches of Germany from 1760 to 1814*. She produced a good translation from the German of Prince Pückler-Muskau's *Tour in England* (1832), and also one of Ranke's *History of the Popes* (3 vols., 1840), which was highly commended by Macaulay. D. at Weybridge, in Surrey, Aug. 8, 1867.

Austin, STEPHEN F.: b. about 1790; was a son of Moses Austin, a pioneer born at Durham, Conn. About 1821 he conducted a company of emigrants from New Orleans, and planted a colony where the city of Austin now stands. His

father emigrated to Texas about 1820, and obtained a land-grant and permission to plant a colony in that province; this grant was confirmed to the son in 1822 or 1823. Early in 1833 the Texan colonists formed a constitution, to obtain a ratification of which Austin and other delegates went to the city of Mexico. In consequence of the frequent revolutions and anarchy of Mexico, they did not obtain the admission of Texas into the confederacy. In 1835 Austin was chosen commander of the Texan army, and joined in the movement for the liberation of Texas. He went as a commissioner to the U. S. to obtain the recognition of Texas as an independent State. D. in Texas, Dec. 27, 1836. See Yoakum, *History of Texas*, 1856.

Austin, WILLIAM: lawyer and author; b. at Charlestown, Mass., Mar. 2, 1778; author of *Letters from London* (Boston, 1804); *An Essay on the Human Character of Jesus Christ*; *Peter Rugg, the Missing Man*, a legendary story published in the *New England Galaxy* (1824-26), etc. D. in Charlestown, Mass., June 27, 1841.

Austin, WILLIAM PIERCY, D. D., Oron., LL. D., Cantab.: Lord Bishop of Guiana and Primate of the West Indies; b. at Stone, Staffordshire, England, Nov. 7, 1807; consecrated Bishop of Guiana Aug. 24, 1842. D. Nov. 9, 1892.

Australasia (i. e. Southern Asia): the islands of the Southern Pacific, with Australia. It includes (1) Australia and Tasmania, area, 3,056,986 sq. miles, pop. 3,330,000; (2) New Guinea group, area, 313,000 sq. miles, pop. 837,000; (3) New Zealand group, area, 104,000 sq. miles, pop. 620,000; (4) Melanesia, including the Bismarek archipelago, Solomon islands, New Caledonia, Fiji, and others, area, 57,000 sq. miles, pop. 642,000. The total land area is about 3,531,000 sq. miles, and population 5,429,000, consisting in part of a brown Polynesian race, in part of black Papuans and Australians, in part European immigrants and some Malays. Great Britain claims all of (1) and (3), about one-third of (2), and about one-fifth of (4). The remainder are divided among the Germans, Dutch, and French, very little of the area being now without at least a nominal "protector." In 1899 a federation of British Australasian colonies was decided upon, to be called The Commonwealth of Australia.

Australia. aw-s-trā'li-a (formerly **New Holland**): the largest island on the globe; sometimes reckoned as a fifth continent; derives its name from its geographical location (*austrā'lis*, "southern"). Lying to the S. of Asia, between lat. 10° 39' and 39° 11' S., and 113° and 153¼° E. lon., its area is about 3,000,000 sq. miles. From E. to W. it is 2,500 miles, and from N. to S. 1,600 miles. The coast-line is indented by singularly few bays, except on the northern shore, which has the great Gulf of Carpentaria.

Geology and Physical Features.—The peculiar features of Australia suggest the probability of its having been at no remote period the bed of an ocean. In general it may be said to be dish-shaped, having a low-lying interior with comparatively elevated table-lands of sandstone formation at an average distance of about 30 miles from the coast, and with an altitude of from 1,000 to 3,000 feet. These table-lands are traversed in some places, principally in the east, by mountains, which are, however, of insignificant height, that of the highest summits being only about 7,000 feet above the sea-level. The principal mountains of the continent extend along its eastern side in a broken series from Cape York on the north to Wilson's Promontory on the south. Mt. Kosciusko, in the Warragong or Australian Alps of New South Wales, is the culminating point of the continent, and has an altitude of 7,308 feet. The geological formations are chiefly Palæozoic, Tertiary, and Secondary, broken by intrusions of granite, trap-rock, syenite, etc. Tertiary deposits are found in Victoria and on the west coast, while absent in Eastern Australia. Granite occurs largely along the coast and in the east drifts, and igneous rocks are found with fragments of palæozoic strata. In the interior occur great deposits of animal bones. In the district north of Spencer Gulf (called the "lake district of Australia") and elsewhere in the interior are numerous salt lakes, and some whose waters are fresh. Most of them vary in size with the season, becoming in the dry season shallow or nearly dried up. There are no active volcanoes, but numerous extinct ones are found in South Australia and in Victoria, the craters of many of which are now the basins of beautiful lakes. Australia's principal and only great river, the Murray, 1,100 miles long, is navigable in the interior, but its outlet where it empties into the Southern Ocean is a shallow lagoon. The Victoria, in the northwest, runs in a deep channel



AUSTRALIA

Scale of Miles
50 100 200 300 400

173 A 163 B 163 C 150 D Longitude West 153 from



through cliffs 300 feet high. Other rivers are the Glenelg, flowing through a fertile country and partially navigable, the Prince Regent, Brisbane, Richmond, Clarence, Hunter, Hawkesbury, Swan, Roper, Albert Murrumbidgee, and Darling. In periods of drought many of these streams dwindle into a chain of "water-holes." In Southeastern Australia, extending from the "lake district" on the W. to the mountains on the E., and from the coast far into the interior, is a vast region of grassy highlands covered with scattered heath, scrub, and thin forests of magnificent trees, and intersected by broad valleys. This immense district, which is drained by the Murray and its tributaries, has great areas of deep black soil of remarkable fertility. In ordinary seasons these tracts are covered with a luxuriant vegetation and furnish sustenance to great numbers of sheep, cattle, and horses. In a year of drought the grass and herbage, ordinarily so abundant, is dried up by the fierce heat, and the cattle and sheep die by the hundreds of thousands, and even the native animals perish of starvation. Extensive attempts are being made to insure a proper water-supply by the establishment of irrigation colonies. There are two of these (those of Mildura in Victoria and of Renmark in South Australia) on the banks of the river Murray, from which they derive the water for purposes of irrigation. There are about 500,000 acres in these colonies, on which the founders have spent about \$1,350,000 and the settlers \$500,000 more. The population numbers over 3,000, and is rapidly increasing. The seepage system of irrigation is employed, and the results obtained have proved highly satisfactory. In other places than these water for irrigation has been obtained from artesian wells, many of which have been bored. The flow from two wells alone is estimated to be about 5,000,000 gal. daily. The western half of the south coast of Australia is low and sandy, the west coast is skirted by detached mountain-ranges with intervening fertile valleys, and the northern coast is in many parts low and swampy. Of the great western interior, however, comparatively little is known, exploration being rendered almost impossible by the lack of water.

Climate.—In general the climate of Australia is warm and dry and very salubrious. Southern Australia gets little rain, while Victoria and New South Wales and parts of Queensland have from 32 to 44 inches annually. In the tropical regions there are but two seasons, the wet and the dry; but in the other portions of the continent the four seasons of the temperate zone are distinctly marked. Here the seasons of America and Europe are reversed, January and February being the hottest months of summer, and July the coldest of winter. Inland on the vast dry plains the heat rises to the height of 100° to 140° in the shade, while the coast-regions are quite temperate, with a mean annual temperature of 58° to 62°. Protracted droughts and violent floods characterize Australia, which has a marked poverty of permanent fresh-water reservoirs.

Soil and Productions.—The part of Australia lying in the tropical regions has forest products of great luxuriance, while the highlands, almost bare of trees, abound in pasture grass and herbaceous vegetation. The dry climate in the N. favors evergreen growth, while there is a marked absence of mosses and lichens. Of the eucalyptus, or gum-tree, 400 species are found, some being 150 to 200 feet high, with stately trunks. About 10,000 species of indigenous Australian plants are described, but none of the cereals and few of the esculent fruits or roots are natives of the soil. Cattle are abundantly raised by herdsmen. The marsupial animals predominate among the Australian mammals. There are found the kangaroo, opossum, flying squirrel, bear, wild dog, etc., but no ruminant beasts. The duck-billed platypus is peculiar to Australia, and forms a connecting link between quadrupeds and birds. Nothing similar to it exists in any other part of the world. The birds embrace near 700 species, among which are the white eagle, black swan, parrot, emu, lyre-bird, honey-eater, etc. Saurians or lizards are numerous. Food-fish abound, several species being peculiar to Australia. Gold was discovered in 1851 in Victoria and New South Wales, and later in Queensland. The annual value of gold exports was \$28,000,000 for the years 1888-90. Victoria alone has produced an aggregate of \$1,100,000,000 in gold. Large coal-fields exist, also profitable copper, iron, and lead mines. Wool is a great staple of Australia, sheep-farming being easy and profitable. Cotton, wheat, sugar, and tobacco are produced, and the grape flourishes. Aggregate exports reach nearly \$265,000,000 annually; total imports, \$301,000,000.

Weights and Measures.—The same as in Great Britain.

Inhabitants.—The aborigines of Australia, though similar to the Africans in thick lips, flat noses, etc., are lighter in color, being dusky brown, and have well-shaped limbs and straight or curly black hair. Their intelligence is of a low order; their knowledge of mechanic arts very slight. They build no permanent dwellings, but only hovels. The sole dress is a single garment, the skin being tattooed. Their hatchets are of stone, with spears and axes of hard wood, as is their peculiar weapon, the boomerang. The tribal relation exists and cannibalism is said to prevail among some tribes. They have no religion beyond believing in the god Buddai, a giant sleeping for ages, whom they expect some day to awake and eat up the world. The native Australians are computed at about 31,000. The rapidly increasing European population is almost wholly British, who have founded thriving settlements.

History.—Australia was first discovered by the Dutch and Spaniards in 1601 to 1606. Capt. Cook in 1770 explored the eastern coast, and took possession of the country for the British Government. In 1788 the first settlement of New South Wales began, Botany Bay following as a penal colony of Great Britain. Western Australia was set apart in 1829, Southern Australia in 1834, Victoria in 1851, and Queensland in 1859. Explorations of the almost unknown interior were conducted by Sturt in 1828-45; Leichhart (who never returned) in 1844; Stuart, 1858; Warburton, 1873; and Winnicke in 1883, proving that the unexplored interior is more fertile than previously believed.

Federation.—The union of the Australian colonies was proposed as early as 1850, and when the Dominion of Canada was established in 1867, the subject was again discussed. A Federal Council was established in 1883; but this was simply an advisory body. New South Wales refused to join in its deliberations from the first, and South Australia subsequently withdrew. The Russian scare, in 1890, gave fresh impetus to the movement, and a conference was held in Melbourne, followed by a convention in Sydney, in 1891, at which the first commonwealth bill was drafted. This bill was submitted to the local parliaments, but failed of adoption. After many conventions and compromises an agreement was reached, and a bill for the federation of the colonies was presented to the British Government in January, 1900. The bill was passed, with amendments, May 15, and the Earl of Hopetoun was appointed to be the first Governor-General of the Commonwealth of Australia, which dates from Jan. 1, 1901. The Constitution provides for a Federal Parliament consisting of a Governor-General, appointed by the sovereign, and a Senate and a House of Representatives, elected directly by the people. The judicial power is vested in the High Court of Australia, and in such minor federal courts as the Parliament may create. A uniform postal and telegraph service, government control of the railways, national defense, and a common tariff are provided for. The Constitution is modeled very closely on that of the United States.

Political Divisions.—Australia is divided as follows:

COLONIES.	Sq. miles.	Pop.
New South Wales, 1891.....	310,700	1,134,207
Queensland, 1891.....	668,497	393,718
South Australia, 1891.....	903,690	215,048
Victoria, 1891.....	87,884	1,140,411
Western Australia, 1891.....	1,060,000	49,782
Totals.....	3,030,771	3,033,166

Austra'sia: the eastern dominions of the Franks under the Merovingians; made a kingdom by Clovis, 511 A. D., comprising the present Lorraine, Belgium, and adjacent territory. It was merged in the empire of Charlemagne.

Aus'tria, Archduchy of: the nucleus around which the Austrian empire has grown. Area, 12,285 sq. miles. It is bounded N. by Bohemia and Moravia, E. by Hungary, S. by Styria, and W. by Bavaria. Pop. of Upper Austria in 1890, 785,831; of Lower Austria, 2,661,790. Both provinces are mountainous and abound in beautiful scenery. The Noric Alps extend along the southern boundary, and the northern parts of the archduchy are occupied by mountains called the Böhmerwald.

Austria-Hungary: an empire situated in the southeastern part of Europe between lon. 9° and 26° E., and lat. 42° and 51° N. It forms an irregular but compact region, surrounded on all sides by other countries, except where it bor-

ders the Adriatic. It is bounded W. and N. by the German empire, N. E. by Russia, E. and S. by the Danubian provinces and Turkey, S. W. by the Adriatic Sea, Switzerland, and Italy. Exclusive of Bosnia and Herzegovina, it has an area of 240,942 English sq. miles, ranking third in point of extent among the countries of Europe. Much of the territory is nearly as mountainous as Switzerland. The Alps extend over the southwestern portion, while the Carpathians, scarcely less in picturesqueness or importance, extend, in the form of a bow, along the northeastern portion for a distance of more than 600 miles. The valley of the Danube and its tributaries constitute a vast and fertile region of great importance. The Danube, with the exception of the Volga the largest river in Europe, has a course of about 820 miles within the country, and during nearly all of this distance is navigable for the largest vessels. The numerous tributaries of the Danube also form important waterways for commerce. Along the foot of the mountains there are numerous lakes and marshes. No other country in Europe contains so many or so valuable mineral springs. These are no less than 1,500 in number, the most celebrated of which are Karlsbad, Marienbad, Franzensbad, Teplitz, and Seidlitz. The climate, owing to the great differences of elevation, is extremely various. In the south grapes, Indian corn, and olives are among the most important products; while in the province of Dalmatia plants of a tropical nature flourish in the open air. In the middle zone the winters are colder and the summers hotter. The vine and maize are here cultivated only in favored situations, while wheat and oats are more generally grown. In the northern portion, embracing Bohemia, Moravia, Silesia, and Galicia, the winters are long and cold; grapes and maize are no longer grown, the principal crops being wheat, oats, rye, barley, hemp, and flax. In the Alps the rainfall sometimes reaches 60 inches; the average is from 20 to 24 inches; while on the plains of Hungary it is often as low as 16. The flora, owing to the great variety of soil and climate, is extremely various, ranging nearly all the way from the plants of the tropics to those of the arctic zone. It is estimated that the number of species is no less than 12,000. There are 90 species of mammals, 248 of birds, 377 of fishes, and more than 13,000 of insects.

Area, Population, and Religion.—The following table gives the area of the several provinces forming the empire, with the number of the inhabitants on Dec. 31, 1890:

PROVINCES OF THE EMPIRE, or CROWN-LANDS.	Sq. miles.	Pop. Dec. 31, 1890.
Lower Austria	7,654	2,661,799
Upper Austria	4,631	785,831
Salzburg	2,767	173,510
Styria	8,670	1,282,708
Carinthia	4,005	361,008
Carniola	3,856	498,958
Littoral	3,084	695,384
Tyrol	11,324	928,769
Bohemia	20,060	5,843,094
Moravia	8,583	2,276,870
Silesia	1,987	605,649
Galicia	30,307	6,607,816
Bukowina	4,035	646,591
Dalmatia	4,940	527,426
Hungary, including Transylvania	108,258	15,232,159
Croatia and Slavonia	16,773	2,200,977
Town of Fiume	8	30,337
Bosnia and Herzegovina	23,262	1,404,000
Totals	264,204	42,762,886

The population of Austria-Hungary is made up of a number of distinct races. Of these the Germans number only a little more than 9,000,000, while the Slavonians amount to as many as 17,400,000; the Magyars or Hungarians about 6,000,000; the Wallachians, 3,000,000; the Jews, 1,106,000; the Italians, 515,000. The Gipsies, Armenians, Bulgarians, Albanians, and Greeks make up the rest. About two-thirds of all the people profess the Roman Catholic religion. The Greek Catholics number about one-tenth of the entire population. Of Protestants there are about 375,000 in Austria proper, and 3,400,000 in Hungary. The statute of May 25, 1868, secures the substantial independence of the Church as regards the state, full liberty of faith and conscience, and the independent enjoyment of civil and political rights. Every religious body, legally recognized, has the right of ordinary public worship, the management of its own affairs, and the undisturbed possession of its own premises and endowments. In Hungary there is perfect religious equality, each religious denomination having the independent organization of its own affairs.

Products.—Agriculture is at the head of the industries of the country. Much attention is paid to the raising of cattle, but except in the Alpine regions the breeds are inferior. The country is distinguished, however, for the number and superiority of its horses. The finest and most beautiful horses are said to be found in Transylvania, while the largest and most powerful come from the vicinity of Salzburg. In the southern parts of the country horses are less numerous, and mules and asses very generally take their place. The productive land of Austria is estimated at 89.6 per cent., while that of Hungary is 84.4, making 86.9 per cent. for the whole country. This great percentage is owing largely to the systematic care of the forests, which occupy one-third of the productive area. The forests very generally belong to the state, and they are carefully managed by the boards known as the Administrators of Forests and Domains, the Direction of Forests and Domains, and the Ministry of Agriculture. It is estimated that the forests yield annually more than 27,000,000 cords of building-timber and firewood, much of which is exported. Of the standard crops the amounts produced are in the order of oats, rye, barley, and wheat. The crop of the sugar beet is in amount about two-thirds that of potatoes. In Hungary the products of wine and silk are large. Many of the Hungarian wines are of superior quality. The various mining industries of Austria-Hungary give employment to somewhat more than 150,000 persons. Coal is found in abundance. There is also a large supply of iron ore. Mines are successfully worked, producing silver, lead, zinc, and quicksilver. The exports of the country, valued in millions of florins, were in 1899: Grain, 69.6; timber, 85.3; sugar, 67; cattle and horses, 35.9; glassware, 11; coal, 36.3; wool, 8.8; gloves and shoes, 24.2; bed feathers, 9.2; fowls, 6.9; eggs, 39.9; beer, 6.9.

Education.—The educational organization of the country consists of: (1) Elementary schools; (2) gymnasia and Real schools; (3) colleges and universities; (4) technical schools; (5) schools for special subjects. In the elementary schools attendance is compulsory from the beginning of the seventh year to the end of the fourteenth. The subjects taught in these schools are prescribed, and embrace religion, reading, writing, language, arithmetic, elementary geometry, natural history, physics, geography, history, drawing, singing, gymnastics, and, for girls, domestic duties. The cost of maintaining the primary schools is defrayed in different ways by the local communities, in very few cases by the general Government. The gymnasia and Real schools are designed to give preparation for the universities and the technical schools respectively. The curriculum of the gymnasium extends over eight years; that of the Real schools over seven. They are maintained partly by the state, partly by the separate provinces, and partly, as in the case of the Church schools, by ecclesiastical foundations. In Austria proper there were in 1891 172 gymnasia and 78 Real schools; in Hungary, 158 gymnasia and 30 Real schools. In all the gymnasia there were in 1889 86,269 pupils, and in the Real schools 25,034. In the empire there are eleven universities, each having the four faculties—theology, law, medicine, and philosophy. In 1890–91 there were in all the universities 17,680 students, and 1,477 professors and instructors of subordinate grade. In the University of Vienna there are usually about 5,000 students. There are seven Government technical high schools, and no less than about 2,000 special technical training schools of lower grade for training in agriculture and all kinds of art, music, mining, commerce, and trade. Schools of this grade have about 150,000 pupils. There are 138 agricultural schools; 6 veterinary schools; 99 forestry schools; 9 art schools; 5 mining schools; 5 nautical schools; and 277 music schools. By the Trade Law of 1884 every commune, where there are 50 or more apprentices, is bound to provide a school for special technical instruction. Nearly 90 per cent. of the children of school age are in attendance at school.

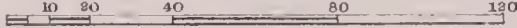
Government.—The present Constitution of Austria-Hungary was adopted in 1867. It recognizes the existence of two states, united politically under one crown, but for local purposes quite independent. Those parts of the Government which are commonly associated with the prerogatives of monarchy are common to Austria and Hungary. These include (1) foreign affairs; (2) military and naval affairs; (3) finance; (4) defense; (5) coinage. The headship of the common monarchy is hereditary in the Habsburg-Lothringen dynasty, the official title being "Emperor of Austria, King of Bohemia, and King of Hungary." The monarch exercises legislative authority, with the "co-operation and consent of the representative bodies." These consist of the Imperial Par-





AUSTRIA-HUNGARY

Scale of Miles



liament (the Reichstag and the Reichsrath) and the provincial Parliaments. The two bodies of the Imperial Parliament, known as the Delegations, consist each of sixty delegates, twenty having been chosen from each of the Upper Houses of the Austrian and the Hungarian Parliaments, and forty from the Lower. The Austrian and Hungarian delegates legislate separately, communicating with each other in writing; but in case of disagreement, after three such interchanges, all come together and vote without discussion. The meetings are held annually and alternately at Vienna and Budapest. The ministry is responsible to the Delegations, and may be impeached. The departments of the united monarchy are the Ministry of Foreign Affairs, the Ministry of War, the Ministry of Finance. The Parliament of Austria, as well as that of Hungary, consists of an Upper and a Lower House. The Upper House in Austria is made up of the imperial princes (in 1900), 19 in number; of 67 nobles, possessing large estates; of 10 archbishops and 8 bishops; and of such men, distinguished in art or science, as may be appointed for life by the emperor. Of this class, the number in 1900 was 136. The Lower House consists of 425 members, elected, partly directly and partly indirectly, by vote of all citizens twenty-four years of age and possessing a small property. In this House 85 members represent the landed proprietors; 118 represent the towns; 21 the chambers of trade and commerce; 129 the rural population, and 72 are elected directly by the people. In Hungary the Upper House consists of all hereditary peers who pay a land tax of 3,000 florins or more; 40 dignitaries of the Catholic Church; 11 representatives of the Protestant confessions; 82 life peers appointed by the crown; and 17 state dignitaries, *ex officio*. The Lower House is composed, according to the law of 1889, of 453 members, elected for five years by all male citizens twenty years or more of age who pay a small annual tax. The army is founded on the principle of universal military service, beginning at the age of twenty-one and continuing three years for active service and seven years for the reserve. The annual contingent of recruits is about 103,100. The peace footing of the army in 1899 was 361,693; the war footing, 1,872,178. The navy in 1899 consisted of 115 ships, of which 25 were armor-clad.

History.—The empire took its rise from the margraviate founded on the south side of the Danube in the time of Charlemagne, and received its name *Ostreich* (eastern country) from its geographical relations with the rest of Germany. It continued under the rule of a margrave till 1156, when, the territory west of the Enns having been added, it was raised to a duchy. In the course of the next three hundred years it received further accessions of territory, and became an archduchy in 1453. The Habsburg dynasty, which still occupies the throne, was introduced in the thirteenth century. In 1283 Albert became sole ruler not only of Austria, but also of Styria and Carniola. From the accession of Albert to the Reformation the history of Austria was an exceedingly turbulent one; but from time to time considerable territorial additions were made. The Archduke Albert V., having married the daughter of the Emperor Sigismund, obtained the thrones of Bohemia and Hungary, and became emperor in the year 1438, as Albert II. It was his son Maximilian who, by marrying a daughter of Charles the Bold, acquired the Netherlands, and transferred the empire with these new acquisitions to Philip the Fair. Philip was married to Joanna, the daughter of the Spanish monarchs Ferdinand and Isabella, and their son, the celebrated Charles V., inherited not only Austria and the Netherlands, but also the vast possessions of Spain. The extent of these territories so strengthened the influence of the Austrian princes that they were able from that time on to secure for themselves the election to the imperial throne of Germany. In the Thirty Years' war Austria represented the interests of the Catholics. In the war of the Spanish Succession and the Seven Years' war the country also played leading parts. In opposition to the demands of Frederick the Great, the claims of Austria were upheld with great skill and power by Maria Theresa. When Napoleon I. came into power Austria took a conspicuous part, and was repeatedly defeated. When in 1806 Napoleon inflicted the fatal blow on the old German empire of creating the Confederation of the Rhine, and thus alienating from the empire about 16,000,000 of the people, the Emperor Francis renounced the imperial crown, and by that act practically dissolved the old empire. The events that resulted in the fall of Napoleon, however, did much to re-instate Austrian influence. In the new German empire there

was no emperor, but Austria became entitled to the presidency of the Diet, and in this way acquired a predominant influence. This continued until the war with Prussia in 1866, when Austria was overwhelmingly defeated at the battle of Königgrätz, and the Constitution of the empire was in consequence so remodeled as to give the dominant influence and authority to Prussia. Since 1866 Austria, though excluded from the German Confederation, has occupied an independent and influential position in the international affairs of Europe. Internal affairs have not been free from turbulence and difficulty. The revolution which swept over Europe in 1848 shook the Government of Austria to its foundations. After the downfall of Napoleon the conservative reaction under the powerful influence of Metternich swept everything before it. The revolution in Vienna followed immediately after that of Paris. Metternich was driven into exile. A long period of civil strife followed, in which Hungary took a leading part. The Austrian troops were repeatedly defeated by the Hungarians, and it was only when Russia joined Austria that the national cause became successful. It was not until Austria was defeated by Prussia in 1866, however, that the emperor consented to the adoption of a Constitution that would satisfy the demands of the people. In May, 1867, the new Constitution was adopted, and on June 8 the emperor and empress were crowned King and Queen of Hungary.

C. K. ADAMS.

Austrian Succession, WAR OF: See SUCCESSION WARS.

Autochthones [Gr. *αὐτόχθων*, of the land itself; *αὐτός*, self + *χθών*, earth]: literally those sprung from the land itself; hence the original inhabitants of a country. The Athenians claimed to be autochthones, and wore on their headdress an emblematic grasshopper, in reference to their origin. The same claim was made by many other peoples.

Au'to-de-Fé [Span., act of faith. The form with *-da-* is Portug.]: the name given in Spain and Portugal originally to the public announcement of the sentence passed by the Inquisition against heresy; later, the execution of that sentence by burning at the stake. High church days by preference were chosen for the deed. Multitudes of spectators assembled to witness the execution and the procession of monks and priests which formed a part of the ceremony. The first to take place was at Seville, under inquisitors appointed by Ferdinand V., Jan. 6, 1481; the last probably was in Mexico, 1815. In 1761 an auto-de-fé was held at Lisbon, at which upward of fifty persons perished. See INQUISITION.

Au'tograph [Gr. *αὐτόγραφον*, written by oneself; *αὐτός*, self + *γράφειν*, write]: a manuscript, usually a signature, written by the person himself; an original manuscript as distinguished from a copy. In modern times many persons devote much time to the collection of autographs, which are articles of trade. Some men study autographs as exponents of the character or temperament of the writers. See John G. Nichols, *Autographs of Royal, Noble, Learned, and Remarkable Personages Conspicuous in English History from the Reign of Richard II. to that of Charles II.* (1829); and *Isographie des Hommes Célèbres* (Paris, 3 vols., 1828-30).

Antol'yus (in Gr. *Ἀντόλυκος*): a Greek astronomer and mathematician; b. at Pitane, in Æolis; flourished about 325 B. C. He wrote a work on the revolving sphere, and another on the rising and setting of the fixed stars; both are extant (ed. R. Hoche, with Latin translation and commentary, Hamburg, 1877).

Automatograph: See RECORDING APPARATUS, PSYCHOLOGICAL, in the Appendix.

Autom'aton, plu. **Autom'ata** (Gr. *αὐτόματον*, neut. of adj., acting of itself): a piece of mechanism so constructed as to imitate the actions of an animal. This exercise of mechanical ingenuity is of very ancient origin. Dædalus was among the first who excelled in this art. Archytas of Tarentum, who lived about 400 B. C., is said to have made a dove that could fly. Among the most wonderful automata of modern times was the flute-player which Vaucanson exhibited in Paris in 1738. This had the form of a man, and performed with its fingers. He also produced an automaton duck which swam, dived, ate and digested barley (!), and quacked like a real duck. Kempelen constructed a famous automaton chess-player, the mechanism of which was very ingenious and complex. This automaton could beat the most of the players who tested its skill, but it was long suspected that a man was concealed in it—a Russian officer who had been

sentenced to death and escaped by this contrivance. It was afterward fully proved that the supposed skill of the automaton was due to the presence of a living man, who was concealed within the machine.

Automobile: See MOTOR CARRIAGES.

Autonomy [Gr. *αὐτονομία*, deriv. of *αὐτόνομος*, independent; *αὐτός*, self + *νόμος*, law]: the power or right of self-government; political independence. The term is used to designate the characteristic of the political condition of ancient Greece, in which nearly every city was a separate state, and the people were very tenacious of the independence and sovereignty of their respective cities. For this reason they could not form a large centralized republic.

Autoplasty [deriv. from Gr. *αὐτόπλαστος*, self-formed; *αὐτός*, self + *πλάσσειν*, shape]: an operation by which lesions are repaired by means of healthy parts being taken from the patient himself (usually from the immediate neighborhood of the lesion to be repaired), and made to supply the deficiency caused by wounds or disease. The operations for this purpose have different names, according to the parts affected, as *cheiloplastic* (the operation for the lips), *rhinoplastic* (for the nose), etc.

Autopsy: See POST-MORTEM EXAMINATION.

Autrefois Acquit, *ōtr'fwaa' āā'kee'* [Fr., formerly acquitted]: a plea by a person indicted that he has previously been tried for the same offense and acquitted.

Autrefois Convict, *ōtr'fwaa' kōn-vik'* [Fr., formerly convicted]: a plea by a defendant under the same circumstances as in the case of *autrefois acquit*, that he has previously been tried and convicted of the same offense. These pleas, if true, are a bar to the action by the rules of the common law. They are in this country established as constitutional rights, both by the U. S. Constitution and those of the respective States. The constitutional provision is that no person shall be subject for the same offense to be put twice in jeopardy of life or limb. This rule does not apply where a new trial is ordered for errors in a previous trial, nor where the judge in the course of a trial, in the exercise of a sound discretion, discharges the jury, so that there is no acquittal nor conviction. In each of these cases the accused may be tried again as often as the case arises. In a legal sense he has not been in jeopardy. The rule upon this point is the same in England under the common law as in the U. S. under constitutional provisions.

Autumn [Lat. *autum'nus*]: the season of the year which follows summer, sometimes, especially in the U. S., called *fall*, in reference to the fall of the leaves. In a vague and popular sense it comprises September, October, and November. In the language of astronomy it is the time which elapses between the autumnal equinox and the winter solstice. In the southern hemisphere, March, April, and May are the months of autumn. Autumn may be regarded as occupying the same relative position among the seasons of the year as evening among the periods of the day, and mature age among the stages of human life.

Autun, *ō'tūn* (anc. *Bibracte* and *Augustodunum*): a city of France; department of Saône-et-Loire; on the river Arroux; 26 miles by rail N. W. of Châlons-sur-Saône (see map of France, ref. 5-G). It is picturesquely situated at the foot of mountains, has a fine Gothic cathedral, a college, and library; also manufactures of cloth, paper, and carpets. It is the seat of a bishop. The ancient Bibracte was the chief city of the Ædui. Here are ruins of an amphitheater, temples, and other Roman antiquities. Autun was the scene of hostile operations between Garibaldi and the Germans in the winter of 1870-71. Pop. (1896) 15,543.

Auvergne, *ō-vār'n'* (anc. *Arverni* or *Alvernia*): a former province in the south central part of France; coincided nearly with present departments of Cantal and Puy-de-Dôme. It is a mountainous district of volcanic formation, presenting many conical and dome-like summits of extinct volcanoes. The soil in some parts is fertile, especially near the river Allier. Auvergne has produced many eminent men, among whom were Pascal, Turenne, Desaix, and La Fayette. The chief towns were Clermont and Aurillac.

Auvergne, LATOUR d': See LATOUR D'AUVERGNE.

Auvergne, Mountains of: a branch of the Cevennes, situated in the French departments of Cantal and Puy-de-Dôme. They separate the basins of the Allier, Cher, and Creuse from those of the Lot and Dordogne. The highest summits of these volcanic mountains are Mont d'Or, 6,188

feet high; Cantal, 6,093; and Puy-de-Dôme, 4,806 feet high. The last is a remarkable specimen of an extinct volcano. They are generally like truncated cones. The scenery of Auvergne is grand and picturesque.

Auwers, *ow'vers*, ARTHUR: astronomer; b. at Göttingen, Germany, Sept. 12, 1838; became assistant in the observatory at Königsberg 1859, at Gotha 1862; succeeded Encke as astronomer of the Royal Prussian Academy of Sciences in Berlin, 1866. While still a student he began to investigate the variable proper motions of Sirius and Procyon, fixing with great precision the motions of the unseen companions around them. As president of the Astronomische Gesellschaft, he took a leading part in the great co-operative work of constructing a catalogue of more than 100,000 stars. As secretary of the German Commission on the Transits of Venus, he was the leading executive officer in fitting out the expeditions for observing those phenomena in 1874 and 1882, and in the latter year he conducted the expedition to the Straits of Magellan to observe it. His most considerable works are the discussion of the German observations of the transit of Venus (4 vols. 4to) and the re-reduction of Bradley's *Observations*, of which two volumes have appeared and a third is in press. For this and other works he has received the gold medal of the Royal Astronomical Society, and foreign membership and the Watson medal from the National Academy of Sciences at Washington. S. NEWCOMB.

Auxanometer [Gr. *αὐξάνειν*, grow + *μέτρον*, measure]: an instrument for measuring the rate of growth of plants. In its simplest form it consists of a slender arm borne by a small wheel, which is moved by a cord attached at one end to the plant, and weighted at the other. By noting the movement of the arm over a graduated arc the rate of growth may be calculated. The arm sometimes is brought in contact with a revolving drum, on which it makes its record. CHARLES E. BESSEY.

Auxerre, *ō-zār'* (anc. *Autissiodorum*): a town of France; capital of the department of Yonne, on the left bank of the Yonne; 93 miles S. S. E. of Paris, with which it is connected by railway (see map of France, ref. 4-G). It has a fine Gothic cathedral, a college, a museum, and a public library of 25,000 volumes. Calico, serge, hosiery, and good wine are manufactured here. Pop. (1896) 18,576.

Auxonne, *ō-zon'*: a town of France; in the department of Côte-d'Or, on the Saône, here crossed by a bridge: 20 miles by rail S. E. of Dijon (see map of France, ref. 5-II). It has an arsenal, a barrack, and a magazine, with manufactures of woolen cloth and nails. Pop. (1896) 6,697.

Auzoux, *ō-zoo'*, THÉODORE LOUIS: b. at St. Aubin d'Ecroville, department of Eure, France, 1797; studied medicine in Paris; invented the so-called *anatomie classique*, a method of making permanent models of anatomical preparations in papier-mâché, and wrote *Mémoire sur le Choléra Morbus* (1832); *Leçons élémentaires d'Anatomie et de Physiologie* (1839); *Des Tares molles et Osseuses dans le Cheval* (1853); *Insuffisance des Chevaux forts et légers, du Cheval de Guerre et de Luxe* (1860). D. in Paris, May 7, 1880.

A'va: former capital of Burma; on the Irawadi river, lat. 21° 52' N., lon. 96° 1' E. (see map of S. India, ref. 2-I). In 1853 the capital was transferred to Mandalay, situated a few miles to the northeast. Ava is a fortified city, being surrounded by a wall (15½ ft. high and 10 feet thick) and a moat. There is also an upper or lesser town, with a higher wall (20 feet), containing a palace and Government buildings. The circumference of the city is 5½ miles, but the houses are very thinly scattered, and some quarters are entirely destitute of habitations. The dwellings are usually mere huts thatched with grass. The city is adorned with numerous temples with gilded spires, which give it an imposing appearance from a distance. One of these temples contains a sitting image of Gautama, in sandstone, 24 feet high, and several are large, beautiful, and celebrated. There are also several large monasteries. The city at one time contained 50,000 inhabitants or more. It is now much decayed, and there are few signs of industry. Pop. probably 8,000. Ava is the political center of a district with an area of 288 miles and a population of 354,200. In this are included the cities of Sagaing and Amarapura. M. W. H.

Ava, KINGDOM OF: See BURMA.

Avalokiteshvara: See KWAN-YIN.

A'va, or **Ka'va** (*Macro'piper methys'ticum*): a narcotic plant of the natural order *Piperaceæ*; is a native of many South Sea islands, the inhabitants of which intoxicate them-

selves with a fermented liquor prepared from its root (rhi-zome). It is a shrubby plant, with cordate, acuminate leaves, and was formerly classed with the genus *Piper*. The effect of this liquor is a stupefaction like that caused by opium, and is followed by copious perspiration. The liquor is prepared by maceration in water.

Av'alanche [Fr., from *avaler*, descend, verbalized phrase *à val* < Lat. *ad vallem*, to the valley]: a mass of snow or ice sliding or rolling down a steep slope. Usually a comparatively small amount of snow, starting near the top of a slope, dislodges other portions as it strikes them, so that the moving body grows in volume as it goes. The name avalanche is sometimes applied, rather figuratively, to sliding masses of rock. Avalanches abound on the steep upper slopes of all mountains reaching above the snow-line, and are important feeders of glaciers. They occur also between the snow-line and the upper limit of timber, and in many regions they fight for territory with the forests. The avalanche can not develop among trees, but once started on a bare surface above may overwhelm and destroy trees. Usually avalanche districts are uninhabited, but in Switzerland man encroaches on them, striving by the driving of stakes and planting of trees to prevent the snow from starting.

Ava'ri, or **A'vars**: a warlike tribe of Mongolians that entered the countries near the Don, the Caspian Sea, the Volga, and westward. Part of them remained near the Caucasus, and another part proceeded about 555 A. D. to Dacia. They served in the army of Justinian, and fought against the Gepidae. They in 568 obtained Pannonia. They oppressed the Slavi, and made inroads into Germany and Italy. In 769 they were defeated by Charlemagne, and nearly exterminated. They used to intrench themselves in circular walled camps, traces of which, called "Avarian rings," are still visible in Hungary. The Avars penetrated into Greece and established colonies in the Morea. Navarino derives its name from them. (See Thierry's *Attila*.) They appear to have amalgamated with the Bulgarians, or rather to have adopted the Bulgarian language, and their descendants are confounded with the Bulgarians, of whom numbers are found throughout Greece.

Avatār', or **Avatāra** [from Skr. *avatāra*-, descent, incarnation; *ava*, down + *tar*-, pass over]: in Hindu mythology signifies "descent," or "transformation," and is applied to incarnations of some of the principal deities, especially Brahma, Siva, and Vishnu. The avatars of Vishnu, which are particularly celebrated, are reckoned as follows: 1, Matsya, the "fish"; 2, Kūrma, the "tortoise"; 3, Varāha, the "boar"; 4, Narasiṅha, the "man-lion"; 5, Vāmana (or Wāmana), the "dwarf"; 6, Parashurāma; 7, Rāma Chandra, or Dasharatha Rāma; 8, Krishna; 9, Būddha; the tenth, yet to come, is called Kalki, the "horse."

Avat'cha, or **Avatch'ka**: a bay in the southeastern part of Kamtchatka. It has the best and most extensive harbor of the whole peninsula. The capital, Petropaulovski, is on this bay, and is strongly fortified. The same name is applied to a small town 20 miles S., and to a river on which it lies; also to one of three mountains near Petropaulovski.

A'vebury, **A'bury**, or **Abiry**: a small village of England, in Wiltshire, 25 miles N. of Salisbury (see map of England, ref. 12-H). It is the site of extensive remains of the prehistoric period in Europe, and is in the vicinity of several barrows and cromlechs of great antiquity. The principal relics, formerly ascribed to the Druids, consist of 100 large blocks of stone placed on end in a circle, inclosing a level area of about 470 yards in diameter, which was surrounded by a ditch and a high embankment. Some of the stones measure 20 feet high above the ground. Nearly a mile S. of this temple is a barrow or conical artificial mound called Silbury Hill, which is 170 feet high, and covers a space of 5 acres. This was undoubtedly constructed long before the Roman conquest of Britain, and the opinion of the later archæologists refers the whole group to times of very remote antiquity.

Avellane'da, GERTRUDE GOMES, de: Spanish poet; b. in the island of Cuba in 1816. She became a resident of Madrid about 1840, and published a volume of lyric poems in 1841. Soon after this date she produced several novels and successful tragedies entitled *Alfonso Munio* and *Egilona*. She was married in 1846 to Don Pedro Sabator, who died the same year. Among her works are *La Cruz*, a poem, and dramas called *The Glories of Spain* (1850) and *Sonambula*.

Avelli'no (anc. *Abellinum*): a fortified town of Italy; capital of province of same name; 25 miles E. of Naples; at the foot of Mt. Vergine (see map of Italy, ref. 6-F). It is the seat of a bishop, has a cathedral, a college, manufactures of paper, woolen goods, and macaroni, and an extensive trade in hazelnuts (*Nuces avellane*), chestnuts, and grain. It was much damaged by an earthquake in 1694. Pop. 23,753.

Avellino (formerly called **Principato Ulteriore**): a province of Campania, Italy; bounded N. by Benevento, E. by Foggia and Potenza, S. by Salerno, and W. by Caserta. Area, 1,410 sq. miles. The country is throughout mountainous. The soil everywhere is extremely fertile, and the harvests are therefore generally very large. The country is traversed by the Calore and the Ofanto. The chief products are cattle, sausages, linen, and leather. Pop. (1890) 408,675. Chief town, Avellino.

A've Mari'a, or **Angel'ica Saluta'tio**: a form of prayer to the Virgin Mary (commencing Ave Maria, "Hail Mary"), which at first was simply the "annunciation" or salutation of the angel in Luke i. 28, and the words of Elizabeth (ib. 42), but grew by successive additions till it reached its present form in the time of Pius V. (1566-72). See ROSARY.

Ave'na [Lat., oats]: a genus of grasses containing forty species, mainly natives of the temperate regions of the Old World. The common oat (*A. sativa*) is a familiar example.

Avenger of Blood: In early ages, as now in barbarous countries, the infliction of the penalty for murder did not take place by the action of public authorities, but was left to the nearest male relative of the murdered person, whose duty was to pursue and slay the murderer. He was called the "avenger of blood" (in Hebrew *gōel*, which term, however, was of wider signification). The Mosaic law (Num. xxxv.) did not set aside this custom, but placed it under regulations, prohibiting the commutation of the penalty of death for money, and appointing six cities of refuge, three on either side of the Jordan, for the manslayer who was not a murderer, in which he might live till the death of the high priest under whom the deed was committed. He then was free to return home. A willful murderer was, however, to be given up to the avenger. The Koran sanctions the avenging of blood by the kinsman, but also sanctions the pecuniary commutation. The custom prevails among the Arabs at present, as well as in other rude nations.

Aventine Hill: See ROME.

Aventi'nus, JOHANNES: a German historian, whose proper name was Turnair or Thurnmaier; b. at Abensberg, in Bavaria, in 1466. He was invited to Munich in 1512, and appointed tutor to the sons of the Duke of Bavaria. His principal work is a *History of Bavaria* (*Annales Boiorum*, 1554), which was highly esteemed. The most complete edition is that published at Basel by Nicholas Ciser in 1580, in which the passages adverse to the Roman Catholics, which had been removed in the first edition, are restored. D. at Ratisbon, Jan. 9, 1534. A monument to him was unveiled at Abensberg in 1861. A complete edition of his works was issued by the Bavarian Academy of Sciences, Munich, 5 vols., 1880-84. See J. Ziegler, *Vita Aventini*.

Aven'turine: See QUARTZ.

Aventurine Glass, also called **Gold Flux** or **Gold Stone**: a variety of glass used as an ornamental stone by jewelers. The ground is of a rich yellowish-brown color, with innumerable golden scales. It may be made by fusing together 300 parts of powdered glass, 40 parts of copper filings, 80 parts of iron filings, and cooling slowly.

Avenue: village; Allegheny co., Pa. (for location of county, see map of Pennsylvania, ref. 5-B); in Harrison township; on Pa. R. R. and on Allegheny river; 22 miles N. E. of Allegheny. Pop. (1880) 415; (1890) 1,453; not returned separately in 1900.

Av'erage [from a Mediterr. maritime word appearing in Span. as *averia*, Ital. *avarria*, etc., meaning duty, impost; whence the meanings expense, distribution of expense among owners, mean]: a mean proportion; a medial sum or quantity intermediate between several unequal quantities. The relation of the average to the other quantities is such that the sum of the excesses of the greater above the average is equal to the sum of the defects of the less below it. The average of several quantities—for example 3, 7, 9, and 13—is obtained by adding them together and dividing the sum by the number of quantities. The sum 32, divided by 4, gives 8 as the average.

Average: a word used in maritime law in different senses when preceded by the words *general*, *particular*, or *petty*.

1. *General Average*.—This means the case where several interests connected together, as being engaged in a common adventure at sea, such as ship and cargo, are exposed to a marine peril, and one of these interests is voluntarily sacrificed, either in whole or in part, as the price of the safety of the residue of the property at risk; or expense is incurred for the same reason, and the amount of such sacrifice or expenditure is charged by law upon the respective interests in proportion to their value. The act of voluntarily casting away property under such circumstances is termed a "jettison." The elements of a general average case are said to be these: there must be a sacrifice of property, it must be voluntary, and must be successful. There is no general average allowed in cases of goods laden on deck, unless it is usual to place the goods there on a voyage such as the one in which this question arises. By the maritime law the master of the ship is intrusted with the power to order a jettison when the circumstances justify it. In the U. S. the law allows general average where a ship which would have foundered is voluntarily wrecked in such a manner as to save the cargo or a part of it. Expenditures of money in some instances justify a contribution of the nature of general average, as where they are incurred for the preservation of the ship or cargo from extraordinary perils, or where they are necessary for the completion of the adventure in which all the interests at risk are concerned; as, for example, for the prosecution of the voyage. The property upon which the contribution is assessed is the ship, cargo, and freights. The property lost contributes as well as that which is saved. The general principle is substantially this: as the whole property at risk is to the whole amount of the loss, so is each owner's particular interest to his share of the loss. This rule results in assessing a certain percentage of the loss on each owner, according to the value of his interest. The values are estimated by rule: the ship and appurtenances are valued as at the end of the voyage, and the cargo at its value at the time and place of discharge. An adjustment made at the end of a voyage at the port of arrival is deemed to be valid everywhere, according to a settled maritime rule. The special rules applicable to the cases in which general average is allowed are not precisely the same in England and in the U. S., and the subject branches out into much detail in the books of maritime law. Practically, it is closely connected with the business of marine insurance, as the insurance on ship, cargo, and freight may be made by different underwriters, and under the law of abandonment the rights to claim general average, as well as the burden of its assessment, may vest in and rest upon the respective insurers. 2. *Particular Average*.—This signifies damage happening to interest (ship, cargo, and freight) at risk at sea in consequence of pure accident. The loss in such a case rests upon the owner of the property injured or upon his insurer. 3. *Petty Average*.—This term refers to certain petty charges in port for pilotage, lights, towage, anchorage, and the like, which were formerly apportioned upon the owners of the ship and cargo. The modern practice is to include these charges in the freight.

T. W. DWIGHT.

A'verell, WILLIAM WOODS: soldier; b. at Cameron, Steuben co., N. Y., Nov. 5, 1832; graduated at West Point 1855; appointed lieutenant Mounted Riflemen; served on frontier and fighting Indians till 1859, when wounded. Served during the civil war; captain Third Cavalry U. S. A., July, 1862, and breveted major, lieutenant-colonel, colonel, brigadier-general, and major-general U. S. A. Resigned May, 1865. He was restored to his rank of captain Aug. 17, 1888, and was retired Aug. 31. D. in Bath, N. Y., Feb. 3, 1900.

Aver'nus [Lat., supposed to be from Gr. *Ἄορνός*; ἄ-, not + *ὄρνις*, a bird]: a famous lake [It. *Lago d'Averno*] of Italy, 10 miles W. of Naples. It occupies the crater of an extinct volcano, is about a mile in diameter and 170 feet deep. It was supposed that the name Avernus was given to it because the mephitic vapors killed the birds that flew over it. The ancients imagined that this lake was the entrance to the infernal regions. Agrippa, in the time of Augustus, opened a canal from Avernus to the sea, converting it into a harbor, but the canal was destroyed by an earthquake in 1538. It was specially dedicated to Proserpine, and an oracle was maintained here. This lake seems to have originally had no outlet. It is often visited by tourists.

Aver'roës, or **Averrhoes**, originally **Ibn-Roshd**: a celebrated Arabian philosopher and physician; b. at Cordova,

in Spain, 1126. He rose to great dignity in the Moorish kingdom, but late in life he was accused of heretical opinions, deprived of his office, and sent to live at a place near Cordova. Before his death, however, which occurred in Morocco, Dec. 12, 1198, he was restored to his patron's favor. He was a great admirer of Aristotle, on whom he wrote a celebrated commentary. In the Middle Ages he was called "The Commentator," and was said to have translated Aristotle into Arabic, which story was repeated over and over again, until in 1852 E. Renan proved it to be a fable; indeed, Averroës did not understand the Greek language.

Revised by J. R. JEWETT.

Aver'sa (anc. *Atella*): a town of Italy; province of Caserta; and in a beautiful plain 9 miles N. of Naples (see map of Italy, ref. 6-E). It is the seat of a bishop, is well built, has a cathedral, several convents, about ten churches, and a lunatic asylum. Pop. about 21,000.

A'very, WAIGHTSTILL: b. at Groton, Conn., May 3, 1745; graduated at Princeton in 1766; became in 1769 a lawyer in Mecklenburg co., N. C. He was an early and constant patriot in the Revolutionary war, being one of the signers of the Mecklenburg Declaration (1775), a member of the Hillsborough congress (1775), of the State congress (1776), first attorney-general of the State (1777), and was in 1779 a colonel of militia in active service. D. in Burke co., N. C., Mar. 15, 1821.

Averysboro: Harnett co., N. C. (for location, see map of North Carolina, ref. 3-G); on Cape Fear river, about 40 miles S. of Raleigh. During Gen. Sherman's Carolina campaign, while his army was marching toward Goldsboro, a strong force of Confederates under Gen. Hardee was entrenched in front of Averysboro (Mar. 16, 1865), to check Gen. Sherman and gain time for the concentration of forces at Smithfield under Gen. Johnston. After three or four hours' severe fighting the Confederates fell back to a second and stronger line. The attack being renewed along this line, fighting continued through the day, the Confederates being driven within their intrenchments; during the night, which was dark and stormy, their works were evacuated, and on the morning of the 17th it was found that the army of Gen. Hardee was retreating toward Smithfield. The Federal loss was about 600, killed and wounded; the Confederate loss was probably smaller, except in prisoners, of which many remained in Gen. Sherman's hands. This battle is known as the battle of Averysboro. Pop. of village (1880) 38; (1890) not separately returned.

A'ves [Lat. *a'vis*, a bird]: birds considered as a class, a group best distinguished by the presence of feathers. See BIRDS.

Avesta, or **Zend-Avesta**: the Zoroastrian Bible, forming with the Pahlavi books (see PAHLAVI) the ancient scriptures of the PARSIS (*q. v.*). In age, there is much of the Avesta that may date back a thousand years or more before Christ; but there are many portions several centuries later than this, while some parts may even belong to the beginning of the Christian era.

Avesta is a word of uncertain derivation; it has been supposed to signify "knowledge, the book of wisdom"; but more probably it means "the text," or "the law." The designation *Zend-Avesta*, often used for the book, should rather be *Avesta and Zend*, corresponding to the Pahlavi phrase *Avestāk va Zand* used of the scriptures. The latter word, *Zand* (Av. *azaiñti*), means "commentary, or explanation"; i. e. of the original *Avesta* or "text," and Parsi tradition so understands the terms.

For the discovery and first deciphering of the Avesta we are indebted to the young French scholar ANQUETIL DU PERRON (*q. v.*), who in 1754 went to the East and learned from the Parsi priests their sacred language. His translation (*Zend-Avesta, ouvrage de Zoroastre*, 3 vols., Paris, 1771) was so inaccurate, perhaps excusably, however, and often so fantastical that the question was raised, especially by Sir William Jones, whether Du Perron's work was not a forgery, or whether he had not, at least, been duped by the priests. Before many years, however, the authenticity of the Avesta and Anquetil's credit were happily vindicated, through the aid of Sanskrit, by such scholars as Burnouf (1825), Rask, and Bopp; and the scientific interpretation of the texts was carried on by men like Haug, Windischmann, Westergaard, Roth, and particularly Spiegel, and has been to-day by Bartholomae, Darmesteter, De Harlez, Hübschmann, Geiger, and especially Geldner.

Tradition has it that the Avesta was once far greater in extent than in its present form. We have mention in Pliny, for example, of 2,000,000 verses composed by ZOROASTER (*q. v.*); the semblance of truth is given to this statement also by Arabic authorities and by the Pahlavi works which tell of 21 Nasks, or books, of the original Avesta, inscribed in gold letters upon 12,000 cowhides, and deposited in the palace library at Persepolis. These books, it is claimed, were destroyed by the Greeks under Alexander the Great, when he allowed the library to be burned. It was this same victorious invasion of the great conqueror that broke the power of the Zoroastrian religion, which for centuries had been the ruling faith of Persia, including that of the Achaemenian kings, Cyrus, Darius, Xerxes, and their followers. The religion maintained a lingering existence, however, during the government of the Seleucidae and under the Parthian sway, until about the third and fourth centuries A. D., when it was restored to its former glory by the Sassanian dynasty, true Zoroastrian monarchs. It was at this time that the scattered portions of the Avesta were again gathered, as far as was possible, and edited, and the Avesta was made the canonical book of the state religion of Iran. The council, it seems, succeeded in collecting and restoring the fragments of about one-third of the original scriptures. The Mohammedan conquest in the seventh century, however, dealt a final fatal blow to the Zoroastrian creed. The fanatical followers of the Koran forced the worshipers of Mazda (see ORMAZD) to adopt the faith of the new prophet, or else they drove them into exile. Some of the fugitives fled to the mountains of Persia, where their descendants are still to be found, numbering only about 10,000; but most of them took refuge in India, especially in the neighborhood of Bombay, where as PARSIS (*q. v.*) they still form a thrifty, prosperous community of some 80,000 souls. It is these two scattered peoples that have preserved for us all they could rescue of their ancient sacred book.

What now remains of the Avesta would equal perhaps one-tenth of our Bible in extent. Like our own sacred text the extant portions of the Avesta are divided into several books. (1) The *Yasna* (Skt. *yajñá*), lit., "sacrifice," the chief liturgical work, and forming with the *Visperad* and *Vendidad*, below mentioned, a sort of Zoroastrian prayer-book. In the midst of the *Yasna* are inserted the five *Gāthās*, lit., "hymns, psalms," the sacred hymns, sayings, or sermons of Zoroaster himself. The *Gāthās* are the oldest part of the Avesta (see AVESTAN LANGUAGE), and in them we have before us the prophet speaking, much as does David in the psalms. (2) The *Visperad* (Av. *vispe ratavō*, "all the lords"), a collection of minor litanies, invocations, and offerings to the various divinities and spiritual heads of the faith. (3) The *Yashts* (Av. *yeshti*, "worship by praise"), some twenty-one longer hymns of praise and adoration of the ancient divinities and mythical heroes. (4) The Minor Texts, *Nyāishes*, *Gāhs*, *Sīrozahs*, *Afūngāns*, a collection forming a kind of manual of morning devotion. (5) The *Vendidad*, a species of Iranian Pentateuch, containing priestly injunctions and rules for rites and ceremonies, together with some legendary matter. (6) Under the head Avesta there belong also some fragments and glosses, such as those from the *Hādhoht Nask*, *Nirungistān*, *Aogema-daeca*, and the *Zand-Pahlavi Glossary*.

In style, much of the Avesta is easy and simple; the *Gāthās*, however, are extremely difficult. The keynote of their thought is the doctrine of the new kingdom, a better life, and the hereafter. They are written in verse resembling the Vedic meters. The rest of the Avesta is either composed in verse somewhat analogous to our familiar Hiawatha, or is written in prose. Meter is the sign of antiquity; prose, as a rule, is a mark of later age. There are exceptions, of course, like the prose "Yasna of the Seven Chapters" (Ys. 35-41), which is but little later than the *Gāthā* hymns. The metrical portions of the Avesta are not without poetic merit; most of the prose passages are young, without spirit, or even stupid. This distinction is easily recognized, and should be properly emphasized.

There is a fine edition of the text by Geldner, *Avesta, the Sacred Books of the Parsis* (Stuttgart, 1884, seq.); a complete dictionary was made by Justi, *Handbuch der Zend-sprache* (Leipzig, 1864). The best English translation that has appeared is by Darmesteter and Mills, *Zand-Avesta*, 3 vols., in the *Sacred Books of the East* (Oxford, 1880-87). There are several German and French grammars of the language; an English one is published in Boston (1892) by Ginn & Co. For a bibliography of the subject, consult the

names mentioned above. See also IRANIAN LANGUAGES, PAHLAVI, and ZOROASTER. A. V. WILLIAMS JACKSON.

Avestan, or Avesta Language: the ancient speech preserved in the AVESTA (*q. v.*), and the oldest member of the Iranian group of languages (see IRANIAN LANGUAGES), sometimes erroneously called *Zend*, which, however, really signifies "interpretation" or "commentary," and refers rather to the Pahlavi version of the Zoroastrian scriptures (see AVESTA). The term Old Bactrian for the language is now quite abandoned. Two dialects of Avestan are recognized: (1) the *Gāthā* dialect, the oldest form of the language as preserved in the *Gāthās*, or Psalms of Zoroaster (*q. v.*); (2) the Younger Avesta dialect, or the language of the rest of the texts. These dialects may, perhaps, be due also to a separation of place as well as to a difference of time.

The Avesta, as we now have it, is written in an alphabet of PAHLAVI (*q. v.*) origin; the writing runs from right to left, and the script is of much later date than the speech which it records. The language of the Avesta itself is most closely allied to Sanskrit (*q. v.*), though independent of it. By certain phonetic changes, each Sanskrit word may be transferred into its Avestan equivalent, and *vice versa*. Thus Av. *iməm þwām paovīm yānəm haoma jaidyemi*, "I ask of thee, O Haoma, this first boon," would answer to a possible Skt. *imām tvām pūrvyām yānām sōma gadyāmi*. Striking features of the Avestan phonology are: (1) the frequent use of epenthetic and anaptyctic vowels, e. g. Av. *dādmaidē*, "we give" = Skt. *dādmahē*; (2) a richness in its vowel-system; (3) the common occurrence of spirants (*þ, f*, etc.); and (4) the change of Skt. voiced aspirates (*gh, dh*, etc.) into stop sounds (*g, d*, etc.) which may develop into spirants. The Avestan inflectional system shows eight cases, three numbers, and, in the older texts, rich verbal forms quite parallel with the Vedic Sanskrit; in later passages, however, there is evidence of grammatical and syntactical decay.

Reference may be made to Justi's *Handbuch der Zend-sprache* (Leipzig, 1864); Spiegel's *Grammatik der Altiran. Sprachen* (Leipzig, 1882); Bartholomae's *Altiranische Dialekte* (Leipzig, 1883); Jackson's *Avesta Series* (Boston, 1892). A. V. WILLIAMS JACKSON.

Aveyron, ā-vāy-roŋ': a department in the south part of France; bounded N. by Cantal, E. by Lozère, Gard, and Hérault, S. by Tarn, and W. by Lot. Area, 3,376 sq. miles. It is intersected by the river Lot and the Tarn, and also drained by the river Aveyron. The surface is mountainous, and the chain of the Cévennes extends along the southeastern border of the department. Among its mineral resources are coal, copper, lead, zinc, and iron. The coal mines are very valuable. It has manufactures of cotton yarn, paper, woolen stuffs, carpets, and leather. It is divided into five arrondissements. Among the chief articles of export is Roquefort cheese. Pop. (1896) 389,464. Capital, Rodez.

Avezzana, ā-vet-zaa'na, GIUSEPPE: an Italian republican and patriot; b. at Chieri, in Piedmont, Feb. 19, 1789. He fought against Bustamente in Mexico in 1832, and became a merchant in the city of New York in 1834. Early in 1848 he returned to Italy to fight for the independence of his country, and was appointed commander of the national guard at Genoa. In Mar., 1849, he was chosen minister of war of the Roman republic and commander of the army. Rome was taken by the French in July of that year, and Avezzana escaped to the U. S. He joined Garibaldi in 1860, and fought with him; became delegate of the Italian House of Representatives 1867, and head of the Italia irredenta party in 1878. D. in Rome, Dec. 25, 1879.

Avianus, or Avianus, FLAVIUS (?): Latin fabulist, probably of the fourth or early fifth century A. D. (cf. O. Unrein, *de Av. vitae*, Jena, 1885), who threw into elegiac verse forty-two Æsopic fables. The work is dedicated to a certain Theodosius (perhaps Macrobius Theodosius). The author names as his forerunners Æsop, Socrates, Horace, Babrius, and Phædrus; but speaks as if his immediate source were a later collection of prose fables (*quas rudi latinitate compositas Elegis sum explicare conatus*). These were perhaps the fables of Titianus, spoken of by Ausonius (epist. 16). Avianus probably lived at Rome, and in the pagan circles there. His style is on the whole good, showing in some ways the same tendencies and ideals as that of Claudian. His version of the fables at once became popular, and as a school-book was much used and imitated during the early Middle Ages. Later the fables of Avianus were confused with those purporting to be by a certain *Romulus imperator* (tenth cen-

tury?), and thus came to be one of the sources of the extensive Æsopic literature of the later Middle Ages. In the eleventh century we have a prose version entitled *Novus Avianus* (ed. E. Grosse, Königsberg, 1868); in the twelfth century another version by Alexander Neckam (d. 1227). The French *Isopet-Avionnet* (Paris, fourteenth century) contains a French version.

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A. R. MARSII.

Avia'tion: See AERONAUTICS.

Avicenna, āv-vē-chen'na (the Latin form of *Ibn-Sina*): the most eminent of Arabian physicians; b. at Afshena, near Bokhara, about 980 A. D. He was well versed in mathematics, astronomy, philosophy, and other sciences. Before he was twenty years old he was reputed the most learned man of his time. He was employed as a physician by several Samanide sovereigns, and resided at Ispahān and Hamadān. He wrote in Arabic a large number of works on medicine and philosophy, the most important of which is his *System of Medicine* (Canon Medicinæ), which, translated into Latin by Gerardius Cremonensis (2 vols., 1595), was for five centuries a standard book of the highest authority in the schools of Europe. His writings exercised a powerful influence in spreading a knowledge of Aristotle's logic among his own countrymen, and subsequently among the Schoolmen. He died at Hamadān, June, 1037. See S. Klein, *Dissertatio de Avicenna Medico* (1846); Ibn-Khallikān, *Biographical Dictionary*, edited by De Slane (Paris, 1842); Freind, *History of Physic*.

Avicennia: a genus of plants of the family *Myoporaceæ*; consists of trees or shrubs resembling mangroves, and growing in salt swamps in tropical regions and in the southern hemisphere. The *Avicennia tomentosa*, the white mangrove of Brazil, has cordate, ovate leaves, downy on the lower side. Its bark is used for tanning. Its gum is used as food in New Zealand, and its seeds in India.

Avid'ius, CASSIUS: an able Roman general; b. in Syria; commanded for Marcus Aurelius an army which defeated the Parthians in 165 A. D. Having become Governor of Syria and commander of several legions, he revolted in 175 A. D., and took the title of emperor. He obtained possession of Egypt and part of Asia. He was killed by his own officers in 175 A. D.

Avie'nus, RUFIIUS FESTUS: a Latin poet of the latter half of the fourth century, distinguished for the vigor and correctness of his diction, as well as for a command of form remarkable in a period of decline. In subject-matter, however, he was not original. He translated into hexameters the *Phænomena* and *Prognostica* of Aratus (*q. v.*), and wrote in the same measure a *Description of the Earth*, following the *Periegesis* of Dionysios. Of his *Ora Maritima* in iambs only a fragment is extant, describing the coast of the Mediterranean, beginning with the Atlantic, as far as Marseilles. Best ed. by A. Holder (Innsbruck, 1887).

M. WARREN.

Avignon, āv-veen'yon (anc. *Ave'nio*): an ancient city of France; capital of the department of Vaucluse; situated on the left bank of the Rhône, 74 miles by rail N. N. W. of Marseilles (see map of France, ref. 8-II). It is the seat of an archbishop, and is surrounded by a rich country with delightful scenery. It contains a college, a public library of about 45,000 volumes, a museum of natural history, a botanical garden, a fine theater, a lunatic asylum, etc. Among the interesting and ancient public edifices are the mediæval walls, with battlements and flanking towers, the former palace of the popes, a vast irregular Gothic structure, originally a very strong fortress, now for a long time used as a barrack and prison, but recently restored, and now the episcopal residence; and the cathedral called Notre Dame des Dons, rebuilt by Charlemagne, and containing a richly sculptured chapel. Petrarch passed several years at Avignon and at Vaucluse (which is about 3 miles distant), where he first saw Laura. The manufacture of silk is the principal branch of industry in this city, which also has several paper-mills, iron-foundries, and manufactures of velvets and woolen stuffs. It has an active trade in wine, brandy, grain, etc. Avenio was the capital of the Cavares before the time

of Cæsar. It was taken by the Saracens in 730 A. D., and after many changes was purchased in 1348 by Pope Clement VI., and became the seat of the papal government. Seven successive popes resided at Avignon in the fourteenth century, during which it had about 100,000 inhabitants. The papal court was transferred to Rome in 1377, and Avignon was annexed to France in 1791. Pop. (1896) 45,107.

A'vila: a province in Spain; in Old Castile; bounded N. by Valladolid, E. by Segovia and Madrid, S. by Toledo and Caceres, and W. by Salamanca. Area, 2,981 sq. miles. The surface is mountainous, except the northern part. The chief article of export is merino wool. Pop. (1887) 193,093.

Avila (anc. *Ob'ila* or *Ab'ula*): an episcopal city of Spain; capital of province of same name; on the river Adaja; 71 miles by rail N. W. of Madrid (see map of Spain, ref. 15-E). It was once a rich and more populous city, having a flourishing university, founded about 1482 and abolished in 1807. It has a fine cathedral and convent. Pop. 9,136.

Avila y Zuñiga, LUIS, de (dā aa'vēc-laa-ēc-thoon-yee'-ga): Spanish historian and diplomatist; b. at Placencia, in Estremadura, about 1490. He enjoyed the favor of Charles V., who sent him as ambassador to Rome about 1558. He wrote in Spanish *Commentaries on the War of Charles V. in Germany in 1546 and 1547* (1548; last ed. Madrid, 1852; Ger. trans. Berlin, 1853). This work has considerable literary merit, but is not impartial. D. about 1552.

Aviler, āv-vēc-lay', AUGUSTIN CHARLES: b. at Paris in 1653; studied in Rome the profession of an architect, aided by a pension from the king. He was engaged for some time with Mansard in Paris, and afterward erected some fine buildings at various places, among them being the palace of the Archbishop of Toulouse. He wrote *Course of Architecture* (1691) and *Dictionary of all the Terms of Architecture, Civil and Hydraulic*. D. in 1700.

A'viles: a Spanish town at the mouth of the river of the same name; 15 miles W. N. W. of the city of Oviedo (see map of Spain, ref. 12-D); one of the most important trading-places in the province of Oviedo. Pop. (1887) 10,235.

A'vis, or **Aviz**: an order of knighthood in Portugal, instituted by King Alphonso I. in 1143 to promote the defeat of the Moors. The King of Portugal is grand master.

Avi'tus, ALCIMUS ECDICIUS, SAINT: Bishop of Vienne and Christian poet; b. of a senatorial family of Auvergne about 450 A. D.; succeeded his father (perhaps also his grandfather and great-grandfather) in the episcopacy about 490. He was a vigorous representative of Roman Catholicism among the Arian Burgundians, and endeavored to convert King Gundobad to orthodoxy. He seems also to have intrigued with the Franks after the conversion and baptism of Clovis (496)—an event which he celebrated in a letter full of adulation to Clovis himself (Ep. 46). He thus belonged to the party which for ecclesiastical reasons desired and helped on the subjection of Southern Gaul to the Franks.

Avitus is, however, chiefly known to the modern world as the author of a poem whose similarity in theme, and at times in treatment, to the *Paradise Lost* of Milton long since attracted attention. This poem was called by Avitus himself in a letter (Ep. 51) *De spiritalis historiae gestis*, and is in five books, to which St. Isidore of Seville (*De vir. illustr.*, Ch. xxiii) gives the following titles: I. *De origine mundi*; II. *De originali peccato*; III. *De sententia dei*; IV. *De diluvio mundi*; V. *De transitu maris rubri*. The poem is of course based upon Genesis and Exodus, and describes the Creation, the Fall of Man, the Flood, and the Captivity in Egypt. What is chiefly noteworthy about it, however, is that it is an heroic poem; i. e. deals with Bible history after the manner of the classic epic poets. For this reason Avitus has a place in a poetical tradition of great importance. To be sure, he was not the first to hit upon the sacred heroic. The Spaniard Juvencus had in his poem on the four gospels (*Evangeliorum libri IV.*, written 330 A. D.) told the life of Christ in this fashion: In the fourth or fifth century had been composed a long version in hexameters of the Pentateuch and the books of Joshua and Judges (attributed in some manuscripts to an unknown Cyprianus, but possibly in part due also to Juvencus); another of the Book of Jonah; still another (by a certain Victorinus) of the second Book of Maccabees. A Gallic lady, Proba by name, had undertaken to compose in mosaic fashion, with lines and phrases taken from the poems of Vergil, the history of the Fall and the Redemption (*Probae Cento Virgilianus*). In the century of Avitus himself and in Gaul there had been

made new poetical versions of Genesis; one, the *Metrum in Genesim*, by a certain Hilarius; another, the *Alethia seu Commentationum in Genesim libri III.* of Claudius Marius Victor, probably a professor of Marseilles. Sedulius also, in his *Paschale Carmen*, had found it necessary to preface his account of man's redemption by the story of his fall—the Paradise Regained by the Paradise Lost. In short, there had been established a new imaginative tradition before Avitus undertook to write his poem; and although his work is far the most poetical and powerful of those here mentioned, it is so largely because he made use freely and skillfully of what his predecessors had done.

Few literary traditions are more interesting than this to which Avitus made so important a contribution. It was destined to live on through the Dark and Middle Ages, and in the Renaissance to give rise to the great poems we all know about. We find it first in Anglo-Saxon England, where the poems attributed to CAEDMON (*q. v.*), from which again Milton has been charged with plagiarizing, show us the now epic material treated by a Germanic singer in the heroic manner peculiar to the north. A little later another Anglo-Saxon poem of great power, Cynwulf's *Christ*, though not directly based upon Latin epic originals, illustrates essentially the same tendencies. We know from Aldhelm, Bede, Aleuin, and others that no works were more widely known and read in England from the seventh to the ninth centuries than the poems of Juvenius, Sedulius, and Avitus; and we are justified in believing that, even in cases where direct borrowing has not been proved, the English poets were indirectly inspired by these examples. Nor were these the only poets to be attracted by the new material. In the ninth century we find it among the Germans on the Continent, giving rise to the Saxon *Hetiand* and the *Gospet-book* of the Frank Otfried. In the Middle Ages proper we find it in a double form. On the one hand, it gives us poetical versions of parts of the Bible in the vulgar tongues; on the other, the epic speeches, separated from the narrative, are thrown together in dialogue form, and we have the mysteries dealing with the Fall and the Redemption. After the Renaissance had renewed the interest of poets in the forms of classic art, we have great numbers of works in both these directions—the poetical version becoming the sacred heroic poem, the mystery becoming the sacred tragedy, without or with musical accompaniment (later the oratorio). There is not space to name all, or even a large part, of these works, but the following are worth mentioning, as having been spoken of now and again in connection with Milton: Antonio Cornozano's *Discorso in Versi della Creazione del Mondo sino alla Venuta di Gesù Cristo* (1472); DU BARTAS'S (*q. v.*) *La Semaine* (1579) and *La seconde Semaine* (1584); Hugo Grotius's Latin tragedy *Adamus Exul* (1601); Giovanni Soranzo's *Dell' Adamo* (1604); TASSO'S (*q. v.*) *Le sette giornate del Mondo Creato* (1607); Giovanni Battista Andreini's tragedy *Adamo* (1613); Alonzo de Azevedo's *Creación del Mundo* (1615); Phineas Fletcher's Latin poem *Locustæ* (1627); Andrew Ramsay's *Poemata sacra* (1633); Joost van den VONDEL'S (*q. v.*) tragedy *Lucifer* (1654). Before bringing the list to an end it is well to mention also a poem later than Milton's, but almost as famous in Germany as is the *Paradise Lost* in England, i. e. Klopstock's *Messias*, finished in 1773. Naturally, the poem of Avitus can not be said to have inspired directly all these numerous and diverse works. What can be said is that it belongs to the same tradition, and helped constitute that tradition.

Besides the *De spiritalis historię gestis*, we have from Avitus a poem, *De consolatoria castitatis lande*, addressed to his sister Fuscina; also fragments of controversial works in prose, and a considerable body of letters, which have great interest for students of the political and social condition of the fifth century. Avitus seems to have lived at least as late as 525, but we do not know the date of his death.

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A. R. MARSH.

Avitus, MARCUS MÆCILIVS: a Roman emperor of the West; b. in Auvergne probably about 400 A. D.; was the father-in-law of Sidonius Apollinaris; fought under the banner of Aëtius; became prefect of Gaul in 439; and succeeded

Maximus as Emperor of the West in 455 A. D. He was deposed by Ricimer in 456. D. in 457 A. D.

Avoca, or **Ovo'ca**: a small river in Wicklow co., Ireland; enters the sea at Arklow. It runs through a very narrow and picturesque valley, inclosed between wooded banks from 300 to 500 feet high. The Vale of Avoca is the subject of one of Moore's songs.

Avoca (formerly *Pleasant Valley*): borough; Luzerne co., Pa. (for location of county, see map of Pennsylvania, ref. 3-1); on the Leh. Val., Del. and Hudson Canal Co. and Erie and Wyoming Val. R. Rs.; in a coal-mining region; 3 miles from Pittston. Pop. (1880) 1,913; (1890) 3,031; (1900) 3,487.

Avoca'do Pear, or **Alligator Pear** (*Per sea gratissima*): a fruit-tree of the family *Lauraceæ*; a native of the warm parts of America. It has leaves which resemble those of the laurel. The fruit is a drupe, like a pear in shape, and has a soft pulp of delicate flavor, which dissolves like butter in the mouth, and is called "vegetable butter." It is much esteemed in the West Indies, and grows in Southern Florida. In Mexico and Central America the fruit is often called *aguacate*.

Avocet: a web-footed bird of the genus *Recurvirostra*, having long legs and very long, slender bills. The avocets are easily distinguished from other wading birds by the upward curvature of the bill, which is like elastic whalebone, and is adapted to seeking in the mud for its food, which consists almost wholly of worms, insects, and little crustaceans. They are birds of powerful wing, and better adapted for flying and walking than swimming. The *Recurvirostra americana* abounds in the U. S. Another species, *Recurvirostra avocetta*, is common in Europe. The length of each species is about eighteen inches.



Avocet.

Avogadro, AMADEO, Count: physicist and chemist; b. in Turin, Aug. 9, 1776; studied jurisprudence at the Turin University; became Doctor of Laws in 1796, and then held a position under the Government until 1806, at which time he began his scientific work. In 1809 he became Professor of Physics at the gymnasium in Vercelli. In 1820 he was elected Professor of Mathematical Physics at the Turin University. He died in Turin, July 9, 1856, at the age of eighty years. He is known chiefly as the discoverer of the law governing the relations between the specific gravity and the molecular weight of substances in the gaseous state. This law, commonly called *Avogadro's law*, has been of the highest value in the development of CHEMISTRY (*q. v.*). I. R.

Avoid'ance: in English ecclesiastical law, the condition of a benefice void of an incumbent; a vacancy in a benefice.

Avoirdupois', or **Averdupois** [goods of weight; O. Fr. *avoir*, property; subst. use of verb *avoir*, have < Lat. *habere* + *de*, of + *pois*, weight < Lat. *pensum*]: the common system of weights by which we ascertain the weight of all commodities except medicines, gems, and precious metals. A pound avoirdupois contains 7,000 grains, the legal standard of which is such that a cubic inch of water weighs 252.458 grains. The pound is divided into 16 ounces, and an ounce into 16 drams. An ounce is equal to 437½ grains.

TABLE OF AVOIRDUPOIS.

27½ grains	= 1 dram,	dr.
16 drams	= 1 ounce,	oz.
16 ounces	= 1 pound,	lb.
28 pounds	= 1 quarter,	qr.
4 quarters	= 1 hundredweight,	cwt.
20 hundredweight	= 1 ton,	ton.

A cubic foot of water weighs 997.17 ounces avoirdupois.

Avo'la: a seaport-town of Sicily; province of Noto; 13 miles S. W. of Syracuse (see map of Italy, ref. 9-F); supposed to occupy the site of the ancient *Ibla* or *Hybta*, famous for honey. It has an active trade for grain, cattle, oil, and fruits. An earthquake in 1693 destroyed the ancient *Avola*. Pop. 13,182.

Avon: town; Norfolk co., Mass. (for location of county, see map of Massachusetts, ref. 3-1); on Old Colony R. R.; 17 miles S. of Boston, has boot and shoe manufactories. Pop. of township (1890) 1,384; (1900) 1,741.

Avon: village on the Erie and the Western N. Y. and Pa. R. Rs.; in Livingston co., N. Y. (for location of county, see map of New York, ref. 5-D); on the right bank of the Genesee river; 18 miles S. S. W. of Rochester. Avon is delightfully situated on a terrace 100 feet above the river. Here are sulphur springs, with several hotels, which are much frequented in summer by invalids. Pop. (1870) 900; (1880) 1,617; (1890) 1,653; (1900) 1,601.

Avon (river): There are several rivers bearing this name in England, Wales, Scotland, and France. The principal of them in English rivers are noticed below. Scotland has an Avon river which flows into the Clyde, another into the Forth, and a third into the Annan. France has two Avon rivers in the Loire system, and two connected with the Seine.

Avon, LOWER: a river of England; rises in Wiltshire; flows southward, then nearly northwestward, passes by Bath and Bristol, and enters the Bristol Channel after a course of about 80 miles. It is navigable for large vessels to Bristol, 7 miles. The valley of the Avon is very picturesque. Another river called Avon, or East Avon, rises in Wiltshire, flows southward, passes Salisbury, and enters the English Channel at Christ Church.

Avon, MIDDLE, or LITTLE: a river of England. Its whole course is in Gloucestershire, entering the Severn a little below the town of Berkeley.

Avon, UPPER: a river of England; rises near Naseby, in Northamptonshire; flows in a general S. W. direction through Warwickshire and Worcestershire, passing Rugby, Warwick, and Stratford, the birthplace of Shakspeare, and joins the Severn at Tewkesbury. It is about 100 miles long. Its tributaries are the Alne, Leame, Stour, and Swift.

Avondale: town; Jefferson co., Ala. (for location of county, see map of Alabama, ref. 3-D); on Queen and Crescent R. R.; 2 miles from Birmingham; in an agricultural and coal and iron mining district. Pop. (1890) 1,642; (1900) 3,060.

Avondale: village (now part of Cincinnati); Hamilton co., O. (for location of county, see map of Ohio, ref. 7-C); on Cin. and Northern R. R. Pop. (1880) 2,552; (1890) 4,473.

Avranches, aa-vraanish' (anc. *Abrin'cæ*): a town of France; department of the Manche; 32 miles S. W. of Saint-Lo (see map of France, ref. 3-C). It was an important Roman military station, and came into the possession of England at the Norman conquest. The Bretons captured the town in 1203. In the fourteenth century the English got possession of it, and held it until 1450. It was once a bishop's see, and its cathedral, destroyed in the time of the first French revolution, was the finest in Normandy. It is beautifully situated on a hill, and has a ruined cathedral, a college, and a convent. Here reside many English families, attracted by the beauty of the position and the cheapness of living. There is some trade in grain, cider, and salt; and has manufactures of candles, laee, nails, leather, parchment, etc. Pop. (1891) 7,785.

Avrillon, ää-vrëe'yon', JEAN BAPTISTE ELIAS: an eloquent Franciscan monk; b. at Paris in 1632; made profession Jan. 3, 1671, in the convent of the Minims (called *Bonshommes*) at Nigeon. He was a noted preacher 1676-1728, and left many devotional works, which are greatly esteemed in the Roman Church. Some of them have been translated by the Romanizing party of the Church of England. Among these are *Guide for Passing Advent Holyly* (London, 1844) and *Eucharistic Meditations* (1864). D. May 16, 1729.

Award [from the O. Fr. *awarder*, adjudge]: the result of an arbitration. (See ARBITRATION.) An award is governed by well-established rules, such as that it must conform to the agreement whereby the matters in dispute were submitted to arbitration; it must embrace them all; it must be final, as well as certain and reasonable. Where several matters are submitted, it is not necessary that each one should be specifically referred to in the award. If the arbitrators purport to dispose of the things submitted by a general result, it will be presumed, *prima facie*, that each subject was acted upon and embraced in their conclusion. The arbitrators in making an award are presumed to be guided by the rules of law which govern the questions involved in the subject-matter arbitrated upon. An award does not have the force of a judgment in a court of justice. If not performed, an action may be brought upon it. If a sum of money were directed to be paid, a debt would be created

which could be collected by action. Statutes sometimes allow a clause to be inserted in the submission that judgment in a court of justice may be entered upon the award. In such a case no action is necessary, and a judgment may be taken in accordance with the statute.

Awe, Loch: a lake of Scotland; in the county of Argyle; 8 miles N. W. of Inverary; extends 24 miles in a direction N. E. and S. W. Its average width is about a mile, but in some places it is 2½ miles wide. The adjacent scenery is very picturesque. The northeastern end is overshadowed by rugged mountains, one of which, Ben Cruachan, is 3,669 feet high. The water of this lake is discharged through the river Awe into Loch Etive. Loch Awe incloses many islands, and abounds in trout. Its scenes are favorites with artists and with tourists. On its islands are the ruins of several convents and castles.

Awn [M. Eng. *awene*; cf. O. N. *ögn*; O. H. G. *agana* > Mod. Germ. *Ahne*; Gr. *ἄχνη*, chaff]: a stiff and pointed bristle which occurs in the flowers of many grasses, forming the extremity of a glume or palet, as the beard of wheat and barley. The flowers of some grasses are awnless. The parts which are furnished with this organ are called *aristate*. The awn is a prolongation of the midrib of a glume or palet, or is a rigid, barren branch of inflorescence. Sometimes it is twisted, and liable to twist and untwist hygrometrically; sometimes it is serrate, as in barley.

Aw'yaw': See Oyo.

Axe: a tool used by carpenters and others for cutting wood; is of very ancient origin. Savage peoples of antiquity formed axes of stone, copper, bronze, etc. The axe of modern civilized nations is constructed of wrought iron, with a cutting edge of steel, which is welded to the iron when they are heated to a white heat. After it has been hammered and ground into the proper form, it is carefully tempered by heat and cold water.

Axe'stone: a mineral regarded as a variety of nephrite; is hard, tough, and more or less translucent. It occurs in primitive rocks in Saxony and New Zealand; the natives of the latter use it to make axes, hence the name.

Ax'holme Isle: a level and once marshy tract of England; in the northern part of Nottinghamshire; was drained in 1634 by a Dutchman named Vermuyden, and was for a long time inhabited by French and Dutch Protestant refugees. After much litigation between the colonists and the proprietors, the lands were divided in 1691, and about one-sixth was given to the former. It is now extremely fertile of all kinds of crops.

Ax'ia: a town of ancient Etruria, whose remains are identified with the sculptured tufaceous rocks at Castel d'Asso; 6 miles W. of Viterbo. Here are many chambers believed to be sepulchral. There are many Etruscan inscriptions. These remains were discovered in 1808. It is probable that Axia never was a large town, but it must once have been quite important.

Ax'inite [from Gr. *ἄξινη*, an axe]: an anhydrous silicate of alumina, lime, etc., with boracic acid; so named because it occurs crystallized in oblique rhomboidal prisms, so flat as to appear tabular and sharp like the edge of an axe. The crystals have a brilliant, glassy luster, and are translucent or sub-translucent.

Ax'iom [from Gr. *ἄξιωμα*, what commends itself, from *ἄξιος*, worthy]: in geometry, a proposition which admits of no demonstration, but is taken for granted as a self-evident truth; as, "The whole is greater than its part"; "Things which are equal to the same are equal to one another"; "Two straight lines can not inclose a space," etc. Every rational science requires such fundamental propositions and established principles, to which the assent of the student is demanded without proof as a basis for further argument. It is an axiom in logic that he who admits a principle admits its consequence.

Ax'is, plu. **Axes** [Lat., axle]: a straight line, real or imaginary, about which a body revolves is called the axis of rotation. Axis is an important term in astronomy, botany, crystallography, geometry, and mechanics. The axis of the earth or other planet is that diameter about which it revolves. In botany, the axis is the central part of a plant, around which various organs are arranged. The stem is called the ascending axis, and the root is the descending axis. The stem is an axis for the branches, the branch is an axis for the leaves, and the rachis is an axis of inflores-

cence. In geometry, the axis of any geometrical solid is the right line which passes through the center of all the corresponding parallel sections of it or the right line about which the parts of the figure are symmetrically disposed. Thus the axis of a cone is a right line drawn from the vertex to the center of the base. The axis of a curved line is formed by a right line dividing the curve into two symmetrical parts. A right line drawn through the foci of an ellipse is its transverse axis. The lines upon which the abscissas and ordinates of plane curves are measured are called co-ordinate axes, of which one is the axis of abscissas and the other the axis of ordinates. For determining points in space a third axis is used. In crystallography, each form of crystal, except the hexagonal prism and the rhombohedron, has three axes, one vertical and two lateral. In anatomy, the axis is the second cervical vertebra, which in man is the pivot on which the head turns. *Ax'is in Peritro'chio*, an old term for one of the five mechanical powers, commonly called the WHEEL AND AXLE. It consists of a wheel fixed immovably to an axle, so that both turn together around the axis of motion. *Axis of Elevation*, in geology, the line or direction in which rocks have been elevated by an internal force. This line generally governs the strike of the strata, or the direction of a horizontal line upon them, when removed from their natural or original position and inclined to the horizon.

Axis (*Axis aris*): a species of deer found in India and in many of the East Indian islands, sometimes called *chittra* by the natives. It resembles in size and color the European fallow-deer, but its horns are slender, pointed, and little branched. The female has no horns. It is easily domes-



Axis deer.

ticated, and is kept in parks in Europe. Other species, or marked varieties, are known. The horns are used for knife-handles.

Ax'le (in Lat. *ax'is*): a bar of iron or a wooden shaft which supports the body of a carriage or wagon, and is supported on two wheels, in the hubs or naves of which its ends are inserted. Also the part of machinery which forms the center of the revolving portion, or the immediate bearing of the revolution of a piece of machinery which revolves on its own center. Axles of railway cars, instead of revolving in the hubs of the wheels, are strongly keyed in them, and journals are turned on the portions outside the wheels. These journals pass through and revolve in boxes.

Ax'minster: a town of England; in the county of Devon, 16 miles E. of Exeter (see map of England, ref. 14-F). It has manufactures of woolen and cotton goods, etc. The Axminster carpets, whose manufacture was formerly the chief employment of the inhabitants, are excellent imitations of those of Persia and Turkey, but the so-called Axminster carpets are now made elsewhere. Pop. about 3,000.

Ax'olotl': a large larval salamander of the genus *Amblystoma* found in the lakes of Mexico and northward



Axolotl.

through the Rocky Mountains. It has bushy external gills, such as are permanent in the mud puppy (*Necturus*). It has, however, been shown to lose these gills, under some circumstances at least, when it develops into the common tiger salamander, *Amblystoma tigrinum*. It was, however, long regarded as a distinct animal, and known in science as *Siredon lichenoides*. It reaches a length of 8 or 10 inches. It is, however, claimed that the true axolotl of the Mexican lakes never leaves the larval state.

DAVID S. JORDAN.

Axoom: See AXUM.

Axtell, SAMUEL B.: jurist; b. Oct. 14, 1819; was educated at Oberlin and Western Reserve Colleges; elected a member of Congress in 1867 and again in 1869; in 1874 he was appointed Governor of Utah Territory, and afterward of New Mexico. In 1882 he was appointed chief justice of the Supreme Court of the latter Territory, resigning in 1885. D. in Morristown, N. J., Aug. 6, 1891. HENRY WADE ROGERS.

Ax'um, or Axoom (in Gr. *Ἀξούμη* or *Ἀξώμη*): ancient and decayed town of Abyssinia; the former capital of the Axumite empire; in the province of Tigre; 85 miles N. W. of Antalo (see map of Africa, ref. 4-G). Here is a Christian church, built about 1657, which is held in great veneration. Among the antiquities of Axum and the monuments of its former grandeur are several finely sculptured prostrate obelisks, and one granite monolith 60 feet high, which is still standing. The Axumite empire extended over Abyssinia and Yemen in Arabia. Through Adule, a port on the Red Sea, the people of ancient Axum carried on commerce with Arabia and India. Pop. 5,000.

Ayacu'cho: a department of Southern Peru; bounded N. by Junin, E. by Cuzco, S. by Arequipa, and W. by Huancavelica. Area, estimated at 24,213 sq. miles. It is drained by the Apurimac and its affluents. Gold and silver are found here, and in agricultural respects it is the richest part of Peru. Pop. 142,205.

Ayacucho: a town of Peru; in department of the same name; 25 miles E. N. E. of Huancavelica (see map of South America, ref. 5-B). Here the armies of Colombia and Peru completely defeated the Spaniards on Dec. 9, 1824. This victory, gained by Gen. Sucre, ended the Spanish dominion on the American continent, and was followed by the speedy surrender of all the Spanish soldiers in Peru. (See PERU and SUCRE.) Pop. 20,000.

Aye-Aye (*Chi'romys madagascariensis*): a very singular quadruped of Madagascar, belonging to the order of lemurs. It has a long, bushy tail, and is about as large as a hare. Each of its four extremities has an opposable thumb, and

the digits are armed with pointed nails, which it sometimes uses to pick kernels out of nuts. It sleeps during the day,



Aye-aye.

and is very active in the night, feeding on insects and fruits.

Ayer: an important railroad center, Middlesex co., Mass. (for location of county, see map of Massachusetts, ref. 2-H); 35 miles N. W. of Boston; formerly known as Groton Junction, and incorporated as a separate town in 1870. Pop. of township (1880) 1,881; (1890) 2,148; (1900) 2,446.

Ay'eshah, or **Aieshah**: the favorite wife of the prophet Mohammed; b. at Medina about 610 A. D.; was a daughter of Abu-Bekr, who afterward became caliph. In the twenty-fourth sura (or chapter) of the Koran, entitled "Light," Mohammed expressly vindicated her chastity, which had been questioned. After his death she took an active part in public affairs as an enemy of the Caliph Othman and his successor Ali, who defeated her in battle. D. in 677 A. D. See Irving, *Mahomet and his Successors*.

Aylesford, **EARLS OF** (1714, in the peerage of Great Britain), and **Barons of Guernsey** (1703, in the English peerage).—**CHARLES WIGHTWICK FINCH**, the eighth earl, was b. in 1851, and succeeded his father in 1885.

Aylmer: a lake in British North America; about 80 miles N. of Great Slave Lake. It is about 70 miles long and 40 miles wide. It lies on the margin of the forest area of Canada.

Aylmer: incorporated town, Elgin co., Ontario, Canada (for location, see map of Ontario, ref. 5-C); on the Air Line Div. of the G. T. Ry., 12 miles E. of St. Thomas. It is also connected with M. C. Ry., the dépôt being, however, 2½ miles N. It is surrounded by fine farming land. Aylmer has a large canning and fruit-evaporating industry, furniture-factory, pork-factory, hub and spoke factory, 2 organ-factories, 2 sash and door factories, 2 roller-mills, a foundry, water-works, electric-lights, 2 newspapers, etc.; has 5 churches, 5 public schools, a collegiate institute, and a mechanics' institute with a library of more than 4,000 vols. Pop. (1881) 1,540; (1891) 2,167. **EDITOR OF "EXPRESS."**

Aylmer: on Can. Pac. Ry. and Lake Deschenes, Ottawa co., Quebec, Canada (for location, see map of Ontario, ref. 2-H); has manufacturing and lumbering industries. A line of steamers for the Upper Ottawa navigation start from here. Pop. (1881) 1,762; (1891) 1,945.

Aylmer, or **Elmer**, **JOHN**: bishop of the Church of England; b. in Aylmer Hall, parish of Tivetshall St. Mary, in Norfolk, England, in 1521. He was educated at Cambridge, B. A. 1541; was tutor to Lady Jane Grey; became archdeacon of Stow 1553, but shortly after, for opposing transubstantiation, was deprived under Mary, and for safety fled to the Continent. On the accession of Elizabeth (1558) he returned to England; became archdeacon of Lincoln 1562, bishop of London 1576. He treated Roman Catholics and Puritans with severity on doctrinal grounds. He wrote in reply to John Knox's *Blast of the trumpet against the monstrous regiment of women*, a work entitled *An Harborowe for faithfull and trewe Subjects, against the late bloune Blaste, concerning the Government of Wemen* (Strassburg, 1559). D. in London, June 3, 1594. See Cooper, *Athenæ Cantabrigienses*, s. v. **S. M. JACKSON.**

Aylmer, **MATTHEW**, Lord: b. at Balrath, County Meath, Ireland, about 1643; became a rear-admiral in the British navy in 1693, having distinguished himself at the battle of La Hogue; vice-admiral 1694. He became in 1709 commander-in-chief of the fleet; was superseded in 1711, but restored in 1714. He was raised to the Irish peerage as Lord Aylmer, Baron of Balrath, in 1718. D. Aug. 18, 1720.

Aylmer, **MATTHEW WHITWORTH**, Lord: an English general; b. in 1775; succeeded to the peerage Oct. 22, 1785; entered the army as ensign in 1787; served at the siege of Copenhagen, also in Portugal in 1809, in the peninsular campaigns, and was made full general in 1825. He was Governor-General of Canada 1828-33. D. in London, Feb. 23, 1850.

Aymarás: See **BOLIVIA** and **INDIANS OF SOUTH AMERICA**.

Aymorés: an Indian tribe of Brazil. See **BOTOCUDOS**.

Ayr, âr: a river of Scotland; flows nearly westward through Ayrshire, and enters the sea at the town of Ayr; noted for stones used in sharpening cutlery. Length, 33 miles.

Ayr: a seaport; county town of Ayrshire, Scotland; at the mouth of the Ayr; 42½ miles S. S. W. of Glasgow. The river is here crossed by three bridges—the new bridge ("New Brig" of Burns, since twice rebuilt) for general traffic, the "Auld Brig," still open to foot-passengers, and a railway bridge. In 1873 Newton-on-Ayr and Wallacetown, on the north side of the river, were amalgamated. Ayr has an excellent academy, a public library (the gift of Andrew Carnegie), a handsome spire, a fine race-course, elegant suburbs, and a marine esplanade. With Campbeltown, Irvine, Inverary, and Oban, it sends a member to Parliament. It possesses a large carpet-factory and extensive docks. The chief export is coal. Pop. (1891) 24,791; (1901) 28,624.

Ayrer, **JACOB**: a German dramatist. He wrote numerous dramas in the style of Hans Sachs and partly after the model of English plays, from which he copied the character of the clown. D. at Nuremberg, Mar. 26, 1605. See his life by C. Schmitt (Marburg, 1851). **JULIUS GOEBEL.**

Ayres, **ârz**, **ROMEYN BECK**: soldier; b. at East Creek, Montgomery co., N. Y., Dec. 20, 1825; graduated at West Point 1847; promoted to colonel Second Artillery July 28, 1879, and Nov. 29, 1862, brigadier-general of U. S. Vols.; served in war with Mexico 1847-48, at various posts 1848-73, and on expedition to Yellow Medicine river 1857. In the civil war served in the Manassas campaign 1861, engaged at Blackburn's Ford and Bull Run as chief of artillery of division 1861-62, and of corps 1862-63, in Virginia Peninsula 1862, engaged at Yorktown, Williamsburg, New Bridge, Garnett's Farm, Gaines's Mill, Golden's Farm, and Glendale; in the Maryland campaign 1862, engaged at South Mountain and Antietam, in Rappahannock campaign 1862-63, engaged at Fredericksburg and Chancellorsville, in the Pennsylvania campaign, in command of a division 1863; engaged at Gettysburg (brevet major), in suppressing New York draft riots in 1863, Rapidan campaign 1863, engaged at Rappahannock Station and Mine Run, in Richmond campaign 1864-65, engaged at Wilderness (brevet lieutenant-colonel), Laurel Hill, Spotsylvania, Jericho Ford, Tolopotomy, Bethesda Church, Petersburg (wounded), Weldon Railroad (brevet colonel), Chapel House, Rowanty Creek, Dabney's Mill, Five Forks (brevet brigadier-general), and Appomattox Court-house; in command of a division in the district of Shenandoah 1865-66, and member of tactics board 1867-69. Brevet major-general U. S. army Mar. 13, 1865, for gallant and meritorious services in the field, and brevet major-general U. S. Vols. Aug. 1, 1864, for conspicuous gallantry in battles of Richmond campaign. D. at Fort Hamilton, New York, Dec. 4, 1888.

Ayr'shire: a maritime county of Scotland; bounded N. by Renfrew, E. by Lanark and Dumfries, S. by Kirkcudbright and Wigtown, and W. by the Frith of Clyde. Area, 1,149 sq. miles. The surface is generally undulating or hilly, and the southeastern part mountainous. It is drained by the Ayr, the Doon, the Lugar, and other small streams. The county is rich in minerals, especially coal, limestone, freestone, and iron. Silurian and Devonian strata occur here. The soil is generally fertile and well cultivated. Ayrshire is noted for its good dairies and superior breed of milch cows. It has important manufactures of cotton and wool. Pop. (1891) 224,222; (1901) 254,133. Capital, Ayr.

Ayr'ton, **WILLIAM EDWARD**, F. R. S.: physicist and writer on electro-technical subjects; b. in London, England, in 1847. Prof. Ayrton may almost be said to be the father of electro-technical education, since from 1873 to 1879, while professor at the Imperial College of Engineering, Japan, he organized and maintained courses of instruction in electrical engineering, a subject for which no practical provision had at that time been made in the technical schools of either Europe or America. Ayrton was educated at University College, London, where he received the degree of

B. A., with honors, in 1867. Like many of the older English electricians, he began his practical career in the Government telegraph service, in which he ultimately rose to the position of electrical superintendent. Since 1879 he has been Professor of Applied Physics at the City and Guilds of London Institute, the leading technical school in Great Britain. Prof. Ayrton has been at once a fertile writer on electrical subjects and a prolific inventor. The number of scientific papers from his pen is very large, nearly a hundred having appeared in the *Proceedings* and *Transactions* of the Royal Society, the Physical Society, the Society of Telegraph Engineers, etc. He is the author of the widely known text-book entitled *Practical Electricity*, and of a large number of papers in the *Proceedings* and *Transactions* of the Royal and other societies. In connection with Prof. Perry, he has been awarded some twenty-six patents in Great Britain, and several in the U. S., France, Germany, etc. He is a Fellow of the Royal Society, London, a vice-president of the Physical Society, and president (1892-93) of the Institution of Electrical Engineers. E. L. NICHOLS.

Aythor: See **ATHOR**.

Ay'ton, Sir ROBERT: Scotch poet and courtier; b. at the castle of Kinaldie, near St. Andrews, 1570, and was educated at St. Andrews. He was one of the first Scotchmen who wrote in English with elegance and purity; intimately acquainted with the eminent men of his time; and was in great favor at the courts of James I. and Charles I. D. in Whitehall Palace, Feb., 1637-38.

Ay'tonn, WILLIAM EDMONDSTOUNE: poet and essayist; b. in Edinburgh, June 21, 1813; and was educated in the university of that city. He studied law; was called to the bar in 1840; and married a daughter of Prof. John Wilson. He became Professor of Rhetoric in the University of Edinburgh in 1845. Under the assumed name of "Augustus Dunshunner" he contributed many articles to *Blackwood's Magazine*, and distinguished himself as a humorist as well as a poet. In 1848 he produced *The Lays of the Scottish Cavaliers, and other Poems*, which had great success (29th ed. 1883; n. e. 1891). Among his other works are a humorous tale called *How I became a Yeoman; Firmitian, a Spasmodic Tragedy* (1854); and *Bothwell*, a narrative poem (1856). D. at Blackhills, near Elgin, Scotland, Aug. 4, 1865. See his life by Theodore Martin (London, 1867).

Ayuntamien'to (literally, a joining or meeting): in Spain, a council or governing body of a town. These councils acquired much political influence and importance during the wars between the Moors and Spanish Christians. The Spanish kings granted to the towns municipal privileges and institutions which were similar to those of the ancient Romans, and promoted a spirit of liberty. The councils were elected by the vote of the citizens. These institutions were abolished under the Bourbon kings, and were restored in 1837. They were deprived of political power in 1844.

Azad'irine: a bitter principle found in an East Indian tree (*Melia Azadirach*), used to some extent as a substitute for quinine. This tree is called "Pride of China" in the U. S.

Azaïs' PIERRE HYACINTHE: b. at Sorèze, department of Tarn, France, Mar. 1, 1766; was educated in the Benedictine college of his native city, and became secretary to the Bishop of Oléron; was condemned to transportation on account of a bitter criticism of the excesses of the revolutionists, but escaped and lived for several years in retirement; went to Paris in 1806; Professor of History at the military school of St. Cyr, and afterward inspector of the public libraries of Avignon and Nancy; lost this position in 1815 because he wrote a defense of Napoleon; received a pension from the Government through the influence of Madame de Staël, and lived quietly in Paris, lecturing on philosophy in his garden, and publishing a great number of books. D. in Paris, Jan. 22, 1845. His two most characteristic works are *Le Système de Compensation* (1806) and *Le Système universel* (1812).

Aza'lea [from Gr. ἀζαλέος, dry; probably so called because it is usually found in dry situations]: a section of the genus *Rhododendron*, of the family *Ericaceæ*, still commonly regarded, especially by horticulturists, as a distinct genus. There are about 100 species or more, natives of North America, China, and other countries. Many of them are cultivated for their flowers, which are beautiful and fragrant. The *Azalea pontica*, a small shrub growing near

the Black Sea, has fragrant flowers covered with glutinous, hairy glands. The whole plant is narcotic and poisonous. Among the American species (which have deciduous leaves)



Azalea indica.

are the *Azalea nudiflora*, sometimes called honeysuckle, which is cultivated in English gardens, and the *Azalea viscosa*, which has glutinous and fragrant flowers. The *Azalea indica*, a native of India, is a favorite of florists, and is remarkable for its brilliant colors. The *Azalea calendulacea*, found in the Southern U. S., is said sometimes to clothe the mountains with a robe of living flame-color. Many hybrid azaleas are cultivated as flowering shrubs.

Aza'ni: an ancient and ruined city of Asia Minor, in Anatolia, on the Rhyndacus, which is here crossed by two Roman bridges, 73 miles S. S. W. of Brusa. Here are extensive remains, among which are an Ionic temple of Jupiter, with eighteen columns standing, and a theater 232 feet in diameter.

Aza'ra, Don FELIX, de: a Spanish naturalist; b. at Barbunales, in Aragon, May 18, 1746. He was a member of a commission sent in 1781 to South America to determine the boundary between the Spanish and Portuguese possessions, and he remained there twenty years. He prepared numerous maps of South America, and published in Spanish *Observations on the Quadrupeds, Reptiles, and Birds of Paraguay and La Plata* (5 vols., 1802). He also wrote *Travels in South America*, which were published in French (4 vols., 1809). These works are highly esteemed. D. in Aragon in 1811. See Walckenaer, *Notice sur F. Azara*, prefixed to his *Voyage dans l'Amérique Méridionale* (1809).

Azari'ah [Heb. אֲזַרְיָהּ, the Lord helps]: a name of frequent occurrence in the Old Testament: (1) Another name for Uzziah, the tenth King of Judah, who began to reign, according to Winer, 809 B. C. (2) One of Daniel's three friends, a noble of the tribe of Judah, carried captive to Babylon in 605 B. C., whose name was changed to Abednego. (3) The name of some twelve other persons mentioned in the Old Testament, most of whom were either priests or high priests.

Aze'glio, MASSIMO TAPPARELLI, Marquis d' (dat-zāl'yō): Italian statesman, author, and artist; b. at Turin, Oct. 24, 1798. He studied and worked as an artist in Rome, where he passed eight years (1821-29), and became a skillful landscape-painter. Having removed to Milan, he married a daughter of the celebrated author Manzoni. He published in 1833 an historical novel entitled *Ettore Fieramosco*, which was very popular. He stimulated the national spirit and patriotism of the Italians by another popular historical romance, *Niccolò de' Lapi* (1841). His political principles were liberal, but moderate. He wrote numerous political treatises, and fought against the Austrians at Vicenza in 1848. In May, 1849, he was appointed president of the council (prime minister) by King Victor Emmanuel. In this position he rendered important services to his country.

He was superseded by Cavour in 1852. D. at Milan, Jan. 15, 1866. See his life by Morozzo (Florence, 1884).

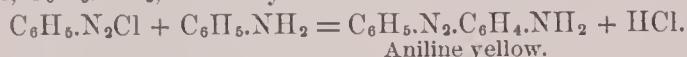
Azeve'do, MANOEL ANTONIO ALVARES, de: Brazilian poet; b. Sept. 12, 1831, at S. Paolo; d. Apr. 25, 1852. He was educated mainly in Rio de Janeiro, where his father was an eminent advocate. He himself had become a learned lawyer before his premature death. He is chiefly known, however, as the most passionate of Brazilian Romanticists. His poems are full of the revolt and despair of Victor Hugo, De Musset, Lamartine, and especially Byron. Aside from a few unimportant critical articles, his achievement is summed up in the edition of his poems published by his father: *Obras de M. A. Alvares de Azevedo, precedidas de um discurso biographico, etc.* (3 vols., 3d ed. Rio de Janeiro and Paris, 1862). A. R. MARSH.

Az'imuth [viâ Fr., from Arab. *as sumût*; *al*, the + *sumût*, way, points]: the angle made at the zenith by the meridian and the vertical circle in which a heavenly body is situated, or the angle measured along the horizon between the north or south point and the point where a circle passing through the zenith and the body cuts the horizon. In trigonometrical surveys on the surface of the earth the accurate determination of the azimuth of an object is very important. It is usually performed with a theodolite. Azimuth circles or vertical circles are great circles of a sphere, passing through the zenith and intersecting the horizon at right angles.

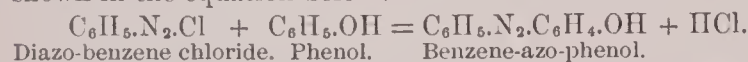
Azineourt: See AGINCOURT.

Azo-colors: an important class of dyestuffs that have come into prominence within the past few years. They belong to a group of compounds known as azo compounds, the simplest of which is azo-benzene. This is related to benzene as shown in the formulæ C_6H_6 , benzene, and $C_6H_5.N_2.C_6H_5$, azo-benzene. The azo-colors that were first manufactured are *aniline yellow*, $C_6H_5.N_2.C_6H_4.NH_2$; *chrysoïdine*, $C_6H_5.N_2.C_6H_3(NH_2)_2$; and *Bismarck brown*, $NH_2.C_6H_4.N_2.C_6H_3(NH_2)_2$.

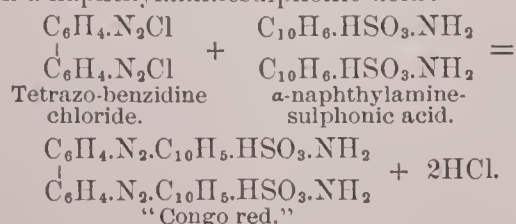
In general terms whenever a diazo compound is brought together with a phenol or an amido compound, reaction takes place with the formation of a colored substance, and many of the products thus formed are valuable as dyes. The simplest diazo compound is diazo-benzene, the chloride of which is represented by the formula $C_6H_5.N_2Cl$. When diazo-benzene chloride acts upon the amido compound, aniline, $C_6H_5.NH_2$, aniline yellow is formed:



The simplest example of the products formed by the action of a diazo compound upon a phenol is the compound benzene-azo-phenol, $C_6H_5.N_2.C_6H_4.OH$, which is formed as shown in the equation below:



Among the most important azo-colors are the following: The *tropæolines*, *helianthin*, *acid yellow*, *anisol-red*, *benzopurpurin*, etc. Chrysoïdine was discovered almost at the same time by Caro and Witt independently, and its composition and constitution were established by Hofmann in 1877. The first dyestuffs formed by the action of diazo compounds on phenols were introduced by Witt in 1879 under the name of "tropæolines," and simultaneously by Poirrier, of St. Denis, under the name of "orange." These are all known in general as *acid azo-colors*. Of these an immense number have been patented, and a great many have come into use. *Secondary azo-colors* are those that contain two azo-groups, all of them being derivatives of the substance oxy-azo-azobenzene, $C_6H_5.N_2.C_6H_4.N_2.C_6H_4.OH$, which was discovered in 1879 by Caro and Schraube. "Bicbrich scarlet" and the "croceïn scarlets" belong to this class. The benzidine colors are also secondary azo-colors. The first of these brought into the market was "Congo red," which is formed by treating the tetrazo compound of benzidine with α -naphthylaminesulphonic acid:



Both acid and basic azo-colors dye silk and wool readily, but a mordant is necessary in order to make them take upon

cotton. The secondary azo-colors, however, have a decided affinity for cotton. This makes the benzidine colors especially valuable, as they can be dyed upon cotton directly from a soap-bath without the use of mordants. BENZOPURPURIN (*q. v.*) is the most extensively used of all the azo-colors. Those oxyazo compounds which are insoluble in water form unstable compounds when heated for some time in alcoholic or aqueous solution with potassium or sodium bisulphite. As these compounds are soluble in water, and are decomposed by steaming or by alkali, they can easily be deposited on the fiber.

IRA REMSEN.

Az'of, Azoph, or Azov, Sea of (the anc. *Pa'lus Mae'otis*, called by the Russians *More Asovskoe*): a large body of water situated in the southeastern part of Europe, between Russia and the Black Sea, with which it communicates by the Strait of Yenikale or Kertch (anc. *Cimmerian Bosphorus*). It extends from the Crimea to the mouth of the Don, about 200 miles, and is in some places 100 miles wide or more. Its area is estimated at 14,000 sq. miles. This sea, the water of which is nearly fresh, contains a great abundance of fish. A canal connects it with the Gulf of Perekop.

Azof, or Azov (anc. *Tan'ais*): a small town and fort of Russia; government of Ekaterinoslav; near the mouth of the river Don, 25 miles E. S. E. of Taganrog (see map of Russia, ref. 10-E). It has declined in population and importance. Its harbor is shallow. Azof was taken from the Turks by Peter the Great. It was settled by the Carians, and in ancient times had the name Tanais. After the taking of Constantinople by the Italians it passed into the hands of the Venetians, who held it until, in 1410, it was captured by the Tartars. The Christians were put to death by the captors, from whom came its present name. Pop. about 20,000.

Azores [Port. *Açores*, from *açor*, a hawk], or **Western Islands**: three groups of islands situated in the North Atlantic, about 500 miles W. of Portugal, to which they belong, and between lat. $36^{\circ} 55'$ and $39^{\circ} 44'$ N., and lon. $25^{\circ} 10'$ and $31^{\circ} 16'$ W. (see map of the World, ref. 4-I). The first group consists of Flores and Corvo. About 114 miles S. E. of this group is the central group of Terceira, St. George, Pico, Fayal, and Graciosa. St. Michael and St. Mary form the third group, which is nearly 70 miles S. E. of the central group. St. Michael, the largest of all, is 50 miles long, and varies in width from 5 to 12 miles, and has an area of 340 sq. miles. They are of volcanic formation, and have fertile soils, though the surface is mostly mountainous. The highest point is the Peak of Pico, which has an altitude of 7,613 feet. Volcanic disturbances of a terrible character have occurred at various times. Whole towns have disappeared in opening chasms, and in 1811 an island emerged suddenly from the deep, and later disappeared. The sugar-cane, coffee-plant, orange, and grapevine flourish here, but the soil is not well cultivated. The chief articles of export are wine, brandy, grain, and oranges. The inhabitants are very ignorant. The land is held by feudal tenure, and under such restrictions that the farmers never think of improving it, and simply gather the products which grow wild. It is owned in immense entailed estates. The people are extremely fond of music. They are not intemperate in their habits, are very clean in their dress, but are prone to the grossest superstition. The Azores have no good harbors. The Portuguese took possession of these islands in 1449. Area, 1,005 sq. miles. Pop. 269,401.

Az'otized Bodies (or **Principles**): substances which contain nitrogen (azote), and form part of the living structure of an animal or plant. Among them are albumen, fibrine, caseine, gelatine, and kreatine.

Azo'tus: the Greek name of *Ashdod*, an ancient city and stronghold of the Philistines, in Palestine, about 3 miles from the Mediterranean and 21 miles S. of Jaffa. See ASHDOD.

Azov, Sea of: See AZOF.

Azpeitia, äs-pā'yēe-tee'a: Spanish town in province of Guipúzcoa, 18 miles S. W. of San Sebastian (see map of Spain, ref. 12-G). In the convent of Loyola, a mile from the village, St. Ignatius of Loyola, founder of the Jesuits, was born, 1491. Pilgrims from all quarters flock to the great festival held here in his honor every year in July. Pop. about 6,000.

Az'tecs: a name of a Mexican nation which inhabited the table-land of Anahuac at the time of the Spanish con-

quest of Mexico. According to tradition, they came originally from Aztlan to Mexico, which was inhabited by the Toltecs before the migration of the Aztecs. It is supposed that the latter founded the city of Mexico (or Tenochtitlan) about 1325, some say as early as 1216, and became the most powerful and dominant people of Mexico or Anahuac. They made considerable progress in civilization and the useful arts, derived partly from the Toltecs. They were a warlike people, and conquered several neighboring tribes. "At the beginning of the sixteenth century," says Prescott, "the Aztec dominion reached across the continent from the Atlantic to the Pacific." The government was an elective monarchy, and the sovereign was selected from the brothers or nephews of the preceding king, so that the choice was always restricted to the same family. As they had never learned the art of alphabetical writing, their laws were exhibited to the public in hieroglyphical paintings or picture-writing. Their religion was a gross polytheism. They sacrificed human victims to their gods on a larger scale than other nations—i. e. about 20,000 annually. Astronomy was the science which they cultivated with most success. "We can not," says Prescott, "contemplate the astronomical science of the Mexicans without astonishment." They were acquainted with the cause of eclipses, and they recognized some of the most important constellations. They adjusted the times of their festivals by the movements of the planets, and fixed the true length of the tropical year with great precision. An immense dial, disinterred in 1790 in the great square of Mexico, has supplied us with interesting facts. The calendar engraved on it shows that they settled the hours of the day precisely; also the periods of the solstices and equinoxes, and the transit of the sun across the zenith. The Aztecs were diligent cultivators of the soil, and had acquired respectable proficiency in agriculture, but they had no horses, oxen, or other animals of draught. Their staple productions were maize and the agave or Mexican aloe, which supplied them with food, drink, and clothing. They were ignorant of the use of iron, but found a substitute in bronze, an alloy of copper and tin, of which they made weapons and tools. They also cast golden and silver vases of large size. In mimetic art they were much inferior to the Egyptians. The Spanish conquerors of Mexico destroyed nearly all the manuscripts which they found in the country, and it is not probable that the art of reading the picture-writing will ever be recovered. "The Aztec character," says Prescott, "was perfectly original and unique. It was made up of incongruities apparently irreconcilable. It blended into one the marked peculiarities of different nations, not only of the same phase of civilization, but as far removed from each other as the extremes of barbarism and refinement. It may find a fitting parallel in their own wonderful climate, capable of producing on a few square leagues of surface the boundless variety of vegetable forms which belong to the frozen regions of the north, the temperate zone of Europe, and the burning skies of Arabia and Hindustan." See Prescott, *Conquest of Mexico*, vol. i.

Revised by R. D. HITCHCOCK.

Aztec Antiquities: See CENTRAL AMERICAN ANTIQUITIES.

Azuay, ă-zoo-ay': a southern department of Ecuador; comprising the plateau of Cuenca and the mountains about it. It is fertile and rich in minerals, and largely devoted to the raising of cattle. Area, 11,300 sq. miles. Pop. 132,400.

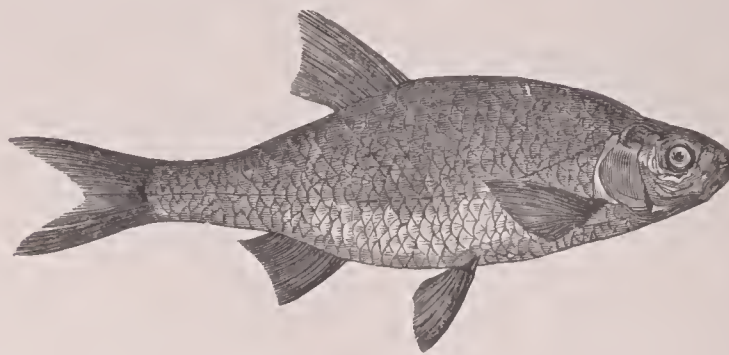
Azu'ni, DOMENICO ALBERTO: an Italian writer known from his researches in maritime law; b. at Sassari, Aug. 3, 1749; was a judge in Genoa. He published *Droit Maritime de l'Europe* (Paris, 1805), and *Dizionario Universale ragionato della giurisprudenza mercantile*. D. at Cagliari, Jan. 23, 1827.

Azure [O. Fr. *azur*, from Pers. *lāzhwārd*, lapis-lazuli]: the fine blue color of the sky; also the blue pigment which is produced by melting a mixture of a salt of cobalt with quartz-sand and potash, and is used in coloring porcelain. In heraldry, azure is one of the colors employed in blazonry, and is represented in engraving by horizontal lines. It is

equivalent to the color of sapphire among precious stones. In painting, azure is a sky-colored blue, called ultramarine.

Azure-stone: See LAPIS-LAZULI.

Az'urine: a blue variety of the common red-eye or rudd



Azurine or blue roach.

(*Scardinius erythrophthalmus*), a minnow or chub found in the waters of England.

Az'urite: a deep blue carbonate of copper, differing slightly in composition from MALACHITE (*q. v.*), and often occurring with it as an ore of copper, and occasionally as an ornamental stone; but it is opaque, and not hard enough for jewelry. Arizona has yielded masses of deep violet-blue azurite, both pure and mingled with green malachite, that can be wrought into small articles of extreme beauty.

GEORGE F. KUNZ.

Az'ymites [from Gr. ἀζυμίτης, ἀζυμος, unleavened; ἀ-, not + ζύμη, leaven]: the opprobrious epithet applied by the Greek Church polemics to the Latins because the latter used unleavened bread in the celebration of the Holy Eucharist, while the Greek Church uses leavened bread. The Latins in reply called the Greeks "Fruentarians." "There is distinct evidence that unleavened bread was used in the Eucharist by the Latins, and by some Eastern sects in the seventh and eighth centuries, and there is probable evidence that it was used in the third. In the orthodox Eastern Church there can be no doubt that leavened bread has been used from a very early period indeed; if not from the very first, at any rate from the time when Judaizing sects insisted on using unleavened cakes, like those of the Passover, in the Lord's Supper" (Smith and Cheetham, *Dict. Christ. Antiq.*, sub "Elements" [i. 602]). The controversy upon the point was begun by the Greeks, but not until the eleventh century. It was fairly opened by Michael Caerularius, patriarch of Constantinople, 1043-59. The Greek and Latin Churches had long been on bad terms, but Caerularius brought matters to a crisis. The charge against the Latins on account of their use of unleavened bread is not stated by Photius in his famous *Encyclical Letter* (867), in which he goes over the points of difference between the two churches. This does not of course prove that it had not been made, but it does show that it was not considered by Photius very important. Caerularius raised it to prime importance. The argument of the Greek Church is that our Lord in instituting the Eucharist after the Passover-meal used true, nourishing bread as the sign of the new dispensation of joy and gladness; that of the Latin Church is that the Eucharist was instituted during the feast of the Passover, and therefore the only bread that our Lord could get for it was unleavened bread. The Greek position is stated in the *Orthodox Confession of the Eastern Church* (Q. 107), which specifies that the bread of the Eucharist shall be made from wheat, fermented and as far as possible pure. So also in the *Longer Catechism of the Eastern Church* (Q. 328) it is taught that the bread for the sacrament should be leavened pure wheaten bread. The Latins have made the use of such bread in the sacrament a grievous sin, but the Council of Florence (1439) decided that as transubstantiation took place just the same whether the bread was leavened or unleavened, the Greeks could not be anathematized for their practice in this respect.

SAMUEL MACAULEY JACKSON.

B



B: the second letter of the English alphabet, and of most others. It is a sonant consonant of the class known as labial mutes. It is cognate with the mutes *p* (surd) and *f*, and etymologically interchangeable with them and with the liquid *m* and the semi-vowels *w* and *v*. (See ALPHABET.) In ancient Rome *B* sometimes stood for 300, and \bar{B} for 3,000. The Greek β stood for 2, and β for 2,000. On old French coins *B* stands for Rouen; on Prussian, for Breslau. *B* in chemistry is the symbol of the element boron. As an abbreviation, *B.*, or *b.*, signifies "born," and sometimes "book."

B: in music, the seventh letter in the natural diatonic scale of either C major or minor. In this melodic connection it forms the "leading note" of the C scale, calling for the octave C to follow it. In the German language *B* corresponds to our B flat, the letter *H* being used for this, our B natural. *B.* is sometimes written as an abbreviation for the word *Basso*. D. B.

Baa'der, FRANZ XAVER, von: b. at Munich, Mar. 27, 1765; studied medicine at Ingolstadt and Vienna 1781-86; then natural science, especially mineralogy, at Freiberg, under Werner, 1788-92; visited England 1792-96, and held various positions in the Bavarian mining department from 1797 to 1820. In this period he wrote *Vom Wärmestoff* (Vienna, 1786); *Versuch einer Theorie der Sprengarbeit* (Freiberg, 1802); and *Anleitung zum Gebrauche der schwefelsäuren Soda oder des Glaubersalzes zur Glaserzeugung* (1815), for which he received a prize of 12,000 florins from the Austrian Government. Meanwhile he cultivated the study of philosophy and theology with great energy, became acquainted with all the leading men of the time and with their ideas, and finally brought himself to rest in the mysticism of Jakob Böhme. In 1826 he was made Professor of Philosophy and Speculative Theology at the University of Munich, and the deep enthusiasm and ingenious argumentation of his lectures and writings attracted great attention, though his ideas were mystical and the form in which he represented them aphoristical. His views tended to a reconstruction of the whole civilization on the basis of religion and of the Church, but in this new Church there should be no pope. In 1814 he presented a memorial to the sovereigns of Russia, Prussia, and Austria, in which he urged the necessity of bringing politics once more into close connection with religion, but in 1837, during the troubles at Cologne, he spoke with much sharpness against the pope. He died, however, a good Roman Catholic, May 23, 1841, at Munich. His philosophical writings have been published in a collected edition in 16 volumes by Franz Hoffmann (Leipzig, 1850-60), who also has given a general representation of his standpoint (Leipzig, 1857). Cf. Classen, on Baader, Stuttgart, 1886-87, 2 vols.

Ba'al, or **Bel** [Heb., lord]: an ancient North Semitic title of deity. Originally the *baal* seems to have been regarded as the owner and fructifier of the soil, and the name was given to any local deity. Every city and locality in Phœnicia had its *baal* (Baal of Tyre, etc.), and the same thing was probably true of Canaan (Baal-peor, etc., and see Judges vi. 26; ix. 4); hence the plural in O. T., "the baalim." Jehovah also had the title *baal* down to the time of the prophet Hosea (c. 750 B. C.); see Hos. ii., and the proper names (Ishbaal, etc.) compounded with this title. The worship of the Sidonian Baal was introduced into Israel by Jezebel (1 Kings xvi. 31), but the Canaanite Baals were there worshiped earlier. The title was in Phœnicia applied also to a celestial deity (Baal-shemem, "the Baal of the sky"). In the more developed Babylonian cultus the name (pronounced *Bel*, Latinized form *Belus*) was individualized and connected with the sun. In Carthage it appears in Hannibal, Hasdrubal, etc. See W. R. Smith, *Religion of the Semites*; Sayce, *Hibbert Lectures*. C. H. Toy.

Baal'bec, **Balbec**, or **Baalbek** [final *bek* derived, perhaps, from Arabic *bakka*, be thronged]: an ancient and magnificent city of Syria (called by the Greeks *Heliopolis*, i. e. city of the sun); situated in a valley or plain near the

foot of Anti-Libanus, about 42 miles N. W. of Damascus; lat. 34° 1' 30" N., lon. 36° 11' E., and about 3,800 feet above the level of the sea. Its origin and early history are not known. It was formerly one of the most populous and important cities of Syria, and contained many palaces and monuments. Antoninus Pius built here a grand temple, which subsequently became a Christian church. In 636, Baalbec fell into the hands of the Mohammedans, and in 748 was sacked by the Caliph of Damascus. The site is now occupied by a modern village of 2,000 inhabitants and extensive ruins of ancient temples, among which was the great temple of the sun. This was 324 feet long, and had a peristyle of fifty-four Corinthian columns, about 7 feet in diameter and 89 feet high, including capital and pedestal. Six of these columns are now standing. Some of the stones used in the walls or substructions of this temple are 64 feet long and 12 feet thick. The chief material of these temples was limestone or marble and granite. See Wood and Dawkins, *Ruins of Baalbec* (1757); Cassas, *Voyage Pittoresque de la Syrie* (1799); Volney, *Voyage en Syrie*; Robinson's *Later Biblical Researches* (1852, pp. 505-527); Bâdeker's *Palestine*, s. v.

Ba'badagh: a town of Bulgaria; on a tributary of the Danube, 93 miles N. E. of Silistria (see map of Turkey, ref. 2-E). It has considerable commerce with the coasts of the Black Sea, and has a Tartar high school. It was stormed by the Russians in 1771 and 1828, and was ineffectually besieged in 1854. Pop. about 10,000.

Babahoy'o: a town of Ecuador, in the province of Guayaquil; 20 miles N. E. of Guayaquil, on the Cabacol. The goods sent from Guayaquil into the interior go to this place, and are thence sent farther by mules. In consequence, there are large warehouses here. But Babahoyo is, in spite of this great trade, only a small, poorly built town.

Bab'bage, CHARLES, F. R. S. (1816): English mathematician; b. near Teignmouth, Devonshire, Dec. 26, 1792; graduated at Trinity College, Cambridge, in 1814. He early showed extraordinary genius for mathematics, and mechanical speculation and invention. His principal work is *On the Economy of Machinery and Manufactures* (London, 1832), which was translated into several languages. Among his other works is the *Ninth Bridgewater Treatise* (1837). But the public knows him best as the inventor of a calculating machine, which was never completed, although about £17,000 of the public money, and £6,000 of his own, was expended on it. He then spent his life upon the equally abortive analytical engine. His fellow-citizens knew him as the remorseless foe of organ-grinders. D. in London, Oct. 20, 1871.

Bab'bitt, ISAAC: b. at Taunton, Mass., July 26, 1799. He was a goldsmith, and made at his native town the first britannia ware produced in the U. S. In 1841 he received a gold medal for his valuable invention of the alloy which bears his name. Congress also gave him \$20,000. He afterward engaged extensively in the manufacture of this alloy, and also of soap. D. insane, May 26, 1862.

Babbitt Met'al: a soft alloy invented by Mr. Isaac Babbitt, of Boston, and used in lining boxes for axles and gudgeons, in order to diminish the friction and abrasion. These boxes are extensively used in the machinery of steamboats and locomotives. The alloy is prepared thus: to 4 lb. of melted copper add gradually 12 lb. of the best Banca tin, then 8 lb. of antimony, and finally 12 lb. more of tin.

Babeock, JAMES FRANCIS: See the Appendix.

Bab'cock, ORVILLE E.: soldier; b. in Franklin, Berkshire co., Vt., Dec. 25, 1835; graduated at the U. S. Military Academy July 6, 1861, and entered the army as second lieutenant of engineers; promoted to be first lieutenant Nov., 1861; captain 1863, major 1867, lieutenant-colonel 1884; upon graduating he was assigned to active duty as assistant engineer on the defenses of Washington, and subsequently on the staff of Gen. Banks on the Upper Potomac. In the Virginia peninsular campaign of 1862 he served with the engineer battalion at Yorktown and subsequent operations

of the campaign; in Jan., 1863, he was appointed lieutenant-colonel of volunteers, and served as assistant inspector-general of the Sixth Army Corps; as chief engineer and assistant inspector-general of the Ninth Corps; as chief engineer department of the Ohio; and in 1864 he became aide-de-camp to Gen. Grant, with whom he served in the battle of the Wilderness and in subsequent operations, terminating with the surrender of the Confederate armies in Virginia and North Carolina; in July, 1866, he was appointed colonel and A. D. C., and continued to serve as such to Gen. Grant until the latter was inaugurated President, when he was assigned to duty with the President, as his secretary. In 1871, in addition to his other duties, he was placed in charge of public buildings and grounds in the city of Washington, and also made engineer in charge of the Washington aqueduct, which duties he performed till 1877; also president of board of directors of Columbia Hospital for Women and Lying-in Asylum. Drowned in Mosquito Inlet, Fla., June 2, 1884.

Babcock, STEPHEN MOULTON, M. A., Ph. D.: agricultural chemist; b. at Babcock Hill, Oneida co., N. Y., Oct. 22, 1843; educated at Tufts College, Cornell University, and at Göttingen, Germany. Dr. Babcock has given special attention to the chemistry of milk and its products, is the inventor of the Babcock milk-tester, now much used by farmers for the determination of fat in milk, and is at present (1900) Professor of Agricultural Chemistry in the University of Wisconsin, having previously been connected with the chemical department of Cornell University. He was also chemist to the New York State Experiment Station. He is author of many articles upon the composition of milk and butter, and is joint author with Dr. G. C. Caldwell of *A Manual of Qualitative Chemical Analysis*. L. H. BAILEY.

Ba'bel, or **Ba'bil** [Heb. *bābel*, Babylon; perhaps from *bābili*, gate of the gods]: the Hebrew name of the city commonly called Babylon, which is the Greek form of the word Babel; it was also the name of the famous tower which the descendants of Noah began to build soon after the Deluge, on the plain of Shinar, but in consequence of the confusion of tongues they could not finish it. The projectors of the tower said, "Go to, now; let us build us a city, and a tower whose top may reach unto heaven, and let us make us a name, lest we be scattered abroad upon the face of the whole earth." (Genesis xi.) There is no evidence that the work was ever raised above the foundations, but several extravagant reports or traditions of its immense height have obtained currency. (See *The Chaldean Account of Genesis*, by George Smith, revised ed. by Sayce, 1880.) Sir Henry Rawlinson identifies it with the ruin now called Amrán, within the city of Babylon itself. But it is generally identified with Birs Nimrud in Borsippa, a suburb of Babylon. The ruin rises 154 feet above the level of the plain. Some persons have confounded the tower of Babel with the temple of Belus.

Bab-el-Man'deb [Arab., gate of mourning]: a strait which connects the Red Sea with the Gulf of Aden and the Indian Ocean. On the Arabian side of the strait is a cape called Bab-el-Mandeb. The strait is about 20 miles wide, and incloses the rocky island of Perim, on which is a British fort. The eastern channel is most frequented. It is 4 miles wide and 7 to 14 fathoms deep. The name was given to the strait because the navigation of the sea to which it is the entrance, owing to numerous small rocky islets, was, before the introduction of steamers, extremely dangerous.

Bá'ber, **Babur**, or **Babour**, MOHAMMED (surnamed ZAHÉER-ED-DEEN, i.e. protector of religion): a celebrated Emperor of India, and the first of the Great Moguls; b. Feb. 14, 1483. He was a descendant of Tamerlane (Timur-Leng). In 1494 he succeeded his father, who was King of Ferghána. The first part of his reign was disturbed by wars with neighboring powers, and he experienced great vicissitudes of fortune. He performed remarkable exploits in war, and extended his dominions by the conquest of Kandahar, Cabul, etc. He made an incursion into the Punjáb in 1505, and a second time in 1519. Having again crossed the Indus in 1524, he defeated Ibrahim, King of Delhi, on the plain of Paniput in 1526, and became master of India. He was an able ruler, and had a genius for poetry and music. He died Dec. 26, 1530, and was succeeded by his son Humayoon. See his autobiography (London, 1826), abridged in R. M. Caldecott's *Life of Báber, Emperor of Hindostan* (London, 1844); cf. Wheeler, *Short History of India* (1880).

Babenf, *baä'böf'*, FRANÇOIS NOEL: a French conspirator and Socialist, who assumed the name of CAIUS GRACCHUS; b. at Saint-Quentin in 1760. He founded in Paris, in 1794, *The Tribune of the People*, a journal in which he advocated equality and community of property. His disciples were called Babouvistes, and his system Babouvisme. He formed a conspiracy against the Directory, was arrested and tried in Paris, and, the sentence of death being pronounced upon him, he stabbed himself with a dagger, but not fatally, and was guillotined the next day, May 28, 1797.

Babi: the Malay word for "hog," is the name of several islands in the Pacific and Indian Oceans.

Bab'ington, ANTONY: English Catholic gentleman; b. at Dethick, Oct., 1561; entered into a conspiracy to free Mary Stuart and murder Queen Elizabeth. The plot being discovered, he was executed by hanging and quartering in London, Sept. 20, 1586, with a number of his companions. Queen Mary herself was executed largely on the evidence of a letter she was said to have written to Babington, approving of the plot to murder Elizabeth, although she strenuously denied having any knowledge of it.

Babington, CHURCHILL: classical philologist; b. in Leicestershire, England, in 1821; graduated at St. John's College, Cambridge; held the chapelry of Horningsea, Cambridgeshire, 1848-61; was Disney professor of archæology 1865-80; became rector of Cockfield in 1866; edited from MSS. discovered, 1847 and 1856, orations of Hyperides; wrote largely on botany, ornithology, archæology, and numismatics for various works and *Transactions*, and was a contributor to Smith's *Dictionary of Christian Antiquities*. D. Jan. 13, 1889.

Babingtonite: a silicate of iron and calcium.

Babirussa: See BABYROUSSA.

Bab'ists [Pers. *bābī*, babism, deriv. of *bāb*, gate, the name assumed by the founder, Ali Mohammed ibn Redha]: a Mohammedan sect which originated in Persia in the second quarter of the present century, and in a short time attained to a widespread cult. Its political agitation led the present shah to oppose it. The Babists defended themselves, and civil war ensued. The Bab was shot at Tabriz, 1850. His successor was Yahya Hazrat-i-Ezel. In 1852, in consequence of a Babist attempt on the shah's life, the sect was suppressed. Many were put to death, many more were forced to recant, but the sect still lives; indeed, it is said that its adherents at present amount to several millions. In 1867 a split occurred, headed by Behá (Huseyn Ali), who claims to be inspired. The Babists profess to be reformers, assert the absolute unity of God, and claim that the Bab is as much superior to Mohammed as the latter is to Christ. They consider the Bab to be an incarnation of God. Their religious ideas are a mixture of various elements—mysticism, gnosticism, and fanaticism—well-nigh impossible of definition. Their principal social reforms are in the way of elevating the position of women by rendering divorce less easy and remarriage of the divorced women allowable. They also forbid traffic in slaves, and smoking. See E. G. Browne, *The Babists of Persia*, in the *Journal of the Royal Asiatic Society*, new series, vol. xxi. (July and Oct., 1889); cf. his translation *The Episode of the Bab* (London and New York, 1892); also Clement Huart, *La Religion de Bab* (Paris, 1889).

SAMUEL MACAULEY JACKSON.

Bab'lah: the fruit of several species of acacia. It contains tannic acid and a red coloring-matter. It is used in dyeing and calico-printing for fawn colors.

Ba'boo [Bengali and Hindi, *bābū*]: a Hindu title equivalent to the English "Mr.," usually given to gentlemen who are educated and wealthy. The Baboos are noted for generosity and public spirit, and are liberal in religion. Many of them are bankers and merchants.

Baboon' [from Old Fr. *babuin*, *baboin*, *babion*; of unknown origin]: one of a group of monkeys belonging to the family *Simiida*, distinguished by long truncated muzzles and cheek-pouches. The face resembles that of a dog, and the ridges over the eyes are very distinct. Baboons have large callosities on the buttocks, and a repulsive physiognomy. They walk or run easily on the ground, and climb trees with agility. They are exceedingly strong, cunning, and mischievous. Troops of these animals sometimes enter a plantation for plunder, and destroy much besides what they eat and carry away in their cheek-pouches. They are chiefly found on the continent of Africa, and feed mostly on fruits

and vegetables. The group is divisible into two genera—the baboons proper (*Cynocephalus*), which have long tails, and the mandrills (*Mormon*), which have very short tails. As examples of baboons of the first genus may be mentioned



The baboon mother and her infant.

the chacma, or pig-faced baboon (*Cynocephalus porcarius*), a native of South Africa, one of the largest of the baboons, and about the size of a mastiff; and the dog-faced baboon (*Cynocephalus hamadryas*), which is a native of Arabia and Abyssinia. The latter species is often sculptured on the ancient monuments of Egypt, and it is supposed to have been the "Thoth" baboon to which divine honors were paid. It was frequently embalmed, and the mummies are still found. The mandrill, or rib-nosed baboon (*C. mormon*), a native of Guinea, is the largest, ugliest, and fiercest of the whole group. Its muzzle is marked with blue and scarlet ribs. Numerous other species are known, the most familiar being *Cynocephalus babuin* of Northeastern Africa.

Revised by D. S. JORDAN.

Babrius (in Gr. *Βάβριος*): a famous Greek fabulist; a Syrian by birth; of uncertain period. The estimates are no less than five hundred years apart; but it is safer to put him in the early centuries A. D. Babrius drew his material mainly from the old stock of fables, and his great charm lies in his careful handling of the choliambic meter in which his fables are composed and in the popular character of his style. The poems of Babrius lay hidden for ages under a prose paraphrase. The poetic form was detected by Tyrwhitt in 1776; 123 of the poems were discovered at Mt. Athos by Minoïdes Minas in 1843, and first edited by Boissonade in 1844. A valuable edition, with notes by W. G. Rutherford (London, 1883). There is an English translation by James Davies (London, 1860). B. L. GILDERSLEEVE.

Babur, MOHAMMED: See **BABER**.

Babuyan', or Five Islands: the northern end of the Philippine Archipelago, forming a kind of circular chain fronting the north coast of Luzon, consisting of Fuga, Dalupiri, Calayan, Babuyan Claro, and Camiguin. They are volcanic, and furnish a supply of sulphur. Babuyan Claro (i. e. bright Babuyan) has been all but abandoned on account of volcanic eruptions. While under Spanish rule they formed the department of Cayan. Area of the group, 175 sq. miles. Pop. about 7,000.

Baby, LOUIS FRANÇOIS GEORGES: Canadian jurist; b. in Montreal, Aug. 26, 1834; educated at St. Sulpice College, Montreal, and at the College of Joliette; admitted to the bar of Lower Canada in 1857; represented Joliette in the Dominion Parliament 1872-80; became Minister of Inland Revenue Oct. 26, 1878; judge of the Superior Court of the

Province of Quebec 1880, and a judge of the Court of Queen's Bench April, 1881. He was a founder of the Historical Society of Montreal; has been several times mayor of Joliette; and was appointed an advocate of the papal see in 1888. Pope Leo XIII. conferred on him the title of Knight Grand Cross of the Order of St. Gregory the Great.

NEIL MACDONALD.

Bab'ylas, SAINT: Bishop of Antioch from 237 to 250 A. D., when he suffered martyrdom. He is noted for his holy courage in compelling the Emperor Philip to undergo public penance at Antioch for his part in the murder of his predecessor, the Emperor Gordianus. The body of the saint was buried first in Antioch; transferred in 351 to Daphne, a suburb, by Gallus Cæsar, who built a church over his relics, with the object of checking the licentiousness for which the groves of Daphne were notorious. There was a temple of Apollo hard by, but the oracle of the heathen god was silenced by the relics of the Christian saint. In 362 the pagan Emperor Julian visited Antioch. He learned of the troubles of Apollo from the god himself, and therefore ordered the relics to be removed, which was done amid a great outburst of Christian zeal. They were transferred to a church in Antioch. But that very night the temple of Apollo was struck by lightning, the roof was burnt, and the famous image of Apollo himself destroyed. Julian, in rage, punished the pagan priests, and shut up the great Christian church of Antioch. Shortly after the relics were removed to the church built to receive them on the other side of the Orontes. See the *Homily on S. Babylas* by Chrysostom, delivered in 387. (Eng. trans. in *Nicene and Post-Nicene Fathers*, New York, Christian Literature Company, vol. ix., 141-43.) During the crusades the relics were taken to Cremona, Italy. His day in the Latin Church is Jan. 24; in the Greek Church Sept. 4. See Butler, *Lives of the Saints*, sub Jan. 24.

SAMUEL MACAULEY JACKSON.

Bab'ylon: an ancient powerful city situated on the Euphrates river, about 60 miles south of the present Bagdad. It was for many centuries the most important center of civilization in Western Asia. The native Semitic form of the name *Bābīlu*, i. e. gate of God, is the translation of an older non-Semitic name, *Ka-dingir*, *Ka* meaning gate and *dingir* God. There were various other names, one of which, *Tintir*, means grove of life. Such names arise from the sacred character of the city as the home of the gods. Regarding the earliest history of the city we are not informed. It is likely that many other cities in the valley are older, and it seems that they attained to importance before Babylon. It was about 2300 B. C. that Babylon became the chief city, through the successful wars waged by its king, Hammurabi, against his neighbors. The political supremacy thus attained by Babylon resulted also in religious supremacy, and Marduk, the god of the city, became the national god. After Hammurabi's time we are instructed regarding the successive dynasties ruling at Babylon, but of many of the kings we have little more than the names and the length of the reigns. In the sixteenth century B. C. fall the wars with Assyria and the correspondence with Egypt, already mentioned in the article on ASSYRIAN EXPLORATION. Several of these letters were from Burnaburiash, King of Babylon, about 1550 B. C. After this time Babylonian political history is largely involved in that of Assyria, and much of what we know on the subject comes from Assyrian sources. The state archives of Babylon have not yet been found, and though we have numerous records from the later kings, these are mainly devoted to architecture and religion.

The early records of the city have doubtless perished in war. When Sennacherib, about 690 B. C., sacked and demolished it, he states that he cast even the débris into canals and pits, and made the very site unrecognizable. There is likewise a tradition that Nabonassar, King of Babylon, 747-733 B. C., destroyed all the records he could find of former kings, in order that subsequent history might date from his reign, but such an act is highly improbable.

The Babylonians were much less given to wars of conquest than their northern neighbors. During the time of the Assyrian foreign wars Babylon was often subject to Assyria. The brutal policy of Sennacherib, involving the city in the catastrophe just mentioned, was reversed by his son, Esarhaddon, who early in his reign rebuilt Babylon. During the reign of Assurbanipal at Nineveh, a brother of this monarch was for twenty years on the Babylonian throne, 668-648, after which the city was again made more directly subject to Assyria. In the declining years of Nine-

veh, Babylon was regaining something of her former greatness. Nabopolassar, 624-604, began those great restorations and new buildings for which the city became famous. With the fall of Nineveh, about 606, Babylon again acquired political significance. Nabopolassar's great son Nebuchadnezzar, 604-562, was both warrior and architect. His inscriptions have been found in large numbers, but, while he applies to himself military titles, we have not yet the native records of his wars. From the biblical books of Kings and Chronicles, and from the contemporary prophets Jeremiah and Ezekiel, we have accounts of his Syrian wars, resulting in a capture of Jerusalem in 597 B. C., and of a second capture and demolition in 586, both of which captures were attended with deportation of Hebrews to Babylon. The writings of Nebuchadnezzar give numerous details regarding his buildings, especially of the palace at Babylon, and of the temple of Marduk in that city, and of the temple of Nabu in Borsippa. The succeeding native kings are of little consequence till we come to Nabonidus, 555-538 B. C. This monarch likewise was a great builder and antiquarian, but not a warrior. For some reason he became distasteful to his subjects. His son Belshazzar, though not king, was active in public affairs, and took a leading part in defending Babylon against the invasions of the Persians. But in 538 B. C. the city fell into the hands of Cyrus, and thus lost forever its independence. Its subsequent political history is Persian and Greek, and our information regarding it comes from foreign sources. Cyrus and his successors resided at Babylon during a part of the year, and the city was one of the capitals of the Persian empire. Both Persian and Greek kings continued to care for its temples, and the old culture lived on as before. But the loss of independence, the presence of foreign rulers, the rise of other cities in the vicinity, built in part from the materials removed from Babylon, led to the gradual decay of the city until it became a place of utter desolation. In the time of Nebuchadnezzar the city was surrounded by a double wall and moats. Herodotus and other Greek and Roman writers give accounts of its great extent and magnificence, its principal temple and its hanging gardens being two of the seven wonders of the world. See C. J. Rich's *Memoir on the Ruins of Babylon* (London, 1818); Sir R. K. Porter's *Travels* (2 vols., 1821-22); Friedrich Delitzsch's *Wo lag das Paradies?* (Leipzig, 1881); George Rawlinson's *Herodotus*; and the works referred to under ASSYRIA.

D. G. LYON.

Babylon: town and popular watering-place; Suffolk co., Long Island, N. Y. (for location of county, see map of New York, ref. 8-K); on the Great South Bay, and the Long Island Railroad; 33 miles E. of Brooklyn. It is connected with Fire island by steam ferry, and is famed for the salubrity of its climate, and much frequented as a summer resort. The township of Babylon was formed in 1872 from the south part of Huntington township. Pop. (1880) 4,739; (1890) 6,035; (1900) village, 2,157.

Babylonia: the territory through which the Tigris and Euphrates rivers flow, extending from about Bagdad to the Persian Gulf. This district has been won from the sea by the deposits of the two rivers. It is accordingly an alluvial plain, much of which is covered by water at the time of the annual overflow of the rivers (Tigris, March-June; Euphrates, March-September). The rate of encroachment on the sea is estimated to be about a mile in seventy years, but is believed to have been much more rapid in ancient times. Prof. George Rawlinson reckons the gain in the past 4,000 years to be a region 130 miles long by 60 or 70 miles broad. This great gain is explained by the lowness of the plain, the swiftness of the rivers, and the shallowness of the gulf. The Babylonia of history was perhaps not much larger than the State of South Carolina. This plain is bounded on the E. by the mountains of Elam, and on the W. by the Arabian desert. Owing to lack of irrigation it is being gradually invaded by the desert, and the sand moves at times in storms of great intensity. Formerly there was an extensive system of canals, the old beds of which intersect the plain in all directions. These canals were both for commerce and for irrigation, and on their banks stood some of the largest cities. Changes of government and of population, misrule and extortion, have led to neglect of these waterways, so that the region, which was once a paradise of productiveness, is now, during a portion of the year, covered with marshes and lakes, and during the remainder is a desolate waste. The heat of the summer is intense, while the exhalations from the marshes in summer and autumn fill the air with pestilence and fever.

The inhospitality of the climate, together with the lack of money and the difficulty of obtaining firmans from the Turkish Government, has allowed but little exhaustive digging in the artificial mounds which are so numerous in the plain, and which mark the sites of the ancient cities.

Babylonia is one of the first centers at which men reached a high state of culture. Whether the beginnings of this culture antedate that of Egypt is impossible to decide. It is also unknown whence the first occupants of the land came, but there are strong grounds for believing that the first settlements were at or near the upper end of the Persian Gulf. These first settlers were perhaps the inventors of the cuneiform system of writing, a system destined to have such a long history in Western Asia, and to which we now owe most of our information regarding Babylonia. To judge from the language and the physiognomy (discoveries by E. de Sarzec at Telloh), the first-comers were of non-Semitic stock. As early as 4000 B. C., or earlier, the land was invaded by Semites. These may have been rude inhabitants of the Arabian peninsula who were attracted by the easier life in Babylonia. For many generations the two populations lived together, the newer borrowing much of its culture from the older, but also robbing it by degrees of its political significance. This early occupation of Babylonia by Semites is only one wave of a succession of invasions by the people of this race. Similar invasions are the one by the Aramæans, the one by the Mohammedan conquerors, and the one by the Bedouin tribes of to-day. In ancient times the population had still other elements. There were the *Kaldi*, or Chaldæans, who may likewise have been Semites, the *Kasshi*, or Kassites, the Elamites, and in the period of foreign wars hosts of captives brought in as well by Kings of Assyria as by those of Babylon.

The history of Babylonia after the time of Hammurabi, about 2300 B. C., is intimately connected with that of the city of Babylon. Of the centuries preceding this time our information is scant, and comes mainly from the very brief inscriptions of certain of the earlier kings, and from references in the writings of kings of later date. Successively or contemporaneously small kingdoms arose, with capitals at Ur, Nisin, Nipur (Niffer), Uruk (Erech, Warka), Larsa, and other points. At times several of these smaller kingdoms were united under a single scepter.

The oldest definite date takes us to North Babylonia, to the time of Sargon I. and his son Naram-Sin. On the authority of Nabu-na'id, the last native King of Babylon (B. C. 555-538), these two rulers belong to the first half of the thirty-eighth century B. C. Nabu-na'id relates that, while he was restoring the temple of the sun-god at Sippar, he found a record deposited in the foundation by Naram-Sin 3200 years before the discovery. Inscriptions have reached us from both of these ancient kings. Sargon is called the King of Agade (which is the twin city of Sippar), and it seems certain that he erected buildings at Agade, Babylon, and Nipur. A late Assyrian scribe has preserved a record in which Sargon speaks in the first person, telling how he was born in secret, exposed as an infant in a basket of rushes on the river, rescued and reared by a shepherd, chosen leader of a band in the mountains, and afterward crowned as king. Another inscription records that his conquests reached the Mediterranean. The British Museum owns an egg-shaped marble object with an inscription of Sargon written in nine lines of very archaic script and reading: "Sargon the king, King of Agade. To the Sun-god in Sippar I have dedicated." One of the finest carved seals ever found bears the name of Sargon, and has eight lines of archaic writing. From the son, Naram-Sin, there is likewise an inscription in eight archaic lines. The diggings by the party from Philadelphia (1888-90), led by Dr. J. P. Peters, in the ruins of Niffer, brought to light various objects from Sargon and Naram-Sin. These rulers seem to have been Semites.

Not much later perhaps were the rulers who resided at the city represented by the modern ruins called Telloh (Shirpurla, in the inscriptions), in Southern Babylonia, where De Sarzec found (1878-82) a large quantity of the most archaic material, including about a dozen statues. According to the researches of M. Amiaud, four or five of these rulers call themselves king, while the remaining nine style themselves by the lower title *patesi*. The inscriptions of the kings have a more archaic appearance, and one may hence place them earlier than those of the *patesis*. If this be correct, the explanation is probably that, after a period of independence, the city had become tributary to some other power, as that of Ur. We know that one of the *patesis* was contemporary

and apparently subject to the great King Dungi of Ur, and that this Dungi also erected temples for the gods of Shirpurla. At the same time, one of the *patesis*, Gudea by name, if tributary, was still a ruler of great power and magnificence. From him come eight of the remarkable statues from Telloh, two large clay cylinders covered with writing, and hundreds of smaller tablets and fragments. Gudea waged successful war with Elam, and had commercial relations with distant regions, as the Persian Gulf, the Sinaitic peninsula, and apparently Egypt. The inscriptions of these rulers are chiefly accounts of the erection of temples.

The next strong government in Babylonia seems to have had its center at Ur, the biblical Ur of the Chaldees, the modern ruins Mugheir. Inscriptions from the kings of this dynasty have been found at Mugheir, Warka, Senkereh, Niffer, Telloh, and Abu-Shahreim. Such wide dispersion indicates that the rule extended over a considerable part of Babylonia. The two chief rulers were Dungi and his father, whose name is read variously as Urbagas, Urbau, Urgur, etc. These kings style themselves not only "King of Ur," but also King of Sumer and Akkad. These terms are commonly held to be synonyms of South Babylonia and North Babylonia, but Dr. H. Winckler has shown that at this early time they designated two portions of South Babylonia, the union of which under one rule makes the first important kingdom in Babylonia. Dungi seems also to have held rule over a portion of North Babylonia. In Cutha, near Babylon, he built a temple to the god Nergal. He likewise calls himself king of the four regions. This term is commonly supposed to mean king of all the world, but Dr. Winckler sees in it a designation for North Babylonia, corresponding to Sumer and Akkad for South Babylonia.

Unknown conditions led to a shifting of the seat of power to other Babylonian cities, followed, however, by a second period of supremacy at Ur. The rulers of the new dynasty call themselves not only kings of Ur, but also kings of the four regions. This dynasty was displaced by an invasion from Elam, led by Rim-Sin, son of Kudur-Mabuk. Rim-Sin was devoted to the worship of the Babylonian gods, and has left records of temple constructions. The invader, however, was not to found a dynasty. A power was rising at Babylon which was to put an end to the existing order and to make that city ever after the first in the land. Its ruler, Hammurabi, repulsed Rim-Sin, and united all of Babylonia under himself. Henceforth the great cities of the south were to have religious significance, but their political power passed over to Babylon. From this time the history of Babylonia and that of Babylon are inseparably connected.

For the Babylonian chronology after this time we have most valuable information in the so-called *Dynastic Tablets*. (See translation in the *Records of the Past*, new series, vol. i.) These tablets give us the succession of dynasties ruling at Babylon, beginning with the one to which Hammurabi belonged and extending to the death of Asshurbanipal, 626 B. C. There are, unfortunately, some serious lacunæ. In their unbroken condition the tablets gave the names of the successive dynasties, the length of their continuance, and the names of the respective kings. Hammurabi is the sixth king of the "Dynasty of Babylon." He began his rule about 2300 B. C., and reigned for fifty-five years. The dynasty, embracing eleven kings, began about 2400 B. C., and continued for 305 years. From the second king of the dynasty to the eleventh, the succession passed regularly from father to son, and the average length of the reigns was twenty-eight years—facts which indicate tranquility or executive ability. From Hammurabi we have many inscriptions recording his victories, his buildings, and his digging of canals. There are also many commercial records from his time, as well as from the reign of his son Samsu-iluna and other kings of the dynasty. Some of these documents contain in their dates valuable historical allusions.

The summary of these dynasties is as follows:

NAME.	No. of years.	No. of kings.	Approximate dates, B. C.
1. Babylonian	305	11	2422-2117
2. Uru-azagga	368	11	2117-1749
3. Kassite	576½	36	1749-1172
4. Pashe	72½	11	1172-1100
5. Seacoast	21½	3	1100-1078
6. Bit-[Bazi]	20½	3	1078-1058
7.	6	1	1058-1052
8.	290	17 (?)	1052-762
9. Babylonian	31	5 (?)	762-731
10.	105½	16 +	731-626

Dynasty nine really includes various dynasties of brief duration. The first name in this dynasty is Ukin-zir, who was defeated and succeeded, in 729 B. C., by Pul, the biblical Pul or Tiglathpileser (King of Assyria 745-727 B. C.). On the dynastic tablets the names, or portions of the names, of seventy-seven of the kings of Babylon are preserved. Before the tablets were injured they must have contained at least one hundred names.

The *Kasshi*, or Kassites, who furnished many of the kings of the third of these dynasties, were a warlike people, living to the east of Babylon, in the mountainous borders of Elam. Having once gained possession of the Babylonian territory, they played an important rôle for nearly six centuries. Our information concerning the character of this period comes from Assyria and Egypt. The fragments of the so-called synchronous history of Assyria and Babylon give brief accounts of the quarrels between the two countries at this time. There were frequent invasions and counter invasions, the differences being at times settled by intermarriage of the two royal houses. Some of these Kassite Kings of Babylon lived also on friendly terms with the kings of Egypt, and were among those who, in the sixteenth century B. C., sent presents and letters to the Pharaohs.

Of the succeeding dynasties at Babylon we know but little. The history becomes intimately involved with that of Assyria. The armies from Nineveh frequently overrun the country, and most of the rulers named in the tenth dynasty are either kings of Assyria or their appointees. During this time, however, there were two other powers contending for the throne of Babylon, the Elamites and the Chaldeans. The Elamites had been from time immemorial enemies both of Babylon and of Assyria. But in the times when their own country was overrun by Assyrians, they joined their forces to those of Babylon or to those of Chaldæa in order to resist the power from Nineveh. The so-called *Babylonian Chronicle* gives the account of the relations of the three countries, Babylon, Assyria, and Elam, from 745 to 668 B. C.

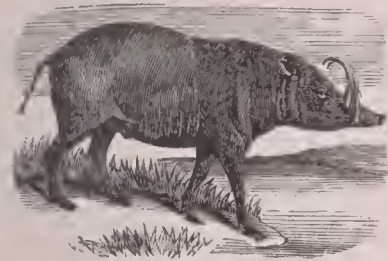
For the correct understanding of the later history of Babylonia it is important to know who the *Chaldæans* were. The confusion of the name Babylonian and Chaldæan has led to much obscurity. The credit of having cleared up this obscurity by a close study of the data in the cuneiform inscriptions belongs to A. Delattre and H. Winckler. Chaldæa proper was a district in South Babylonia on the Persian Gulf, and its inhabitants were the Chaldæans. Whence and when they came is unknown, but they were perhaps of Semitic stock. The fifth of the Babylonian dynasties, called the dynasty from the seacoast, was probably Chaldæan. Even as early as the time of the Kassite dynasty the Chaldæan kingdom may have existed as a tributary power. However this may be, when the period of Assyrian conquest begins, after 900 B. C., we find that the invaders march past Babylon to the subjection of the Chaldæans. There were even times when the Chaldæans disputed with Assyria the possession of Babylon. Such was the case when the Chaldæan Mero-dachbaladan contended with varying fortune against Sargon and Sennacherib. Some of the fiercest fighting about Babylon was with these Chaldæans, who spread themselves over the country, dispossessing the people of Babylon of their lands, and even carrying the people into captivity to Chaldæa. When Sargon overran Chaldæa he released these captives from prison, and his grandson Esarhaddon restored to the people of Babylon and Borsippa the lands of which they had been robbed by the Chaldæans. The people of Chaldæa were more warlike than the natives of Babylon. When the Assyrian power began to wane toward the end of the seventh century B. C., the Chaldæans again became masters. Nabopolassar may have recognized in a manner the superiority of Assyria. His son Nebuchadrezzar succeeded him, and Chaldæa now became supreme. This great prince so identified his interests with those of Babylon that he raised the city to a degree of splendor and power which it had never known before. It is the Babylon of this great builder which is pictured in glowing language by Daniel and Herodotus. The name Chaldæa now came to be applied to all of Babylonia, and Babylonian and Chaldæan became synonymous terms. There were extensive foreign wars, the real Chaldæans doubtless forming the more important portion of the army. This is the army to which the powers of Judah submitted, and by which they were led into exile. (For further details of the political history, see article BABYLON.) In still later times, when the government of Babylon had passed away from the Semites, the Chaldæans became

famous for their wisdom. They were no longer regarded as a people, but as a class or caste.

See G. Rawlinson's *Ancient Monarchies* (London, 1862-67); Fr. Delitzsch's *Wo lag das Paradies?* (Leipzig, 1881); Layard's *Nineveh and Babylon*; E. De Sarzec's *Découvertes en Chaldée*; H. Winckler's *Untersuchungen zur Altorientalischen Geschichte* (Leipzig, 1889); A. Delattre's *Les Chaldéens* (Louvain, 1889); C. P. Tiele's *Babylonisch-Assyrische Geschichte* (Gotha, 1886-88); *Records of the Past* (new series, vols i. and ii.).

D. G. LYON.

Babyrous'sa, or **Babirussa**: an animal (*Babyroussa alfurus*) allied to the hog; found only in the islands of Celebes and Buru. It is remarkable for the long tusks of the upper jaw, which are curved backward and resemble horns. Its legs are more slender than those of the hog.



Babyroussa.

Baccarat, bāk'ka-raa' [Fr.]: game of cards, of French or Italian origin, played with one or more packs of cards, any number of betters, and a banker. Each better plays a

stake which the banker duplicates, after which two cards are dealt by the latter to each player, including himself. The face cards count ten and the others according to the spots. The aim is to make the value of the player's card foot up the total of 9, 19, 29, or as nearly so as possible. The player may call for more cards at the risk of exceeding 29, in which case his stake is forfeited. If a player has 9, 19, or 29 he declares it, and the banker pays all hands superior to his own their bets and takes the stakes of the inferior hands. In America face cards and tens do not count. C. H. T.

Bacchana'lia (called by the Greeks *Dionysia*): the feasts and orgies of the votaries of Bacchus among the ancient Greeks and Romans. On account of the licentious practices and drunkenness which prevailed on these occasions, they were prohibited by the Roman Senate in 186 B. C. In modern language the term is applied to wild revels and intemperate feasts. Theatrical representations originated in Greece from these feasts. See DIONYSIA.

Bacchan'tes [from pres. partic. of Lat. *baccha'ri*, celebrate with frenzy, based on Gr. *βάκχην*, a Bacchant]: those, whether male or female, who joined in the orgies of Bacchus among the ancient Greeks and Romans. Their conduct was very disorderly. They danced, swung the thyrsus about, and made a great noise. According to an ancient poetical legend, Orpheus was torn to pieces by some female Bacchantes.

Bac'chus [Lat., from Gr. *Βάκχος*]: the god of wine (called also *Dionysus* by the Greeks, and sometimes *Liber* by the Romans). He was said to be the son of Jupiter and Semele, or, according to one tradition, of Ammon, King of Libya, and Amalthea. He taught men the culture of the vine, and first produced from grapes an intoxicating drink. His worship was spread over many countries of the world, and the myth of Bacchus was variously modified by different peoples. Bacchus is usually represented as an effeminate young man, crowned with vine or ivy leaves, with a *thyrsus* (a stick with a pine cone at the end) in his hand. His votaries carried sticks or staves called *thyrsi* (sing. *thyrsus*), which were bound with leaves of the ivy and vine. He is said to have performed a successful expedition to India. The Greek festivals in honor of Bacchus were called *Dionysia*. See BACCHANALIA and BACCHANTES.

Bacchyl'ides (in Gr. *Βακχυλίδης*): one of the nine canonical Greek lyric poets, about 470 B. C.; was a nephew of Simonides of Ceos, and, according to tradition, joint rival with him of Pindar. The peer of his uncle in elegance of composition and softness of tone, he was not his equal in range or power. Of the few fragments that remain famous is the one on *Peace*. See Bergk's *Poetae Lyrici Graeci*.

B. L. G.

Bach, baach: the name of a celebrated German family which for upward of two centuries was noted for great musical talent and produced more than fifty distinguished artists.—VEIT BACH, the founder of the family, was a native of Presburg in Hungary, and emigrated to Thuringia about 1600. Besides the great JOHANN SEBASTIAN (1685-1750), other eminent members of the family were JOHANN CHRISTIAN, called the "Milanese Bach" (1735-82); JOHANN CHRISTOPH (1642-1703), with his sons JOHANN CHRISTOPH and Jo-

HANN NIKOLAUS; also KARL PHILIPP EMANUEL (1714-88), and WILHELM FRIEDEMANN (1710-84).

Bach, JOHANN SEBASTIAN: youngest son of Johann Ambrosius, court-musician of Eisenach; b. there Mar. 21, 1685; the most distinguished of the remarkable family of BACH, and one of the great musicians of the world. A North German and a Protestant, he was a patriarch and founder of German music, and has been not inaptly termed the Albert Dürer of his art. An extraordinary talent, united with enthusiasm and tireless industry, made his whole long life, from childhood on, a career of acquisition and greatness. Early throwing aside the traditions of the Italian school, he penetrated by severe study the secrets of musical science, sought the boldest masters, and pursued the most rigorous methods. Music in every style interested him—instruments of all kinds, but the organ was his great delight. He walked miles, as a boy, to hear a master's performance on that instrument. Such ability and enthusiasm were recognized from the first. Bach was spared the struggle with poverty, and rapidly, by his own efforts, rose to eminence. He had, till his voice became manly, sung treble in a choir at Lüneburg; at eighteen he was a violinist at the court of Weimar; at twenty he filled the place of organist at Arnstadt; at twenty-one he was at Mühlhausen; at twenty-two he was at Weimar again as court-organist; seven years later he resigned that most honorable position for that of concert-master to the duke, an office demanding high capacity, imposing varied responsibilities, and offering rich opportunity for study and practice in composition. His industry at this period was marvelous. Here, however, his stay was short. In 1723—in the meantime he had passed six years as chapel-master to the court at Köthen, capital of the duchy of Anhalt-Köthen—the city authorities of Leipzig chose him to the place of musical director of the St. Thomas School; he was thirty-eight years old. Here for the rest of his life, twenty-seven years, he lived, honored and happy, in the bosom of a large family, for he had ten sons, all musicians—beloved by numerous pupils, and occupied with the art he had done so much to create. D. at Leipzig, July 28, 1750.

Bach's compositions were numerous, original, and in many styles. He wrote for voice and instrument—for orchestra, organ, pianoforte, instruments of wood and metal, himself being a performer on them all. He wrote for sacred occasions masses, oratorios, concerted pieces of every kind; his preludes, fugues, cantatas are famous; but his stately genius unbent at festive occasions, births, and weddings; and even comedy was not out of his range. In nearly every field of his art he was a discoverer—in some he was a prophet of future discoveries. The fame of Bach has been increasing since his death. For generations to come they who would study the difficult science of music will go to him, as students of literature or painting go to the grand masters. There are statues of him at Leipzig (1842) and Eisenach (1884). See his biography by Spitta (Leipzig, 1873-80, 2 vols).

Bache, bayeh, ALEXANDER DALLAS, LL. D.: a distinguished educator and scientist; b. in Philadelphia, July 19, 1806; great-grandson of Benjamin Franklin; received his higher education at the U. S. Military Academy, where he graduated in 1825 at the head of his class. After serving there as assistant professor for one year, and on military engineering duty for two more, he was called to the chair of Natural Philosophy and Chemistry in the University of Pennsylvania, which position he filled with great success for eight years, during which he was also constantly engaged upon scientific researches in physics and chemistry, and as member of the Franklin Institute conducted important experiments on steam-boiler explosions and kindred matters. In 1836 he was appointed president of Girard College, then about to be organized, and went to Europe to study the systems of education and methods of instruction and discipline adopted there. His report on education in Europe (1839), embodying the results of his studies, has done very much to improve the theory and art of education in America. The Girard College not being ready to go into operation, Bache undertook the organization of the school-system of Philadelphia; after accomplishing which he resumed his old chair at the university. He established at Girard College, and during five years directed, a magnetical and meteorological observatory, supported by the American Philosophical Society, of which he was a member. The results of these observations, which were made in correspondence with other observations in different countries, have

largely added to our knowledge of terrestrial magnetism. In 1843 he was appointed superintendent of the U. S. Coast Survey, which important position he filled to the end of his life, displaying the highest administrative ability, combined with all the scientific knowledge requisite for the successful prosecution of that important work. By the confidence with which he inspired the Government he was enabled largely to increase the scale of expenditure for the survey, resulting in a still greater ratio of progress. He omitted no opportunity of securing for science the collateral results that could be gathered during the prosecution of the work; he organized a systematic exploration of the Gulf Stream, an extended series of tidal observations, of the magnetism of the earth, of the direction of the winds; and instituted researches in regard to the bottom of the ocean within soundings, and to the forms of animal life existing there. His annual reports to Congress are a monument, not only of his administration, but also of his personal investigations in regard to the subjects named, and many others connected with the improvement of methods of geodesy. In addition to the direction of the coast survey, Prof. Bache had, *ex officio*, charge of the construction of standard weights and measures for the U. S., and was a member of the lighthouse board. As a regent of the Smithsonian Institution from 1846 to the end of his life, he had a large share in shaping its operations. During the civil war he was active as a member of the Sanitary Commission, and in directing the resources of the coast survey to the assistance of the naval and military forces. When, in 1863, the National Academy of Sciences was organized by Congress, Prof. Bache, as the acknowledged leader of science in the country, was elected its president; nor were his distinguished services to science less acknowledged abroad, as was evinced by his election to membership of the most prominent scientific bodies of Europe. Prof. Bache married Miss Naney Clarke Fowler, of Newport, but had no issue. He left his property in trust to the National Academy of Sciences, the income to be devoted to researches in physical science. D. at Newport, R. I., after a lingering illness, Feb. 17, 1867.

Bache, FRANKLIN, M. D.: son of Benjamin Franklin Bache; b. in Philadelphia, Oct. 25, 1792. He graduated at the University of Pennsylvania in 1810. He published a *System of Chemistry for the Use of Students of Medicine* (1819); became Professor of Chemistry in the Philadelphia College of Pharmacy in 1831, and obtained the same chair at the Jefferson Medical College in 1841. He was one of the authors of Wood and Bache's *Dispensatory of the United States*, an acknowledged standard of authority. D. in Philadelphia, Mar. 19, 1864.

Bache, GEORGE M.: commander, U. S. N.; b. in the District of Columbia, Nov. 12, 1840; graduated at the Naval Academy in 1860; became a lieutenant in 1862. He commanded the ironclad *Cincinnati* during her various engagements on the Mississippi river, and until she was sunk by the Vicksburg batteries, May 27, 1863. His conduct in this last affair elicited the admiration of Admiral Porter and Gen. Sherman; and the Secretary of the Navy, Gideon Welles, in his "letter of thanks to Lieut.-Commander Bache," says: "Amidst an incessant fire of shot and shell, even when the fate of the vessel had been sealed, and destruction both from the elements and the enemy was threatened, the officers and men appear to have stood bravely at their posts; and it is a proud record of the *Cincinnati* that when her last moments came she went down with the colors nailed to the mast. It is with no ordinary pleasure that I express to you, and to the surviving officers and crew of the *Cincinnati*, the department's appreciation of your brave conduct." He was in command of a little squadron of three vessels, the *Tyler*, the *Naumkeag*, and *Fawn*, in the very spirited action of June 24, 1864, at Clarendon, Ark., where in forty-five minutes he drove the enemy from their battery of seven guns, capturing guns, ammunition, and stores. He was in both attacks on Fort Fisher, and led the men of the *Powhatan* in the naval assault on the fort Jan. 15, 1865, where he was wounded in the right shoulder. Referring to this assault, Rear-Admiral Porter, in his dispatch of Jan. 28, 1865, says: "Nowhere in the annals of war have officers and sailors undertaken so desperate a service. The names of some of these officers will be found on record on the files of the department, among which that of Lieut. George M. Bache will be found most conspicuous." Retired Apr. 5, 1875.

Bache, HARTMAN: soldier; great-grandson of Dr. Franklin; b. in Philadelphia, Pa., Sept. 3, 1798; graduated at West Point in 1818; colonel of engineers Mar. 3, 1863; served chiefly as topographical engineer on surveys for coast defense, naval depôts, harbor and river improvements, roads, and canals, and for lighthouse sites 1818-47, in constructing Brandywine screw-pile lighthouse and ice harbor, Del., 1848-51, on engineer boards 1852-55, as lighthouse engineer 1852-70, in charge of military roads on Pacific coast 1855-58, in topographical bureau, Washington, D. C., 1861-62, in charge 1861, and member of lighthouse board 1862-70. Became brevet brigadier-general U. S. A. Mar. 13, 1865, for long, faithful, and meritorious services, and retired from active service May 7, 1867. D. in Philadelphia, Pa., Oct. 8, 1872.

Bache, WALTER: a pianist of extraordinary merit, and devoted to the compositions of Liszt; b. in Birmingham, England, June 19, 1842; studied first at home, but in 1858 went to Leipzig and studied under Plaidy, Moscheles, Hauptmann, and Richter; then he went to Rome and for three years received lessons from Liszt, returning to London in 1865. From that time till his death on Mar. 26, 1888, he was an unflinching advocate of Liszt's music, bringing it forward on all occasions. He gave many concerts of Liszt's compositions at a personal pecuniary loss, but before he died had the satisfaction of seeing a change in the public appreciation of his beloved master, and he was instrumental in establishing a Liszt scholarship at the Royal Academy of Music, where he was one of the piano teachers. He composed little or nothing, his fame resting entirely upon his piano playing and his teaching. D. E. HERVEY.

Bachelor's-but'tons: the double-flowered forms of one of the buttercups (*Ranunculus acris*).

Bachelor of Music: See DOCTOR OF MUSIC.

Bachkirtsev, MARIE: See BASHKIRTSEFF, MARIE.

Bachman, bāk'man, JOHN, D. D., LL. D.: naturalist; b. in Dutchess co., N. Y., Feb. 4, 1790. He was pastor of a Lutheran church at Charleston, S. C. (1815 to death). He contributed to Audubon's great work on ornithology, and wrote the principal part of the work on the quadrupeds of North America, which was illustrated by Audubon and his sons. Among his other works is *Characteristics of Genera and Species as Applicable to the Doctrine of the Unity of the Human Race* (1854). D. in Charleston, S. C., Feb. 25, 1874.

Bacillaria'ceæ: See DIATOMS.

Bacil'lus: See BACTERIA.

Backergunge, baa-ker-gūnj', or Bakarganj': a district of the Dacca division, Bengal, India. Area, 3,649 sq. miles. Pop. about 2,000,000. It lies in the delta formation at the apex of the Bay of Bengal, to the W. of the Bramaputra, here called the Megna, river. It is a flat, even country, without a hillock, intersected by a perfect network of dark-colored, sluggish streams, and dotted with clusters of bamboos and betel-nut trees. It is always green and fresh; aquatic plants grow in the greatest luxuriance and profusion. Travel is almost impossible except by boat. Toward the N. W. the country is so marshy as to be still for the most part unreclaimed. Along the sea-face lie the forest tracts of Sundarbans, the home of tigers, leopards, and other wild beasts. The streams are all subject to tidal action. A very strong bore runs up the Megna at spring tides, giving rise to a singular sound like thunder, known as the "Barisal guns," often heard far out to sea. Two-thirds of the inhabitants are Mohammedans, here of a very low type. A gipsy-like tribe, called the Bebjias, are rather numerous. They live in boats, travel from place to place, profess Mohammedanism, and make a living by wood-cutting, fishing, fortune-telling, and trading in trinkets. The towns are all small. Barisal, the largest, containing about 8,000 inhabitants. Rice is the great crop, and three harvests are obtained annually. Other crops are mustard, rape, linseed, jute, sugar-cane, and betel-nut. The rainfall is heavy and the water bad, but the district is one of the healthiest of Eastern Bengal, because fully exposed to the strong S. W. monsoon. The thermometer ranges from 62° to 98°, with a mean annual temperature of 78° to 85°. Cholera is always present, and smallpox is occasionally epidemic.

MARK W. HARRINGTON.

Back'gammon [-gammon is from M. Eng. *gamen*, game; the element *back-* is of doubtful origin]: a game of com-

bined skill and chance, played upon a peculiar board or table with men and with dice. The men are of two colors, and the table is divided into two compartments, each with two sets of points, of which there are twenty-four in all. Upon these points the men are placed in playing, and their movements are determined by throws of the dice alternately made by each player; but the rules of the game are such that much skill may be exercised in executing the movements of the men as indicated by the dice. The object of the game is for the player to bring his own men into his own inner table, and to prevent his adversary from doing the same. There are several games of backgammon, for which the rules are given in *Hoyle's Games*. Backgammon is a very ancient recreation, and is by many authorities said to have originated in England, or perhaps in ancient Britain.

Backhuysen: See BAKHUYSEN.

Back'us, AZEL, D. D.: nephew of Charles Backus; b. at Norwich, Conn., Oct. 13, 1765; graduated at Yale 1787; in 1791 succeeded Dr. Bellamy as pastor of the Congregational church in Bethlehem, Conn.; in 1812 was chosen first president of Hamilton College, Clinton, N. Y., and died in that place Dec. 9, 1817. He took great interest in political questions, was an eloquent preacher, and a successful teacher and disciplinarian. He published only a few sermons.

Backus, CHARLES, D. D.: b. at Norwich, Conn., Nov. 5, 1749; graduated at Yale 1769; was settled over the Congregational church in Somers, Conn., in 1774, and died there Dec. 30, 1803. For many years he was accustomed to receive theological students into his family. Nearly fifty were trained by him, among whom were Dr. Woods, of Andover, President Moore, of Amherst College, President Davis, of Hamilton College, and several other distinguished men. He published many sermons.

Backus, ISAAC: b. at Norwich, Conn., Jan. 9, 1724; ordained pastor of a Separatist church in Titicut (a parish of Bridgewater and Middleboro), Mass., Apr. 13, 1748; preached in Titicut till his death, which occurred Nov. 20, 1806. In 1751 Mr. Backus espoused Baptist principles, and soon became one of the most active and influential ministers of that denomination. He was for thirty-four years a trustee of Rhode Island College (now Brown University); was in 1774 agent of the Warren (R. I.) Association to advocate before Congress equal privileges for all religious denominations, and in 1788 delegate from Middleboro to the Massachusetts convention which ratified the Federal Constitution. In 1777-96 Mr. Backus published *A History of New England, with Especial Reference to the Baptists* (3 vols.), a work which is still of value to the general student of the history of New England. A new edition, in two octavo volumes (carefully edited by Prof. David Weston, of Madison University), was published by the Backus Historical Society, Newton Centre, Mass., in 1871. See his *Life* by A. Hovey, Boston, 1858.

Ba'con, BENJAMIN WISNER: Congregationalist; son of Rev. Leonard W. Bacon; b. at Litchfield, Jan. 15, 1860; graduated at Yale 1881, and at the Yale Divinity School 1884; pastor at Lyme, Conn., 1884-89; at Oswego, N. Y., since 1889. He is the author of an able and scholarly work, *The Genesis of Genesis* (1892), which has been reprinted in Germany.

GEORGE P. FISHER.

Bacon, DELIA: author; sister of Dr. Leonard Bacon; b. at Tallmadge, O., Feb. 2, 1811; wrote, besides *Tales of the Puritans* and a drama entitled *The Bride of Fort Edward*, *The Philosophy of Shakspeare's Plays* (1857), in which she first threw out the startling hypothesis that these plays were really written by Francis Bacon, who simply used Shakspeare as a shield against the prejudices of the time. In support of this hypothesis, which became an infatuation, she visited England, met much repression, and her troubles impaired her health. D. at Hartford, Conn., Sept. 2, 1859. See *Delia Bacon: a Biographical Sketch*, by Theodore Bacon (1888); and *Recollections of a Gifted Woman*, in Hawthorne's *Our Old Home*.

Revised by HENRY A. BEERS.

Bacon, EZEKIEL, LL. D.: b. in Stockbridge, Mass., Sept. 1, 1776; graduated at Yale in 1794; was one of the chief justices of the Massachusetts court of common pleas in 1813, first comptroller of the U. S. treasury (1813-15), and a member of Congress from Massachusetts (1807-13). He afterward removed to Utica, N. Y., and was a delegate to the State constitutional convention of 1821. He published in 1843 *Recollections of Fifty Years Since*. D. Oct. 18, 1870.

Bacon, FRANCIS (in Latin *Francis'cus Baco'nus*), BARON VER'ULAM, VISCOUNT SAINT ALBANS: one of the most illustrious of modern philosophers; b. in London, England, Jan. 22, 1561. His father, Sir Nicholas Bacon, was Lord-Keeper of the Great Seal under Elizabeth. His mother, a lady of fine talents, whose maiden name was Anne Cooke, was a sister of Mildred, the second wife of Lord Burleigh. Bacon, soon after he had completed his twelfth year, was sent to Cambridge, where he is said to have distinguished himself by diligence and by rapid progress in his studies. While at the university he conceived, it is said, a decided dislike to the philosophy of Aristotle as it was then taught in the schools. Soon after leaving Cambridge he visited France, in order to acquire the French language and to continue his studies on the Continent, but his father's death, in 1579, obliged him to return to England. In 1582 he was admitted to the bar, and became in 1584 member of Parliament, and in 1590 counselor-extraordinary to the queen—a distinction almost without example for one so young. Ben Jonson speaks in the highest terms of his gifts as an orator; he tells us that Bacon "commanded when he spoke, and had his judges angry or pleased at his devotion. No man had their affections more in his power. The fear of every man that heard him was that he should make an end." Lord Burleigh, though Bacon's uncle by marriage, appears rather to have retarded than aided the promotion of his nephew. The latter, left wholly to his own exertions, applied himself diligently to his profession, and at length acquired a lucrative practice. He became in 1594 a candidate for the office of solicitor-general, but was unsuccessful. The Earl of Essex, who appears to have conceived a warm and sincere friendship for Bacon, in order to console him under his disappointment made him a present of an estate near Twickenham worth £1,800 sterling, which in real value was, in all probability, nearly if not quite equal to five times that number of pounds at the present day.

It appears to have been Bacon's aim for many years to acquire a fortune by a wealthy marriage. He paid court (1597) to the rich young widow, Lady Hatton, but, though aided by the intercession of Essex, who was then in great favor at court, he was not successful; which, according to Ma-caulay, was a very fortunate circumstance for Bacon. The lady afterward married Bacon's rival and enemy, Sir Edward Coke, and "did her best to make him as miserable as he deserved to be." When Essex, seduced by a wild and reckless ambition, embarked on those schemes which afterward led to his death on the block (see ESSEX), Bacon appears to have used whatever influence he had in order to mitigate the resentment of the queen against her misguided kinsman. Unhappily for his reputation, he was induced by the desire to advance his interest at court—for we can scarcely suppose he was influenced by a sense of duty—to abandon the office of intercessor, and to take an active and prominent part in the prosecution of his former friend. And worse still, after the death of Essex, in order to vindicate the conduct of the queen, he employed his talents and eloquence to blacken the character of his benefactor. After the accession of James I., Bacon appears to have enjoyed the highest favor at court. He was knighted (1603) before the king's coronation. His law practice had now become, if not very extensive, at least very lucrative. In 1606 he married Alice Barnham, the daughter of a rich London merchant. He had previously been appointed king's counsel, and in 1607 he was made solicitor-general. He became in 1613 attorney-general and a member of the privy council. He was selected by the king as his agent to conduct the prosecution against Peacham, in which affair Bacon is accused of having sought, against law and justice, to obtain the opinions of the judges before the case came up for trial. Bacon was appointed in 1617 Keeper of the Great Seal, and in January of the ensuing year he was made Lord High Chancellor of England, the highest civil office to which any subject could then attain. In the following July he was created Baron Verulam, and admitted to a seat in the House of Peers. In 1621 he became Viscount Saint Albans, and in 1620 published his greatest work, the *NOVUM ORGANUM (q. v.)*. The cup of his prosperity and fame appeared to be full to overflowing, but a great reverse was near. It seemed as if Fate had raised him to the highest pinnacle of greatness that his fall might be the more tragic and more conspicuous. He was accused of accepting bribes by a man named Waynham, against whom Bacon had decided a suit in chancery. A committee of the House of Commons was appointed to inquire into the case, which was

referred to the House of Lords as the only legitimate tribunal for trying it. At the beginning of the trial Bacon strongly asserted his innocence, but he subsequently abandoned his defense and confessed his guilt. He was sentenced (May 3, 1621) to pay a fine of £40,000 and to be imprisoned at the king's pleasure. James was disposed to show him every indulgence. As a mere form he was sent to the Tower, but two days afterward he was set at liberty. His fine was also remitted, and he was allowed an income of £1,200, a sum which may safely be pronounced fully equal to £6,000 at the present day. He died at Highgate, London, Apr. 9, 1626, and left no children. Bacon's celebrated *Novum Organum* and his *De Augmentis* are but parts of a more extensive work entitled *Instauratio Magna*, or Great Restoration, so called because through its means he hoped to recall Philosophy from what he considered the vain and idle speculations of the Aristotelian school, and restore her to her true and legitimate office of interpreter of nature. Among his other works should be mentioned his *Essays* (first published in 1597), doubtless the most popular and widely read of all his writings, and his *De Sapientia Veterum* (On the Wisdom of the Ancients, 1609), of which a good translation by Sir A. Gorges was published in 1619. Although Bacon's celebrity as an author may be said to rest exclusively on his philosophical writings and his *Essays*, he left some very able legal treatises; among others his *History of the Alienation Office*. In person Bacon was well formed, but not robust, of a middling stature, with a high and broad forehead, his countenance conveying the impression both of intellectual power and benevolence of disposition. In society he is said to have been "a most delightful companion, adapting himself to company of every degree, calling, and humor, . . . bringing out with great effect his unexhausted stores of jests new and old." His complete works were edited by Spedding, Ellis, and Heath (London, 1857-59, 7 vols.); for general use see his *Works* (selected, New York, 1877, 2 vols.); his biography by Spedding (London, 1862-74, 7 vols.); R. W. Church (1884), E. A. Abbott (1885). Best edition of the *Essays* is by W. Aldis Wright (new ed. London, 1883). J. THOMAS.

Revised by S. M. JACKSON.

Bacon, GEORGE BLAGDEN: son of Rev. Dr. Leonard Bacon, Sr.; b. at New Haven, Conn., May 23, 1836; studied theology at Yale Divinity School; minister at Orange Valley, N. J., from 1861; d. there Sept. 16, 1876. He wrote *Six Sermons on the Sabbath Question* (1st and 2d ed. New York, 1882). GEORGE P. FISHER.

Bacon, HENRY: genre-painter; b. at Haverhill, Mass., in 1839; pupil of Cabanel in Paris, and at Écouen, France, of Edouard Frère. Among his most popular works are pictures of life on the transatlantic steamships, and he has also painted a number of pictures of peasant life in France, which are notable for good qualities of color and drawing.

Bacon, JOEL S., D. D.: b. in Cayuga co., N. Y., Sept. 3, 1802; graduated at Hamilton College, Clinton, N. Y., in 1826; studied theology at Newton, Mass., 1829-30; was successively president of Georgetown College, Kentucky, pastor of a Baptist church in Lynn, Mass., professor in the institution at Hamilton, N. Y. (1834-37), president of Columbian College, D. C. (1843-54), and subsequently was a teacher in Alabama and in Virginia. D. at Richmond, Va., Nov. 9, 1869.

Bacon, JOHN: See BACONTHORPE.

Bacon, JOHN: sculptor; b. in Southwark, Nov. 24, 1740; in 1769 received the first gold medal for sculpture awarded by the Royal Academy. Principal works are monuments to Lord Chatham in Westminster Abbey and the Guildhall; to Howard and Johnson in St. Paul's; to Blackstone in All Souls' College, Oxford. D. in London, Aug. 4, 1799.

Bacon, JOHN EDMUND: See the Appendix.

Bacon, LEONARD, D. D., LL. D.: the son of a Connecticut missionary to the Indians; b. at Detroit, Mich., Feb. 19, 1802; graduated at Yale 1820, and at Andover 1824. From 1825 to 1866 he was pastor of the First church (Congregational), New Haven, Conn.; from 1866 to 1871 he was acting Professor of Systematic Theology, and after 1871 was lecturer on church polity and American church history in the Divinity School of Yale College. He contributed largely to the *Christian Spectator* and the *New Englander*, and was for several years one of the editors of the *Independent*. Besides numerous occasional sermons and addresses, he published *Select Practical Writings of Richard Baxter* (1830), *Thir-*

teen Discourses on the Two Hundredth Anniversary of the First Church in New Haven (1839); *Slavery Discussed* (1846); *Genesis of the New England Churches* (New York, 1874). D. in New Haven, Conn., Dec. 24, 1881. He was a prolific writer, and among Congregationalists a leader of great ability and influence. Revised by GEORGE P. FISHER.

Bacon, LEONARD WOOLSEY, M. D., D. D.: Congregationalist; b. at New Haven, Conn., Jan. 1, 1830; graduated at Yale College 1850, and at Yale Divinity School 1854; minister at Litchfield, Conn., 1857-60. He spent several years in Europe (1872-77), principally at Geneva. He has been pastor in several other places, including Norwich, Conn. (1878-82), Brooklyn, N. Y., and Philadelphia, Pa. His contributions to the public press are numerous. He has published a number of volumes of hymns and tunes. Among his other writings are *Church Papers, etc.* (1876), and a volume of *Sermons*, marked by freshness and vigor (1886). GEORGE P. FISHER.

Bacon, NATHANIEL: a young English lawyer; b. in Suffolk, Jan. 2, 1647, and migrated to Virginia, where he died Oct. 29, 1676. See Sparks's *American Biography*, vol. iii. of new series, and BACON'S REBELLION.

Bacon, Sir NICHOLAS: an English statesman; b. at Chislehurst, in Kent, in 1509; was the father of Sir Francis Bacon, Baron Verulam. He was educated at Cambridge, studied law, and was appointed solicitor to the court of augmentations in 1537. In 1546 he obtained the office of attorney to the court of wards and liveries, which he kept under Queen Mary, although he was a Protestant. He was appointed Lord-Keeper of the Great Seal by Elizabeth in 1558. He was distinguished for his moderation, sagacity, and discretion, and rendered important services to the Protestant cause. Among the English statesmen of that age he was ranked next to Lord Burleigh, who was his friend and brother-in-law. Having held the office of lord-keeper about twenty years, he died in London, Feb. 20, 1579. See G. Whetstone, *Memoir of Sir N. Bacon*; Lord Campbell, *Lives of the Lord Chancellors*.

Bacon, ROGER: an eminent English philosopher and monk, called THE ADMIRABLE DOCTOR; b. near Ilchester, in Somersetshire, about 1214. He studied at Oxford and at Paris, where he took the degree of doctor of laws. Having entered the order of Franciscan monks, he settled at Oxford and devoted much time to experimental philosophy. He was far in advance of his age, and made discoveries in several sciences. He wrote in Latin a number of works on chemistry, optics, physics, etc. By denouncing the immorality and ignorance of the clergy and monks, he made many enemies. His mechanical skill and his insight into the secrets of nature were such that he was suspected of dealing in magic. Thus he became in the popular imagination the necromancer, Friar Bacon, who figures largely in legends. His writings having been condemned by a council of Franciscan monks, he was thrown into prison about 1278, and confined at least ten years. Indeed, it is not certain that he ever came out of prison. Nor is it certain in what year he died, but probably at Oxford, June 11, 1294. His capital work, which treats of several sciences, is entitled *Opus Majus*, and was written about 1266. It was first printed in 1733. Several of his works, such as the *Opus Tertium*, *Opus Minus*, and *Compendium Philosophiæ*, were published for the first time in 1859. It appears that he was acquainted with the composition and explosive power of gunpowder. "The mind of Roger Bacon," says Hallam, "was strangely compounded of almost prophetic gleams of the future course of science and the best principles of the inductive philosophy, with a more than usual credulity in the superstitions of his own time." Recent investigations have proved how much in advance of his times he was, and that he really anticipated later discoveries. See his *Opera*, ed. J. S. Brewer (London, 1859); best biography (in French) by E. Charles (Paris, 1861). Revised by S. M. JACKSON.

Bacon, THOMAS SCOTT, D. D.: controversial and theological writer of the Protestant Episcopal Church; b. in Saratoga, N. Y., Feb. 1, 1825; graduated at Williams College; originally a lawyer and member of the Suffolk bar, Boston, 1847; ordained deacon 1853, priest 1854. The civil war found him at his parish in the old French town of Natchitoches, La. Though an ardent sympathizer with the North he was able to remain and, to a certain extent, exercise his ministry under most romantic and trying circumstances. Removing to Maryland at the close of the war he has lived the life of a student and divine in a secluded par-

ish. Author of *Both Sides of the Controversy between the Roman and the Reformed Churches* (1858); *Christian Children: How the Church Regards and Addresses them* (1868); *The Reign of God, not the Reign of Law* (1879); *The Beginnings of Religion* (London, 1887); *Primitive Man in Christian Thought* (1890); *It is Written* (1891); *The Primitive and Catholic Doctrine as to Holy Scripture* (1892); sermons, reviews, addresses, etc. W. S. PERRY.

Bacon's Rebellion: the civil conflict which, under the leadership of Nathaniel Bacon, took place in Virginia during the rule of Sir William Berkeley, one hundred years before the American Revolution. About the details and the real significance of the conflict there has been, until recently, much obscurity; but careful studies of the original sources by John W. Johnston and G. Brown Goode in Virginia, and Edward Eggleston in the British Record Office, have tended to clear up many obscurities and relieve Bacon of much of the opprobrium which formerly attached to his name. That the colonists had great reason for complaint against the oppressive tyranny of Berkeley can no longer admit of any doubt. The causes of dissatisfaction were aggravated by the attitude of the British Government. An act of Parliament declared that all goods, from whatever country or place they came, if intended for Virginia, should be shipped first to England, and then be reshipped in British vessels to the colony. The practical effect of this measure was, on the one hand, to limit the market for tobacco to England, and thus greatly reduce the only source of revenue to the colony, and, on the other, greatly to increase the price of all articles furnished by foreign countries. It was for the purpose of enforcing this obnoxious law that the Government erected a series of forts, against which the most strenuous objections were made by the colonists. Popular opinion became still more hostile when the edict was promulgated that no tobacco or other produce could be sold at any point except where there was a fort. Not less obnoxious were the duties imposed on trade between the colonies themselves, especially when it was found that no part of the duties collected went into the colonial treasury. Of all the moneys thus paid in the collector received one-half, the comptroller one-fourth, and the other fourth went to the minor officials. A similar spirit was shown in the law requiring that fish from the other colonies should pay duties, while fish imported by people living in England should be admitted free. Still further to shake the faith of the colonies in the beneficent disposition of the mother country was the fact that about the year 1673 the crown assigned the whole province of Virginia for thirty-one years to the royal favorites, Lords Arlington and Culpepper, with power to collect for their own uses all quit rents, escheats, and duties; to name sheriffs, surveyors, and other officers; to make new counties, and, in general, to exercise in their own name all the essential authority of absolute rulers. The Governor of the province, Sir William Berkeley, was an ardent royalist, who seemed to think that the function of a governor was to obtain as much as possible from the colonists for himself and for his masters at the least possible cost. But the most flagrant offense of Berkeley was his total neglect and refusal to provide for the safety and defense of the colonists against the Indians. Murderous assaults were made again and again upon the inhabitants along the James river; but no remonstrance or petition that the Governor would organize a defensive army was of any avail.

Such was the general state of affairs when Nathaniel Bacon arrived in the colony in 1673. B. Jan. 2, 1647, he had been admitted to St. Catherine's College, Cambridge, in 1660, where he took the degree of M. A. at the age of twenty, in the year 1667. After studying law at the Inns of Court, he determined to go to Virginia. When he arrived in the colony he was only twenty-six. Descended from a patrician family, he brought with him a fortune sufficient to give him immediate prominence. He purchased one estate at a point now occupied by the city of Richmond, and another some miles lower down on the James river. Bacon had scarcely taken up his abode in the new province when his qualities as a leader began to make themselves manifest. Though he professed unswerving loyalty to the crown, he saw plainly the abuses to which the colonists were subjected, and did not hesitate to denounce the course taken by Berkeley. His ability and energy soon gave him unbounded popularity. Though there were many causes of discontent, the most extreme dissatisfaction was

felt with the refusals of the Governor to take any measures to protect the colonists against the Indians. Bacon's first important movement was in this direction at the moment when it was ascertained that the Indian tribes were collecting all their forces with the evident intent of exterminating the whites. Bacon had never seen a hostile Indian, and he knew absolutely nothing from personal experience of the most successful manner of fighting them. The knowledge came to him as by instinct. He first applied to the Governor for authority to organize the people. Berkeley neither granted nor refused the petition; he simply did nothing. Bacon then declared that if another white person lost his life at the hands of the hostile Indians he would not wait for formal authority, but would act without it. He had not long to wait. One of Bacon's own men was killed at his lower plantation, whereupon the news spread rapidly, and the people flocked together, demanding that Bacon should put himself at their head and take the field against the savages. With a force of 500 men, but without authority or even permission from the Governor, he assumed the offensive against the savage foes. As soon as Berkeley heard of what had taken place he issued a proclamation, depriving Bacon of his seat in the House of Burgesses and ordering his followers to disband and disperse to their homes. Many of the men, fearing the confiscation of their property, deserted, and Bacon was left with only fifty-seven men. With this force, however, he did not hesitate to sally forth into the wilderness. In his first conflict with the enemy he set fire to the palisades erected by the Indians and, it is said, killed 150 of the enemy, with a loss of only three of his own men. After the capture of the Indian fort he determined to go to Jamestown and demand of Berkeley not only the restoration of his seat in the assembly, but a commission as major-general. This was an audacious move, but Bacon was conscious of having the support of the entire province. Forty men insisted on accompanying him. On approaching Jamestown he was arrested and brought before Berkeley, who addressed him as "the greatest rebel that ever was in Virginia." The news of his arrest, however, set the country ablaze with excitement, and Berkeley thought it not prudent to punish or retain him. Though Bacon escaped, it was immediately evident that matters could not be settled without a formal trial of strength. Berkeley at once called his forces together, but Bacon determined to avoid the defensive by making an immediate attack on Jamestown. Everybody at the capital, excepting the Governor, appears to have been panic-stricken. Berkeley, however, never lost his courage, for on the appearance of Bacon he drew his sword and offered to decide the matter in a hand-to-hand contest. Bacon answered that he came not to hurt a hair of the Governor's head, but simply to get a commission against the heathen who were spilling so much good blood. But these courtly speeches were not successful. It was necessary that he try a new device. Drawing up his troops, he ordered them to present arms, and then declared that, if the commission were not forthcoming, he would kill the Governor and the Council and then sheathe his sword in his own heart's blood. His energetic declaration was effective, for one of the burgesses called out that, if he would hold his hand, he should have what he pleased. He demanded a commission as major-general for himself, and thirty commissions in blank for his subordinate officers. More than this, he extorted a letter signed by the Governor and directed to the king, exculpating himself and his followers. The Governor even assented to a large number of laws, some of them repealing the most obnoxious statutes, and some of them providing for meeting the present needs of the colonies. But while this legislation was going on, Bacon heard of a desperate attack by the Indians only a few miles away, and determined to advance to the invaded region. No sooner had he gone, however, than Berkeley set himself to undo all that had been accomplished. He summoned troops from York and elsewhere; but when they learned that it was against Bacon that they were to march they refused to move. It is said that the Governor fainted with chagrin. Bacon, on the other hand, as soon as he learned of the attempts of Berkeley, made a ringing speech to his troops and turned to go back to Jamestown. Berkeley fled at his approach, and Bacon found the government of the province practically in his hands. The Indians, however, had taken advantage of his absence, and had again made an attack upon the inhabitants up the river. Bacon not only learned of this fact, but he knew that if he should leave Jamestown Berkeley would at once return and attempt to

re-establish himself in power. Bacon determined to attack the savages with great vigor. The battle, which completely broke their power, was fought on the ground now occupied by the eastern part of the city of Richmond. The name "Bloody Run" has from that day to this clung to the stream which is said to have been reddened by Indian blood. But no sooner had Bacon turned against the Indians than Berkeley turned against Jamestown. The capital could make no resistance. Bacon, however, decided to return, and marched with such extraordinary speed that he was ready for an attack before Berkeley knew of his approach. A siege was begun and carried on with such vigor that Berkeley, though he had superior numbers, soon decided to evacuate. The Governor's fleet, however, anchored near the town with the evident purpose of returning to the attack. Bacon, knowing that he had a greatly inferior force, acted with characteristic promptness and set fire to all the buildings of the town, including the church and the State-house. But this was practically the end of his career. He had enacted and caused to be promulgated a number of laws so favorable to the people that, long after his death and when all his acts had been reversed, there was a popular clamor for the re-enactment of "Bacon's laws." But, in the course of his latest expedition in the swamps, Bacon was attacked with a fatal dysentery, and he died Oct. 29, 1676. Until very recently the date of his death was unknown, and the place of his burial has remained in persistent obscurity. Friends disposed of his body in such a way that it was impossible for Berkeley to display it upon the gibbet. Bacon left no leader to take his place; and hence it has been customary to attach to his name the obloquy which usually accompanies the name of an unsuccessful rebel. But recent studies have revealed the fact that he was actuated by lofty motives, that he did much to protect the colonies, and that his laws were of a most beneficent nature. The reasons for his rebellion, though local in their scope, were not less flagrant than the reasons for the American Revolution just a hundred years later. The accounts in the standard histories have been made inadequate by recent investigations. See *Magazine of American History*, vols. xvii. and xviii., and the *Century Magazine* for 1890. C. K. ADAMS.

Baconthorpe, Bacon, or Bacho, JOHN: an English Carmelite, surnamed THE RESOLUTE DOCTOR; b. at Baconthorpe, in Norfolk, about the beginning of the fourteenth century. He was said to be the grand-nephew of Roger Bacon, and he advocated the philosophy of Averroës, and had great reputation for learning. Among his works is a commentary on the *Master of Sentences* (Peter Lombard). D. in London, 1346.

Bacs, baach: a county of Hungary; bounded N. by the county of Pesth, E. by Torontal, S. by Slavonia, and W. by Baranya. Area, 4,260 sq. miles. The Danube flows along the western boundary, and the Theiss along the eastern, while the two are connected by the canal of Bacs, which is about 60 miles long. The county is entirely level, and, with the exception of the swamps along the rivers, is very fertile. Pop. (1890) 716,325. Chief town, Zombor.

Bacte'ria [plur. of Gr. *βακτήριον*; dimin. of *βακτηρία* or *βάκτρον*, staff, stick]: minute, chlorophyll-less plants, belonging to the lowest class (*Schizophyceæ*) in the vegetable kingdom. They are allied to the minute aquatic green plants, water-slimes, so common in pools of water, and belonging to the genera *Nostoc*, *Oscillaria*, *Leptothrix*, *Spirulina*, etc., from which they may have been derived by degeneration due to their parasitic and saprophytic habits. "Bacteria appear in the form of round or cylindrical rod-shaped, rarely fusiform, cells of very minute size. The diameter or the transverse section of the cylindrical cells is in most cases about one micromillimeter ($\frac{1}{25000}$ inch), or even less; the length of the cylindrical cell is two to four times the transverse section, rarely more. There are only a few forms with distinctly large dimensions" (*De Bary*).

On account of their minute size their study is surrounded by many difficulties. Thus while they are unquestionably cells, and chains of cells, according to De Bary, "cell-nuclei have not yet been observed in them." They multiply by simple fission of the ordinary cells as in other simple plants, and by spore formation. Of the latter there are two kinds, distinguished as endosporous and arthrosporous, which seem to divide the Bacteria into two groups. In the development of an endospore, it begins as "a comparatively very minute, point-like granule in the protoplasm of a hitherto vegetative cell. This granule increases in volume, and soon pre-

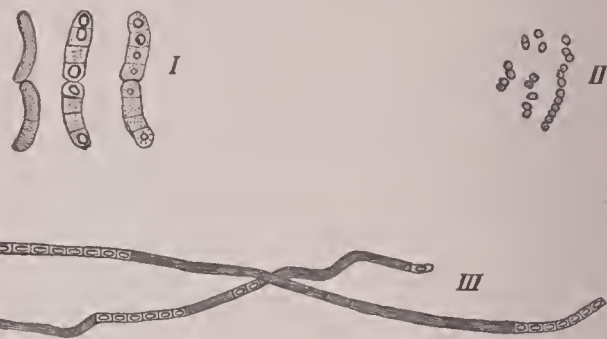
sents the appearance of an elongated or round, highly refringent, sharply defined body, attains its ultimate size rapidly, sometimes in a few hours, and is then the mature spore. The spore always remains smaller than its mother-cell, the protoplasm and other contents of which disappear with the growth of the spore, being doubtless consumed for its benefit, until at length the spore is seen suspended in a pellucid substance inside the delicate membrane of the mother-cell" (*De Bary*).

In the arthrosporous Bacteria the spores are produced by the breaking asunder of the cells which constitute the filament, each cell thus becoming a spore.

The classification of Bacteria is as yet largely artificial, being based to a great extent upon form. The arrangement by De Toni and Trevisan is as follows:

Sub-family I.—Plants in mature state filamentous; arthrosporous. The principal genera are *Crenothrix*, *Cladothrix*, *Nocardia*, *Rasmussenia*, *Leptorhchia*, and *Beggiatoa*.

Nocardia actinomycetes is the cause of the disease in cattle known as "Actinomycosis." *Rasmussenia buccalis* occurs in decayed teeth.



Bacteria: I. A species of bacillus, some of the plants forming spores, magnified 600 times. II. A species of micrococcus (*M. ureæ*), magnified 1,100 times. III. The bacillus of anthrax (*B. anthracis*), two plants forming spores, magnified 600 times.

Sub-family II.—Plants in mature state short rods (bacilli); mostly endosporous. The principal genera are *Bacillus* (of which 227 species have been described), *Pasteurella*, *Cornilia*, *Clostridium*, *Vibrio*, *Spirillum*, *Pacinia*, *Bacterium*, and *Klebsiella*.

Bacillus tuberculosis produces tuberculosis in animals (and man); *B. anthracis* is the cause of anthrax in animals; *B. subtilis* is common in fermenting and decaying substances; *B. amylovorus* is the cause of apple blight. Species of *Pasteurella* produce, or are associated with, diseases in domestic animals; e. g. *P. billingsii*, Texas fever; *P. suilla*, swine plague; *P. cholerae-gallinarum*, chicken cholera. *Cornilia alvei* produces a serious disease in bees. *Pacinia laeffleri* is associated with diphtheria, and *P. cholerae-asiaticæ* with Asiatic cholera in man, the latter being the so-called "Comma Bacillus" of Koch. *Bacterium aceti* is the "mother of vinegar," producing acetous fermentation.

Sub-family III.—Plants minute spheres (cocci). The principal genera are *Sarcina*, *Streptococcus*, *Neisseria*, *Staphylococcus*, and *Micrococcus*. *Sarcina ventriculi* occurs in the intestinal canal of animals (and man); *Streptococcus variolæ* occurs in smallpox pustules; *S. insectarum* produce a disease in chinch-bugs; *S. alvearis* is the cause of "foul brood" in bees.

On account of their importance Bacteria have been much studied in recent years, and the literature of the subject is already large. Very high powers of the microscope are necessary, and special cultures must be resorted to in order to isolate the species from one another.

The following works may be profitably consulted; they contain a full account of the voluminous literature: De Bary, *Comparative Morphology and Biology of the Fungi, Mycetozoa, and Bacteria* (1887); De Toni and Trevisan, *Schizomycetaceæ*, in Saccardo's *Sylloge Fungorum* (vol. viii., 1889); Dolley, *The Technology of Bacteria Investigation* (1885); Grove, *A Synopsis of the Bacteria and Yeast Fungi* (1884); Hueppe, *The Methods of Bacteriological Investigation* (1886); Prudden, *The Story of the Bacteria, and their Relations to Health and Disease* (1889). See also BACTERIOLOGY. CHARLES E. BESSEY.

Bacteria'ceæ [from *bacterium* + *-aceæ*, a botanical suffix used in forming ordinal and family names]: bacteria considered as a group in systematic botany. See BACTERIA.

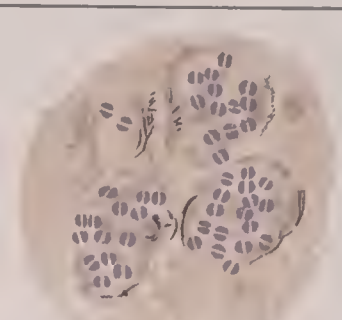
Bacteriol'ogy [from *bacterium* + *λέγειν*, to discuss]: scientific study of bacteria. The general term "Bacteria" denotes a group of minute miscellaneous vegetable organisms



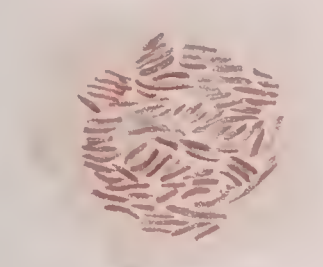
1. Primary forms of bacteria:
Spheroidal, rod-like, and spiral.



2. *Bacillus tetani* from a culture.



3. *Gonococcus* in pus cells.



4. *Bacillus typhosus* from a culture.



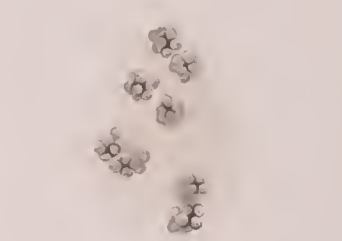
6. Spiral bacteria with cilia from
a putrefying vegetable infusion.



7. Yeast - *Saccharomyces*.



5. Mould - *Penicillium*.



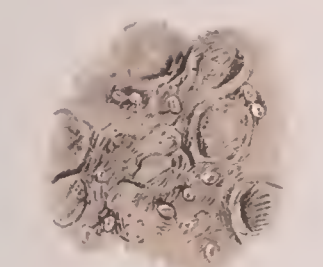
8. Cocci in groups of eight (*Sarcina*)



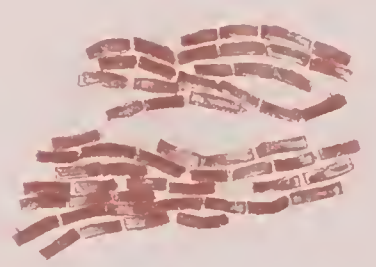
9. Spheroidal bacteria (cocci)
in pairs (*Diplococcus*)



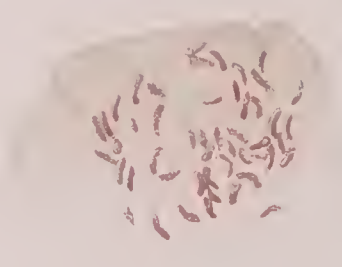
10. Cocci in chains (*Streptococcus*)



11. *Diplococcus pneumoniae* in blood.



15. *Bacillus anthracis* from a culture.



16. *Spirillum cholerae* in segments
(Comma bacillus from a culture)



17. Rod-like bacteria (bacilli) with spores.



18. *Bacillus tuberculosis* in sputum.

BACTERIA.

closely allied to, and now usually classed with, the fungi. They multiply by the simple process of transverse division, and are therefore known as *Schizomycetes*, or fission fungi. The simplest forms appear under the microscope as spherical bodies varying in size from minute points just visible under the high powers to $\frac{1}{100000}$ of an inch in diameter. These are called *Micrococci*. Others are rod-shaped—from $\frac{1}{12000}$ to $\frac{1}{5000}$ of an inch in length, and usually much less than half that in breadth. To these the name *Bacillus* is given. Others appear as undulating threads or rods twisted like a corkscrew. To these the name *Spirillum* is given.

These morphological peculiarities of the different bacteria are constant—that is to say, an organism that is normally spherical in shape always remains spherical and can never be caused to become rod-like in outline, and a rod-shaped organism remains rod-shaped, never becoming either a sphere or a spiral form. For this reason a number of classifications for the bacteria, based entirely upon morphological peculiarities, have been suggested; but as they are in the main the classifications of the older authors, many details have been introduced that are now known to be unnecessary. The tendency of the day is to simplify the grouping, and recognize the three grand morphological groups already mentioned—viz., *Micrococci*, *Bacilli*, and *Spirilla*. In the course of development, however, the members of these three divisions are seen to group themselves in a more or less constant and characteristic manner, and undergo certain peculiar alterations in their life cycle, and for this reason many of them have received names indicative of these conditions.

For example, in the group *Micrococci* there are those which, when growing, divide in such a way as to form clusters somewhat resembling bunches of grapes; to these the name *Staphylococci* is given. Others when growing are always seen in chains somewhat resembling strands of beads. These are therefore known as *Streptococci*; while again others divide commonly into twos, and are consequently seen in pairs—*Diplococci*. The *Tetrads* are those that develop by dividing in length and breadth, forming groups of fours. Another group, the *Sarcine*, include those forms that divide regularly in length, breadth, and thickness, the resulting cluster having somewhat the appearance of a bale of cotton. The *Bacilli* comprise all straight bacteria, whether long or short, that are not spherical in outline. Among the bacilli some forms possess the interesting property of passing into a stage in which they are much more resistant to detrimental influences than when growing normally. This stage of development is known as the spore, or permanent stage. The property of forming spores is not possessed by all bacilli. Some of them under all conditions appear as nothing else than simple rods that elongate and divide into two, and repeat this process until conditions unfavorable to their life processes arise, when development ceases and they die. Others also, when growing under the most favorable conditions, appear only as rods longer or shorter in size, but with the advent of surroundings not favorable to this regular and normal vegetation there appears a change in the individual rods that indicates the formation within the body of the rod of a structure quite different in size, outline, and color from the bacillus in which it is forming. This body when formed is round or oval in outline, very highly refractive to light, and markedly glistening. It is the spore of the bacillus, and is usually situated about the center of the rod in which it appears. When in this condition the organisms are said to be in the resting stage, and many of them by virtue of this peculiarity retain their vitality for years under conditions that would be destructive to the vitality of organisms in the stage of active growth and development.

The spore-stage is strictly a resting or inactive stage of these organisms. That is to say, spores can not divide into two and form other spores in the same way that the vegetative forms multiply, but they lie dormant until conditions favorable to their growth appear; they then germinate, not into spores, but into rods in every way identical, not only morphologically but physiologically, with the rods from which they were formed.

Spores are much more resistant to chemical and thermal influences than the vegetative forms from which they arose, and it is this that makes disinfection of those substances containing spores a matter of some difficulty. The spiral forms appear as those having the turns of the spiral long and quite obtuse, *Spirilla*, and those in which the angles are acute, *Spirochaete*. Owing to the difficulty, and in many

instances the impossibility, of obtaining the spiral bacteria in artificial cultures, our knowledge of them is quite limited. They apparently multiply by simple fission, and, so far as is known, do not form spores. Another property possessed by many bacteria is motility—they possess the power of independent motion, and, by the lashing movements of delicate hair-like appendages (flagella), move themselves about from one place to another in the fluid in which they float. Other forms are without the locomotive apparatus, and in consequence do not possess the property of independent motion.

In their nutritive processes bacteria differ markedly from the more highly organized members of the vegetable kingdom. They are devoid of chlorophyll, the green coloring-matter by virtue of which the higher plants decompose, and obtain their nutrition from, such bodies as carbonic acid and ammonia, and must therefore obtain the nitrogenous compounds necessary to the building up of their tissues from previously formed organic matter. They can not exist upon inorganic compounds alone. Because of the absence of chlorophyll from their tissues, they exist as saprophytes, obtaining their nutrition from dead organic matter, or as parasites, which exist at the expense of either a living animal or vegetable.

Owing to the rapidity of their life processes, they produce the most profound decomposition and fermentative changes in the materials to which they have gained access. Decomposition and fermentation are the results of the growth of saprophytic bacteria, whereas the parasitic forms produce changes in the tissues of their hosts, which may result in disease, and frequently in death.

To those unfamiliar with the part played in nature by these minute organisms, the word bacteria is frequently associated exclusively with disease. This is erroneous, for the number of species of bacteria capable of causing disease is relatively small. The great majority of them are concerned in processes that are not only in no way related to disease, but are directly beneficial to all living members of both the animal and vegetable kingdoms; in fact, they are essential to life upon the surface of the earth. Through their action the highly complicated tissues of dead animals and vegetables are resolved into simple compounds—carbonic acid, ammonia, and water—in which form they serve as nutrition for the more highly organized growing plants. It is to the ultimate production of carbonic acid and ammonia by bacteria, as end products in the process of decomposition, that the demands of growing vegetation for these compounds can be supplied. Without the carbon and nitrogen compounds resulting from the activities of saprophytic bacteria, the growth of higher vegetation would cease. Deprive the animal kingdom of the foodstuffs supplied to it by the vegetable world and life is no longer possible. The parasites, on the other hand, play a part which is usually in no way beneficial to the higher kingdoms. Their host must always be either a living animal or vegetable, in which are present conditions favorable to the development of the parasite. With this development substances are appropriated as nutrition that are essential to the health and life of the tissues in which the parasite is located. At the same time the materials formed as a result of the nutrition of the parasites are direct poisons for the surrounding tissues.

It is plain, therefore, that the positions occupied by the saprophytic and parasitic bacteria in nature are, in their relation to mankind, diametrically opposite, the saprophytes standing in the relation of benefactors, while the result of the growth of the parasites is almost always a more or less serious loss to their hosts.

For the growth of bacteria organic matter, moisture and a suitable temperature are necessary, the latter varying from about 70° F. to that of the human body. Living bacteria are almost omnipresent in nature; they are found in the water, soil, air, on the surface of moist and dry bodies exposed to the air, and in the intestinal canal of all animals. They are never present in the tissues of the healthy organs of the living animal.

As found in nature, many species of bacteria are usually present as a heterogeneous mixture, and in order that the characteristics of the individuals comprising the group can be studied, separation of the individual species by artificial means in what are called "pure cultures" is necessary. The process commonly employed for this purpose is in principle similar to the means that would be taken for separating the different granules from a handful of mixed seeds. As the grains lie in the hollow of the hand it is difficult if not impossible to pick out each separate granule having a distinct

size and shape, but if one throws them upon the surface of a table, or some large flat object, the task then becomes very simple. So it is with the bacteria: if they can be diffused in some medium that has the property of at one time being fluid and at another solid, they can be scattered so that each drop of the fluid will contain a few of these microscopic bodies. If now, while fluid, this diluted culture medium is poured out upon a large glass surface, the individual bacteria are more widely separated the one from the other, and if the medium possesses the property of solidifying when brought in contact with the cool surface of the glass plate, the bacteria are not only separated, but, as solidification occurs, are fixed in this separated condition. The media that are employed for this purpose are composed primarily of beef tea to which enough ordinary bone gelatin or vegetable gelatin (agar-agar of the Japanese) is added to permit of their being at one temperature fluid, and at a lower temperature solid. These media afford conditions favorable to the growth of bacteria, so that in the course of from twenty-four to forty-eight hours the organisms, separated by the process described above, begin to grow, and very quickly give rise to what are known as colonies of bacteria that can easily be seen with the unaided eye. Each colony represents the offspring from a single bacterium that was fixed at the point at which it appears. They are therefore each a pure culture of the organism from which they sprang. As colonies from different species of bacteria commonly present peculiar characteristics, it is usually possible to determine the number of particular species that were present in the original mixture by the appearance of the colonies developing from them. In some instances the resulting colonies will have a characteristic shape, being regularly round or oval in outline; again they will be irregular and ragged at their borders; in some instances they will be dense and non-transparent; and again very thin, delicate, and translucent. Some of them grow as dry lusterless patches, others as moist glistening islands that stand up above the surrounding medium. Many species of bacteria—the chromogenic varieties—possess the interesting property of producing brilliant pigments, by which they can readily be recognized. Just as some roses grow red, others white, and others yellow, so will the colonies resulting from certain of the chromogenic species be in one case red, in another yellow, and in still others violet in color, so that a plate that is made for the purpose of separating the individuals of a mixture containing, with other organisms, certain of these color-producers, will often present a most attractive array of these various pigmented colonies.

If now a portion from each representative colony is introduced into a tube or flask containing a sterile, nutrient medium, the growth that results will be a pure culture of the organism forming the colony from which the bit was taken. By this means it is a comparatively simple matter to separate from a mixture of bacteria the individuals that composed it. The process, as just described, represents the well-known method of Koch for the isolation and cultivation of bacteria on solid media.

Another means for distinguishing them is by their relation to bone gelatin. Some of them by their powers of peptonization cause the gelatin to become fluid, and in doing this so alter the chemical constitution of the medium that it can not again be rendered solid. Others never under any circumstances bring about this change.

Again, certain of them are characterized by their relation to oxygen. Most species—the aerobic forms—require this gas for their development, while others—the anaerobic forms—not only do not grow where it is present, but are directly destroyed through its influence.

Still another means of identification is by the nature of their chemical products, and finally, and most important to mankind, by the absence or presence of the power to produce disease.

With certain mixtures of bacteria, particularly those suspected of containing pathogenic (disease-producing) organisms, another method of separation is often resorted to: the inoculation of susceptible animals with the suspicious mixtures. The innocent saprophytes are quickly destroyed by the tissues of the animal, while the disease-producers will perform their specific function, and can often be obtained from the blood or organs in pure culture.

The life history of the parasites when outside of the body of their host is not only an interesting one, but to mankind a matter of great practical importance. When disease-producing bacteria are thrown off from the body of the affected animal or man, either with the intestinal evacuations, the

sputum, or from the skin, the conditions which they meet, though not sufficiently unfavorable in most cases to prevent the development of the ordinary saprophytes, are by no means favorable to the growth of the more delicate parasites, so that in the main they quickly lose their vitality. Where conditions of a more favorable character do exist, they are likewise those under which the saprophytic forms grow most luxuriantly, so that again the delicate disease-producers meet another element not favorable to their growth—the antagonism that is offered to them by the common organisms found upon the surface of the earth, in the water, etc. Were it otherwise, the causes of some diseases, such as typhoid fever, would be much more persistent and widespread than they seem to be at present.

By the methods described, with certain modifications, the details of which can hardly be given in an article of this character, a very large number of different species of bacteria have been isolated, and their peculiarities in cultures and their relation to changes going on about us and to diseases have been established.

At different places upon the earth's surface bacteriological analyses of waters have been made, and comparisons of the results reveal the interesting fact that there is a definite flora of bacteria from open watercourses over the entire earth. These water bacteria, as they are commonly called, are saprophytes, and do not possess the property of inducing disease. By their presence in water complex nitrogenous matter is converted into simpler forms, in which it is either taken up as food by the higher inhabitants of the water, or is precipitated to the bottom of the stream by chemical processes, or remains in solution in the water in the form of innocent inorganic salts.

No less interesting and instructive are the results of studies upon the soil. Here are found countless numbers of bacteria, the majority of which are those concerned in the great process of decomposition and disintegration constantly in progress. Of these certain species are, however, directly instrumental in a more or less specific feature of decomposition—nitrification, i. e. the production of soluble salts of nitric acid from the more complex forms of nitrogenous organic matter. It is through the agency of these organisms, most probably in combination with other organisms that are concerned in the primary process of decomposing the nitrogenous organic matter as such, that the purification of sewage by filtration through soil is mainly accomplished. It is also due to the activities of the same organisms that ammonia, nitrous and nitric acid are found in water polluted by nitrogenous wastes, and it is these microscopic creatures that are instrumental in perpetuating the niter or saltpeter beds of Chili and Peru, that are of such importance in commerce. It is interesting to note that, though the organisms of nitrification produce these characteristic end products from nitrogenous organic matter, they are still incapable of development in the nitrogenous nutritive media employed in general bacteriological studies. They can not be isolated by the ordinary methods from water or soil in which they are present, but require for their isolation media quite different from those utilized in the cultivation of any other known bacteria. Those who have worked with greatest success upon this organism have cultivated it only through the use of solutions of inorganic salts in distilled water, from which organic matter is absent. It is isolated from waters in which nitrification is in progress by a process of dilution. As other organisms that were originally present with the nitrifying bacillus do not retain their life properties in solutions favorable to the growth of this organism, it is a comparatively simple matter to exclude them after a few generations.

The nitrifying bacillus, when examined microscopically, is a short rod of a slightly oval shape. It varies in size from 1.1μ to 1.7μ in length, and from 0.8μ to 0.9μ in breadth. It stains with difficulty with the ordinary aniline staining reagents, and is, when examined fresh, seen to be without the power of independent movement. As found in cultures they are grouped very characteristically in irregular clumps, and are held together by a jelly-like material. These clumps are found usually at the bottom of the fluid. It is not improbable that there may be several closely allied, though not identical, organisms included in this term "nitrifying bacillus." The most remarkable feature of the organism, and that which distinguishes it from all other bacteria thus far studied, is its peculiar source of nutrition. The absence of chlorophyll from its tissues precludes the possibility of its obtaining the necessary carbon and nitrogen from such

simple substances as gaseous ammonia and carbonic acid, as do the more highly organized green plants; and its failure to grow in artificial cultures or media containing nitrogenous organic matter renders it somewhat enigmatical as to how its processes of nutrition are conducted. It is to be hoped that further studies upon this interesting and important organism will clear away some of these obscure points.

The disease-producing organisms are not very rarely found in the soil, and are for the most part those possessing the property of forming spores, by which they are enabled to resist those detrimental influences that result in the death of the less resistant, non-spore-forming organisms. Of these forms the most conspicuous are the bacillus of tetanus (lockjaw) and the bacillus of malignant œdema.

The bacillus of tetanus is a delicate rod of about 1.0μ to 1.3μ in length, and of about 0.1 to 0.2μ in thickness. It possesses the property of forming spores, and when in this stage has somewhat the appearance of a miniature drumstick, owing to the tendency of the spore to form at one end of the rod, at which point the rod becomes slightly enlarged. It is feebly motile. It is anaërobie, and will therefore not grow in the presence of oxygen. When this gas is rigidly excluded from the cultures, the organism grows well on the ordinary culture media after they have been rendered a little more alkaline than is necessary for the majority of other organisms. It grows best in those media to which a little (about 1 to 2 per cent.) of grape sugar has been added. It is not a rapidly growing organism, and thrives best at the temperature of the human body. It liquefies gelatin, and gives off a peculiar, unpleasant odor. It can be stained with the ordinary aniline dyes. It is most readily obtained in pure cultures from the soil or other materials in which it is present, after subjecting them for two or three successive days to a temperature of 80°C . (176°F .) for one-half to one hour, a temperature that destroys the other organisms present but is not harmful to the spores of the tetanus bacillus. When subjected to the temperature of steam (100°C . or 212°F .) for five minutes the organism and its spores are killed. When in the dried condition the spores of this organism have been known to retain their virulence for as long as sixteen months.

The animals that are susceptible to its pathogenic activities are horses, sheep, dogs, mice, rats, guinea-pigs, rabbits, and also man. As seen experimentally, the clinical manifestations and pathological alterations in this disease are due entirely to the absorption of the poisonous products of growth of the organisms located at the point at which they gained access to the tissues. In animals dead of this disease neither the bacilli nor their spores are ever found in the internal organs, and in many cases they are even absent from the seat of inoculation. The presence of this organism in the soil serves to explain the frequent appearance of tetanus as an accompaniment of wounds to which dirt and dust have had access—those wounds, for example, of individuals engaged in agricultural labors, street workmen, and crushed wounds from the wheels of engines and railroad cars.

The bacillus of malignant œdema (French, *Vibrion septique*), another pathogenic organism found in the soil, is a rod-shaped organism of 3 to 4μ long and 1.0 to 1.1μ thick. It is sometimes straight and sometimes slightly curved in shape, and not infrequently grows as long threads. In the vegetative stage it is motile, but becomes motionless as the spores form within it. It is, strictly speaking, an anaërobie organism, and grows best in an atmosphere of hydrogen. It is not a gas-producer, and gives off when growing an unpleasant acid odor. On bone gelatin it produces liquefaction. It stains with the ordinary aniline dyes. It grows most luxuriantly at the temperature of the human body.

The animals that are susceptible to the action of this bacillus are guinea-pigs, mice, cattle, sheep, goats, pigs, chickens, and rabbits, though the intensity of the disease varies considerably with the animal affected. Guinea-pigs that have died as a result of subcutaneous inoculation with this organism present the condition of intense œdema of the subcutaneous and muscular tissues at and about the point of inoculation. The bacilli can easily be found in this œdematous fluid, and have been detected in the tissues of the mesentery. Horses, asses, and white rats when inoculated present only a very limited local swelling that quickly disappears without proving fatal, while hogs, dogs, cats, rabbits, ducks, chickens, and pigeons are practically susceptible to the disease. Aside from the importance of the relation of this organism to the lower animals, it is principally of interest historically as being the organism that was, prior to

the more exact methods of work of to-day, most frequently confounded with the bacillus of ANTHRAX (*q. v.*).

Bacteriological study of the air has shown that the number of organisms present are in proportion to the amount of floating matters, i. e. the amount of dust; and microscopic examination of these dust particles shows them to be covered in most cases with a group of adherent organisms. Individual bacteria alone are probably not present in the air, but, as stated, are deposited upon dust particles. The bacteria found in the air are most commonly the ordinary saprophytes, though under certain conditions disease-producing bacteria may be detected not in the open air, but in that of closed apartments occupied by persons or animals suffering from infectious diseases. In badly managed surgical wards of hospitals the bacteria concerned in ordinary suppurative processes have been detected; also the *Streptococcus* of erysipelas has in a few instances been found in the dust of these rooms. Though it has not been found floating in the air, still the bacillus of tuberculosis (consumption) has been found in quite a number of instances in the dust of apartments occupied by individuals suffering from this malady. This is particularly the case in those instances in which cleanliness is not rigidly observed—where the expectoration finds its way to the floor and is ground into dry dust by the feet of those walking about the room. As this expectoration contains the tubercle bacilli, frequently in very large numbers, it is easy to conceive of the danger of breathing the dust-laden atmosphere of such rooms. This source of infection can easily be eliminated by having the sputum from these patients collected in vessels containing water. The vessels, with their contents, should be boiled every morning. Bacteria can only be swept into the air from dry surfaces, and can not by ordinary means find their way into the air from moist surfaces. The characteristics of the pathogenic organisms named, that may under exceptional instances be present in the air of closed spaces, are as follows:

The ordinary organisms of suppuration, the pyogenic cocci, as they are called, comprise a group of micrococci that are distinguished from one another by the fact that they are of different degrees of virulence, produce different colors in the course of their artificial cultivation, and in the course of their growth are grouped differently. There are four different kinds of micrococci to which the term pyogenic is applied: The *Staphylococcus pyogenes aureus*, so called because of the golden color of its colonies; the *Staphylococcus pyogenes albus*, the colonies of which are white; the *Staphylococcus pyogenes citreus*, which grows in lemon-colored colonies; and the *Streptococcus pyogenes*, so called because it grows in chains consisting of several individual organisms joined together. The staphylococci of pus are very closely allied in their cultural peculiarities, and biologically are distinguished the one from the other only by the color of the pigments produced. They are all micrococci of about 0.87μ in diameter, grouped together like clusters of grapes. They are non-motile, and being of the micrococcus group do not form spores. They grow readily at the ordinary temperature of a room, about 68° to 70°F ., but most luxuriantly at the temperature of the body. They grow on all the ordinary culture-media—agar-agar, gelatin, potato, blood-serum, and bouillon. They liquefy gelatin, and can readily be stained with the ordinary aniline dyes. They may be found both microscopically and by culture methods in the pus from acute, circumscribed, suppurative processes, though the *Staphylococcus pyogenes aureus* is much more frequently present than either of the others. Suppurative processes similar to those from which these organisms are obtained can be reproduced in susceptible lower animals by the introduction of the organisms into the tissues; and, by the intravenous injection of the *Staphylococcus aureus* into rabbits, multiple abscess formations, most conspicuous in the muscles, the heart, and kidneys, can be produced.

The *Streptococcus pyogenes* is most commonly found in those suppurative processes which partake of the nature of erysipelas, i. e. those of a spreading tendency. As stated, this organism is grouped in the form of chains somewhat resembling strands of beads. In cultures it grows less luxuriantly than do the other pyogenic cocci, and is throughout a much less hardy organism, though the disease processes produced by it are usually of a more serious character than those resulting from the activities of the *Staphylococci*. It does not liquefy gelatin. It is not motile, and under artificial conditions not very tenacious of life. On the other hand, it appears to be of high vitality when once having gained

access to the tissues of susceptible animals, and particularly man. It stains readily with the ordinary staining reagents. This organism is so like the *Streptococcus* concerned in the production of erysipelas as in all probability to be identical with it. Inoculations of lower animals with this organism do sometimes, though not constantly, result in the appearance of a condition analogous to that from which the organisms were obtained.

The *Bacillus tuberculosis*, the other pathogenic organism that may possibly be present in the air of an inclosed space, is a rod-shaped bacillus of about 2 to 5 μ long and very slender. It is usually beaded in appearance and slightly curved or bent on its long axis. It forms spores. Under artificial conditions it grows very slowly, and either very slightly or not at all at a temperature lower than that of the animal body. It grows best on solidified blood-serum or nutritive agar-agar to which about 6 per cent. of glycerin has been added. Its growth on those media is characteristic, being very dry and coarsely granular, so that the point at which it is developing has somewhat the appearance of having been spread with dry meal. It grows also on glycerin-bouillon, forming a dry pellicle that floats upon the surface of the fluid. It does not develop upon gelatin, because of the low temperature at which this medium must be used. It does not stain by the ordinary methods, but requires a special process, so that it can be identified by this means. It is very difficult to stain, but when once stained is equally tenacious of its color.

These organisms are present in the sputum of all persons suffering from pulmonary tuberculosis, in the intestinal evacuations of all patients with tubercular enteritis, in serofulous glands, and in tuberculous bone troubles. They stand in direct causal relation to these processes. Tubercular infection can occur through the air-passages, the alimentary tract, and through wounds of the skin. The animals, including man, that are susceptible to the action of this organism are cattle, hogs, cats, rabbits, guinea-pigs, and field mice. White mice, rats, and dogs possess natural immunity.

In addition to the organisms mentioned, the bacillus of anthrax, that of typhoid fever, and that of Asiatic cholera are now and then found outside the body in either the soil or water. Besides these there are other pathogenic organisms whose relation to disease is established, but which have not been found outside of the diseased conditions with which they are associated. Of these may be mentioned the *Bacillus diphtheriae* and the *Diplococcus lanceolatus* of pneumonia, an organism that, according to Sternberg, is found in the mouth cavity of about 20 per cent. of all healthy persons.

The *Bacillus diphtheriae* is a rod-shaped organism of about the size of the tubercle bacillus, but very irregular in its morphology, which may be curved, straight, spindle or club shaped. It is always present in the false membranes in the pharynx of diphtheric patients, and rarely in the internal organs of individuals that have died of the disease. It can be isolated and cultivated upon artificial media, and when introduced into the tissues of guinea-pigs and kittens gives rise to alterations quite identical with those of diphtheria in the human being. Like tetanus, the symptoms and pathological lesions of diphtheria are due not to the dissemination of the bacteria through the body, but rather to the absorption of their poisonous products from the seat of activity in the throat.

The *Diplococcus lanceolatus* of pneumonia, though not fulfilling all the postulates necessary to prove absolutely its relation to acute fibrinous pneumonia, is nevertheless in all probability the etiological factor in the production of this disease. As its name implies, it is a coccus commonly found in pairs. It is an extremely delicate organism, so that it is with much difficulty that it can be cultivated for any length of time upon artificial media. It is possible to isolate it from pneumonic processes, however, and cultivate it artificially. When introduced into the tissues of susceptible animals, particularly mice and rabbits, the resulting process is not pneumonia, but a very acute and fatal form of septicaemia. This organism is present in the saliva of about 20 per cent. of all normal, healthy individuals.

The results of studies upon the *modus operandi* of infection lead us to believe that bacteria invade and destroy the vitality of tissues in which they are located, principally by the production of poisonous products that are of an albuminous nature. These products are the weapons, so to speak, of the invading foe and the result of the contest depends mainly upon the power of the tissues to resist the action of these agents: this they do through substances which

are chemically of a somewhat similar nature to the products of the bacteria, but which act as antidotes in neutralizing the poisons as fast as formed.

The study of bacteria in disease is by no means the only direction in which bacteriological research is being directed. The employment of bacteria in the industries is a very important problem. It is to the activities of peculiar species of bacteria that certain cheeses owe their flavor that gives to them their value as an article of food. It is by bacteria and closely allied forms that many of the organic acids are produced, and the part played by the yeast fungus, which, though not a bacterium, is usually considered with them, in the manufacture of beer, ale, and alcohol, is a very important one.

A. C. ABBOTT and J. S. BILLINGS.

Bact'erium, plural BACTERIA: See BACTERIA and BACTERIOLOGY.

Bac'tria, or **Bactria'na**: an ancient country of Central Asia, bounded N. by the river Oxus (Amoo or Gihon) and S. by the Hindu Koosh Mountains (anc. *Paropamisus*). Its boundaries are not perfectly known, but it is considered to be identical with the modern province of Balkh. This is supposed by some to have been the native country of the Aryan race. Bactria was the center of a powerful kingdom which flourished before the historical period. Its capital, Bactra, or Zariaspa, which stood on the site of the modern Balkh, was the headquarters of the Magi. In the time of Cyrus the Great, Bactria became a Persian province, and was conquered, with the rest of the Persian empire, by Alexander the Great. In the third century B. C., by the revolt of the satrap Diodotus, it gained independence, and was ruled by a dynasty of Greek origin, whose coins have not yet elucidated their succession. In the early Christian centuries it became a powerful seat of Buddhism. With Bokhara, to which it was subject, it passed under Russian control about 1868. This history of Bactria has recently been elucidated by numerous Græco-Bactrian coins and other antiquities found in the *topes* or burial-places of Afghanistan. Some of these coins present Greek letters, and also letters of a dialect of Sanskrit. See Wilson, *Ariana Antiqua* (1841); Lassen, *Indische Alterthumskunde* (1849); E. Thomas, *Bactrian Coins*, in *Journal of Royal Asiatic Society* (London, 1873).

Revised by D. O. KELLOGG.

Bac'tris [from Gr. *βάκτρον*, a stick]: a genus of palms, comprising about fifty known species, all natives of America. They are generally small trees, with slender stems and pinnate leaves. Some of them are spiny, and form thickets which are almost impenetrable. The *Bactris maraja*, or the maraja palm, bears clusters of fruit resembling small grapes, with a pulp of an agreeable flavor. The stems are used as walking-sticks.

Bactri'tes [from Gr. *βάκτρον*, a stick]: a genus of fossil *Nautiloidea*, with a straight shell, sutures simply curved, and siphon marginal. Classed with the *Orthoceratidae* by Zittel, but by Sandberger it was placed among the *Goniatites*. Several species from the Devonian and Silurian rocks are described.

H. S. WILLIAMS.

Baculi'tes [from Lat. *ba'culum*, stick]: a genus of fossil AMMONOIDEA (*q. v.*), with a straight shell with finely foliated sutures and marginal siphon. Characteristic of the Cretaceous. Though presenting some resemblance to the Palæozoic *Bactrites*, this genus is readily distinguished from it by the foliated sutures.

H. S. WILLIAMS.

Bac'up: a flourishing town of Lancashire, England; 22 miles by rail N. of Manchester (see map of England, ref. 7-G). It is situated in a beautiful valley, and is a terminus of a branch of the Lancashire and Yorkshire Railway. It has many churches and chapels, a fine market-house, and a literary institute. Here are extensive cotton-factories and several brass and iron foundries and dye-works. Coal mines are worked in the vicinity. Pop. (1891) 23,498.

Badag'ry: a seaport-town in the southwest angle of the British Niger Territory, Africa; 50 miles E. N. E. of Whydah (see map of Africa, ref. 5-C). The Portuguese once had several factories at this place, which was a market for slaves. Pop. about 10,000.

Badajoz, *va-da-khoth'*, or **Badajos'**: a province of Spain; formerly known as Lower Estremadura; bounded N. by Caceres, E. by Ciudad Real and Cordova, S. by Seville and Huelva, and W. by Portugal. Area, 8,687 sq. miles. It is for the greater part a poor and uncultivated region, and is chiefly used as pasture-grounds for immense herds of sheep and swine. Pop. (1887) 480,418.

Badajoz, or **Badajos** (anc. *Pax Augusti*): a fortified town of Spain; capital of province of same name; situated on the left bank of the Guadiana; 132 miles by rail E. of Lisbon (see map of Spain, ref. 17-C). The river is here crossed by a good granite bridge of twenty-eight arches. The town contains an old cathedral, an arsenal, and a cannon-foundry. It has manufactures of soap, coarse woolen stuffs, and leather, and a brisk contraband trade. Badajoz was the native place of the painter Morales. It has been the scene of several important military events. It was besieged and taken by the French Marshal Soult in Mar., 1811. Wellington attempted to retake it in April, but he failed. Having renewed the siege in Mar., 1812, he took it by storm on Apr. 6 ensuing, after a desperate contest, in which the British lost 4,824 men, killed and wounded. Pop. (1877) 22,965; (1887) 27,279.

Badakhshan, baa-daa'k'h-shaan': a portion of Eastern Afghanistan, lying between Bokhara and Kafiristan, W. of the Pamirs and N. of the Hindu Kush Mountains. It includes several valleys of the head-streams of the Oxus. The surface is mountainous, and a great mountain-range extends along the eastern border. Here are ruby mines and massive cliffs or quarries of lapis-lazuli. Iron, salt, and sulphur are also obtained here. The inhabitants are Mohammedans. Capital, Faizabad.

Baddeck' (originally *Bedique*): a watering-place and shire-town of Victoria co., Cape Breton island, N. S.; 40 miles W. of Sydney. Pop. 1,900.

Badeau, ADAM: soldier; b. in New York city, Dec. 29, 1831. He received an excellent education, and devoted himself to literary pursuits. He was one of the first volunteers in defense of the Union, and became a captain in 1862. He served on Gen. Sherman's staff, and was wounded at Port Hudson (May 27, 1863). In 1864 he was appointed military secretary to Gen. Grant, with the rank of colonel. This position he held until Mar., 1869. After the close of the war he received a brevet as brigadier-general in recognition of "faithful and meritorious services." He published a *Military History of General Grant* (1867-81, 3 vols.; n. e. 1885), and became in 1869 secretary of legation, and afterward U. S. consul-general in London, and U. S. consul-general at Havana 1882-84. Author of *Conspiracy* (1885); *Aristocracy in England* (1886); and *Grant in Peace* (1886). D. at Ridgewood, N. J., Mar. 19, 1895.

Baden, baa'den (literally, baths; anc. called *Ther'mæ Helvet'icæ*, i. e. Helvetian baths): a town and watering-place of Switzerland; canton of Aargau; on the Limmat; 14 miles by rail N. W. of Zurich (see map of Switzerland, ref. 2-F.). Tacitus mentions it (c. 67, *Histories*); the Goths despoiled it; the Hapsburgs held it until it became Swiss in 1415. The dispute of Zwingli and Œcolampadius with Eck was held here (1526), and the treaty which ended the Spanish Succession war was made here (1714). In Jan., 1834, the "conference of Baden" was held here, in which the representatives of Lucerne, Aargau, Thurgau, Soleure, Berne, Basel city, and St. Gall met to settle the relations of the Catholic Church with these cantons. The temperature of the baths is about 117° F. Pop. (1888) 3,887.

Baden, Grand Duchy of: a state of Germany; bordering on Alsace and Switzerland; bounded N. by Hesse-Darmstadt, E. by Würtemberg, and S. and W. by the Rhine. It has an area of 5,822 sq. miles. Pop. (1895) 1,725,464. The surface is mountainous. A long mountain-range called the Black Forest (Schwarzwald) extends along the eastern border. The highest point is the Feldberg, 4,886 feet high. The western part of Baden is a long plain extending along the Rhine from Basel to Mannheim. The chief rivers, besides the Rhine, are the Danube, which rises in Baden, and the Neckar. The valley of the Rhine has a mild climate and a very fertile soil, which is well cultivated. The grape and other fruits flourish here in abundance. Among the staple products are wheat, barley, rye, oats, pulse, potatoes, and tobacco. Good pine timber abounds in the Black Forest. The average quantity of wine produced annually is about 14,000,000 gal. The mineral produce consists almost solely of salt and building-stone. Baden is rich in mineral springs, which are much frequented as watering-places, as Baden-Baden, Badenweiler, etc. The principal manufactures are silk ribbons, hats, brushes, leather, paper, clocks, musical instruments, and machinery. The chief articles of export are wine and timber. The chief

towns are Mannheim, Carlsruhe (the capital), Freiburg, Heidelberg, Pforzheim, and Constance.

Religion and Government.—Two-thirds of the people are Roman Catholics and one-third Protestants. Baden has two universities (Heidelberg and Freiburg); an excellent system of public instruction, and the children are compelled to attend school. This state is governed by a hereditary grand duke, who in relation to foreign and military affairs is dependent upon the Emperor of Germany. He governs according to a constitution, which is among the most liberal in Germany. The parliament of Baden consists of a chamber of peers and one of sixty-three deputies. The public debt consists almost entirely of the railway debt, which at the beginning of 1891 amounted to 328,733,363 marks. The state then owned 836 of the total 907 miles of railway in the duchy. For 1891 the revenue was estimated at 65,952,000 marks, and the expenditure at 68,120,000. Hermann II., who died in 1130, was the first to assume the title of Margrave of Baden. The grand ducal family now reigning in Baden are his lineal descendants. In 1746 Charles Frederick became Margrave of Baden, which under his reign increased in extent and importance. He acquired the dignity of elector in 1803, and the title of grand duke in 1806. Having joined the Confederation of the Rhine, he gained a large accession of territory. His grandson, Charles Louis, granted in 1818 a charter which forms the basis of the present constitution. Under the impulse of the revolutionary movement which began in France in Feb., 1848, the popular party of Baden took arms to found a republic. The grand duke fled, and a constituent assembly was convened in May, 1849. By the aid of a Prussian army he was restored in July of that year. In Aug., 1866, Baden formed with Prussia a secret alliance, which was made public about Apr., 1867. Baden became in 1870 a state of the new German empire, in the federal council of which she has three votes, the whole number of votes being fifty-eight. The Grand Duke Friedrich I., born Sept. 9, 1826, came to the throne Sept. 5, 1856.

Revised by C. K. ADAMS.

Baden-Baden (anc. *Civitas Aurelia Aquen'sis*): a town and a celebrated watering-place in the grand duchy of Baden; is beautifully situated in the Oos valley at the foot of the Schwarzwald (Black Forest) Mountains; 23 miles by rail S. S. W. of Carlsruhe and 6 miles from the Rhine. It is on a branch of the Mannheim and Basel Railway. Here are warm saline springs, the temperature of which ranges from 117° to 154° F., which were much resorted to in the time of the Roman emperors. They are efficacious in cases of gout and chronic cutaneous diseases. Baden-Baden is frequented in summer by visitors from all parts of Europe and America, to the number of about 30,000 annually. In former years its gambling-hall was a great attraction, but upon the restoration of the German empire gambling here, as in the other watering-places, was suppressed. Relics of Roman sculpture and architecture have been found here. From the fourteenth century the margraves dwelt here; first in the old castle whose ruins crown the hill above the town. They removed (1479) to the new castle near the town, rebuilt in 1697, which still remains with its dungeons. The parish church was the sepulchre of the old margraves. Pop. (1890) 13,889; (1895) 14,862.

Baden-bei-Wien, baa'den-bi-veen (anc. *Ther'mæ Cætiæ* or *Panno'niæ*): a town and bathing-place of Lower Austria; on the river Schwachat; 12 miles by rail S. of Vienna. Here are warm mineral springs, which are frequented by the citizens of Vienna. Many of the Austrian nobility have mansions here, among them the imperial castle of Weilberg. Small steel tools are the principal manufacture. About 8,000 patients visit the waters annually. Pop. (1890) 11,262.

Baden-Powell, bay'den-pow'el, Sir GEORGE SMYTH, M. P., K. C. M. G., F. R. S.: British diplomat and author; b. in Oxford, Dec. 24, 1847; educated at St. Paul's School, Marlborough, and Balliol College, Oxford. Between leaving Marlborough and entering Balliol he traveled extensively in the colonial possessions of Great Britain, and published during the first year of his university career *New Homes for the Old Country: a Personal Experience of the Political and Domestic Life, the Industries, and the Natural History of Australia and New Zealand*, which has been called a cyclopædia of Australian knowledge. Commissioner to investigate West Indian affairs 1882-84; joined Sir Charles Warren in Bechuanaland 1884, and made a tour of investigation in Basutoland, Zululand, and other places in South Africa; and in 1886-87 came to Canada and the United

States to prepare a statement of the fishery dispute. Some of his other works are *Protection and Bad Times* (1879); *State Aid and State Interference* (1882); *The Truth about Home Rule* (1888); *The Political and Social Results of the Absorption of Small States by Large* (1876); *The Land Systems of India* (1892). He was knighted in 1887. D. in London, Nov. 20, 1898. C. H. THURBER.

Badge [O. Fr. *bage*; possibly of Ger. origin]: anything worn as a distinguishing mark, to show that the wearer belongs to a certain body of men, society, rank, or the like; thus a white cockade was a badge of Jacobites in England, a cockade of red, white, and blue was the badge of the Revolutionists in Paris in 1789 and after. The badge has sometimes been a part of the heraldic bearings of the wearer, but more usually it was wholly separate. The same thing is seen in national badges; thus the rose, which is the badge of England, and the thistle, which is the badge of Scotland, do not appear in the royal arms of Great Britain. R. S.

Badger [probably from *badge*, in allusion to the stripes on its head]: a carnivorous animal of the family *Mustelidae*, belonging to the genus *Meles*, *Mydaus*, *Arctonyx*, or *Taxidea*. They attain the size of a cat or medium-sized dog, are plantigrades, have a pointed skull, and feet adapted for burrowing. They have anal glands, as in the closely related skunks, the secretion of which has a disagreeable odor. They live in deep burrows, going out at evenings in search of roots, fruits, insects, frogs, etc. The common badger of Europe (*Meles taxus*) is about the size of the common fox.



The European badger.

It was formerly, and is even now, kept for "badger-drawing." The animal is put into a barrel and assailed by numerous dogs, which are trained to pull the badger out. The animal resists obstinately until overpowered, when he is allowed a short rest and is then ready for another struggle with his enemies. The animal is quite harmless if not abused. Allied species are found in Asia. The East Indian badger (*Arctonyx collaris*) is a more formidable animal. The fur of the American badger (*Taxidea americana*) is fine and soft, and is used for muffs and rugs. The species is more carnivorous than the European badger, and is remarkable for its short ears, long hair, and the rapidity with which it burrows in the earth. Revised by D. S. JORDAN.

Badger, GEORGE EDMUND, LL. D.: statesman; b. in Newbern, N. C., on Apr. 13, 1795. He graduated at Yale in 1813, practiced law at Raleigh with distinction, and in Mar., 1841, was appointed Secretary of the Navy by President Harrison. He resigned in September of that year, because Tyler vetoed the bill to recharter the U. S. Bank. He was a Senator of the U. S. for about seven years (1846-53). He opposed secession. D. at Raleigh, N. C., May 11, 1866.

Badger, OSCAR C.: commodore U. S. N.; b. in Windham, Conn., Aug. 12, 1823; entered the navy as a midshipman on Sept. 19, 1841. In 1861-62 he commanded the steamer *Anacostia* of the Potomac flotilla, was engaged at various times with the batteries on the Potomac river, and the "precision" of the fire of his vessel is more than once referred to by the commanding officer of the flotilla, Lieut.-commanding Wyman, in his reports to the Navy Department. Badger was in command of the ironclads *Patapsco* and *Montauk* in their many engagements with the forts and batteries of Charleston harbor in the summer of 1863; as

fleet-captain was with Rear-Admiral Dahlgren on board the ironclad *Weehawken* in a night attack upon Fort Sumter, Sept. 1, 1863, when he received a severe wound in the right leg. His services, character, etc., are thus mentioned by Rear-Admiral Dahlgren, in his report to the Secretary of the Navy of Sept. 2, 1863: "I shall feel greatly the loss of Commander Badger's services at this time. He has been with me for more than eight years, and his sterling qualities have rendered him one of the very best ordnance officers in the navy." In 1872 he was made captain and in 1881 commodore. Retired 1885. D. in Concord, Mass., June 20, 1899.

Badham, CHARLES: Greek scholar; b. in Glasgow, Scotland, 1813; was in his early years a pupil of Pestalozzi in Yverdon. He was graduated at Oxford in 1837. After traveling in Germany, France, and Italy for seven years, he took holy orders in 1847. In 1867 he went to Sydney (New South Wales) as Professor of Classical Philology and Logic, where he remained till his death, Feb. 27, 1884. His work was chiefly confined to editions of Plato, notably the *Philebus*, *Laws*, *Euthydemus*, *Laches* and *Symposium*. In his critical methods Badham was strongly influenced by Porson and Cobet, for whom he professed an almost idolatrous admiration. ALFRED GUDEMAN.

Badia y Lablich, baä-dee'a-ee-laab'leek, DOMINGO: traveler; b. in Barcelona, 1766; disguised as a Mussulman, and aided by a perfect knowledge of Arabic, he crossed to Africa, 1801, and after two years' residence in Morocco made a tour to Mecca, traveling through Barbary, Greece, Syria, and Egypt; first Christian to visit Mecca since the institution of Islam; returning to Spain, was appointed prefect of Cordova 1812; published *Voyage d'Ali-Bei en Afrique et en Asie* (Paris, 1814). D. in Syria on his way to Damascus, Aug. 30, 1818. C. H. T.

Badlam, STEPHEN: b. in Milton, Mass., Mar. 25, 1748; entered the army in 1775; commanded the artillery in department of Canada; became a Revolutionary officer, and was made brigadier-general of militia in 1779. D. at Dorchester, Mass., Aug. 24, 1815.

Bad-Lands (originally called *Mauvaises terres pour traverser* by the French explorers, from the extreme irregularity of the surface): Bad-lands are common in the arid Western regions of the U. S., where the absence of vegetation enables the scanty rains to wash away the fine unconsolidated sediments, often old lake-beds, and carve them into innumerable hills and ravines of ever-varying yet systematic form. They are generally best developed near the line of some relatively large stream, whose valley has been deepened on account of a general uplift of the land in recent geological time, thus enabling the small wet-weather branches to dissect the weak strata for several miles on either side in an effective manner. Many remarkable fossils of extinct mammals have been preserved in the sediments of extinct Western lakes; the discovery of the fossils is greatly aided in the bad-lands from the thorough dissection of the mass by ravines and by the barrenness of the surface. W. M. DAVIS.

Bad-Lands: as a specific geographical name, refers to an extensive region lying partly in South Dakota and partly in Nebraska, between the North Fork of the Platte and the South Fork of the Cheyenne rivers. It affords the refuge of a natural fortress to the great family of Sioux Indians in their wars with the U. S., but is more famous for the paleontological work done there by O. C. Marsh, D. D. Owen, E. D. Cope, and other geologists.

Badminton: seat of the Duke of Beaufort in the south of Gloucestershire, England, from which have been named a kind of claret-cup and a game somewhat resembling lawn-tennis, played with a shuttlecock instead of a ball.

Baedeker, bay'de-ker, KARL: German publisher; b. in Essen, Nov. 3, 1801; began publishing in 1827 at Coblenz, where he died Oct. 4, 1859. As the originator of a celebrated series of guide-books, his name is favorably known to all travelers. The first guide-book published by Karl Baedeker was a small book on the Rhine, 1839; the series now comprises admirable guides to every country much visited by travelers, and is published in all the principal languages. The business was removed to Leipzig in 1872. C. H. T.

Baehrens, bay'rens, PAUL HEINRICH EMIL, Ph. D.: classical scholar; b. at Bayenthal, near Cologne, Sept. 24, 1848; took his degree (Ph. D.) at Bonn in 1870; became Professor of Latin in Groningen 1877; d. there Sept. 26, 1888. He

was a man of wide erndition, astounding diligence, and great literary productivity. The permanent character of much of his work is, however, partially invalidated by the extreme recklessness of his critical method, and by the passionate invective against opponents which too often defaces his writings. His most valuable contributions to Latin philology, for he was but an indifferent Greek scholar, are *Poete Latini minores* (5 vols.); *Catullus*, with commentary (2 vols.); *Fragmenta poetarum Romanorum*. ALFRED GUEDEMAN.

Baena, baā-ay'nāā: a town of Spain; province of Cordova; sitnated on the Marbella; 32 miles S. E. of Cordova (see map of Spain, ref. 18-E). It occupies the site of an ancient Roman town. Grain and oil are exported from this place. Pop. (1887) 12,036.

Baer, baa'er, KARL ERNST, von: a Russian naturalist of German extraction: b. in Piep, Esthonia, Feb. 17 (28), 1792. He became in 1819 Professor of Zoölogy at Königsberg. He wrote, besides other works in German, a *History of the Development of Animals* (2 vols., 1828-37). In 1834 he removed to St. Petersburg, and was appointed librarian of the Academy of Sciences. He made several discoveries in physiology and zoölogy. D. in Dorpat, Nov. 28, 1876.

Baeyer, bi-er, ADOLPH, von: chemist; b. in Berlin, Oct. 31, 1835. He was Professor of Chemistry in the Gewerbe Akademie at Berlin (1866), but afterward became professor in the University of Strassburg (1872), and, after Liebig's death, was called to Munich (1875). He has carried on many important investigations, particularly in the field of organic chemistry. Among the subjects to the development of which his work has largely contributed are indigo, the phthaleins, benzene. He discovered a method for the artificial preparation of indigo.

Baeza, baā-ay'tha (anc. *Beatia*): an old town of Spain; province of Jaen: 22 miles N. E. of the city of Jaen. It contains a cathedral and several monasteries in the Gothic style, which, with other buildings, present an imposing appearance. The university, established in 1533, has ceased to exist in recent times. Under the Moors the city was the capital of the kingdom of Bajasat, and is said to have had 150,000 inhabitants. Cloth, leather, and soap are made here. Pop. (1887) 13,911.

Baffa, baaff'a (anc. *Pa'phos*): a seaport-town on the southwest coast of the island of Cyprus. It was once an important place, but is now ruined or decayed and nearly deserted. In ancient times Paphos was a beautiful city, having several temples, and was a famous place for the worship of Venus. Lat. 34° 47' N., lon. 32° 26' E.

Baffin, WILLIAM: English navigator; b. probably in London in 1584; accompanied James Hall in an Arctic expedition in 1612, and on a subsequent expedition discovered Baffin's Bay in 1616. He wrote two narratives of these voyages, and gave in the first a new method of ascertaining the longitude at sea by observation of the heavenly bodies. He was killed at the siege of Ormuz, May 23, 1622. See Clements R. Markham, *Voyages of William Baffin, 1612-22* (London, 1881, for the Hakluyt Society).

Baffin's Bay: a large gulf or inland sea of North America; communicates with the North Atlantic by Davis's Strait, and with the Arctic Ocean by Smith's Sound. It is about 950 miles long, and has an average width of about 300 miles. The greatest depth is about 1,050 fathoms. The shores are generally high and rocky, backed by ranges of snow-covered mountains. It was first explored by William Baffin in 1616. Whales abound here.

Bagatelle [Fr., from Ital. *bagatella*, trifle]: a game somewhat resembling billiards. A bagatelle-table is usually about 7 feet long and 21 inches wide, and is lined with cloth. The other apparatus of the game consists of small ivory balls and a mace or cue.

Bag'dad: a pashalic forming the S. E. portion of Asiatic Turkey, bordering on Arabia and Persia. It extends from the Persian Gulf northwestward about 600 miles, and is intersected by the Euphrates and the Tigris. It includes the ancient Chaldaea, Susiana, and Mesopotamia. The part which lies between the Euphrates and Arabia is a barren, sandy plain. The soil of some other parts is fertile. The population is a mixture of Turks, Arabs, Kurds, Armenians, etc. Area, 54,503 sq. miles. Pop. (1885) 850,000.

Bagdad: a celebrated city of Asiatic Turkey; formerly the capital of the empire of the caliphs, and now the capital of the pashalic of Bagdad; situated on both banks of the

Tigris; about 60 miles N. of Babylon; lat. 33° 20' N., lon. 44° 22' 38" E. The river is here about 700 feet wide, and is crossed by a bridge of boats. The appearance of the city at a distance is rendered picturesque by groves of palm-trees and numerous minarets, but the streets are narrow, crooked, and dirty. The dwelling-houses, having no windows on the side next to the street, present an unpleasing exterior, but the interiors are often richly decorated. Bagdad contains about 100 mosques, some of which have beautiful domes and lofty minarets. Here are large bazaars filled with the products of European and Turkish markets. It was formerly a very magnificent city, and was for many ages the great emporium of commerce of the surrounding countries, but its trade has declined. It has manufactures of silk and cotton stuffs and red and yellow leather. In 1831 an inundation destroyed a large part of the city. Bagdad was founded by the Caliph Almansur about 763 A. D., and built out of the ruins of Ctesiphon. In the ninth century it was enlarged by Haroun-al-Raschid, who built here a fine palace. In the tenth and eleventh centuries it is said to have had 2,000,000 inhabitants. It was sacked by Hulaku about 1258, and after several changes of masters was conquered by the Turks in 1638. Pop. (1885) 180,000.

Bagdad, or Boea del Rio, bō'kaā-del-ree'ō: a town on the Rio Grande, near its mouth, in the Mexican state of Tamaulipas; was during the civil war in the U. S. a place of great importance to blockade-runners, who carried on from this point a heavy trade with Western Texas (see map of Mexico, ref. 4-I).

Bagehot, bāj'ot, WALTER: an English publicist, whose writings went far to restrict the scope of deductive and enlarge that of historical economics. He was born in Langport, Somersetshire, Feb. 3, 1826; educated at Bristol and University College, Oxford, where he was graduated in 1848. Four years later he was called to the bar, but he entered then his father's banking-house, and made that his lifelong business. A witness in Paris of the *coup d'état* of Dec., 1851, he wrote a series of letters to a London paper defending the conduct of Louis Napoleon as advantageous to France. In 1858 he married a daughter of James Wilson, founder of *The London Economist*, and soon became editor of that periodical, continuing this duty until he died. His books are *The English Constitution* (London, 1867), a comparative treatment of its tendencies and utilities; *Physies and Politics* (London, 1872); *Lombard Street* (London, 1873; 8th ed. 1878), a treatise on money and its functions of great vogue; and *The Depreciation of Silver* (1877). Posthumously, under the editorship of R. H. Hutton, appeared *Literary Studies* (1879); *Economic Studies* (1880); and *Biographical Studies* (1881), a book of critical literary ability. A complete edition of his works was published about 1888 by an insurance company of Hartford, Conn. D. in Langport, Mar. 24, 1877. Bagehot in early life was a disciple of Ricardo, but an independent investigator, who gave a kindly reception to the historic school when it arose. He did much to clear the field for it. To him the "abstract economic man" of the English school was a good working hypothesis for highly organized industrial conditions, where competition effects prompt transfers of capital and labor from one employment to another. Such conditions he considered to be substantially realized for Great Britain. But the theory was limited, and did not apply to other countries and times; it was insular, and convenient for use in Lombard Street or in the great markets of the world. Outside of the abstractions of the orthodox school lay the concrete world, where quite other methods were requisite, which give rise to a general science of sociology. His influence was marked in showing the restrictions which rest upon the *a priori* method, and the necessity of the historical investigation of wealth as an instrument for the moral and material development of human societies. For this sort of research he displayed great ability, though he wrought in it only in a fragmentary way. His treatment of the "middleman," or the function of superintendence, was the amplest and clearest then extant, and throws light on practical industrial co-operation.

Baggesen, baag'ge-sen, JENS: Danish poet; b. at Korsör, in the island of Seeland, Feb. 15, 1764. He was highly gifted, but of a weak character; with a fine fancy, but of a restless spirit; excitable, but without passion; fantastic, but without imagination. Born between two periods, he could neither stay with the old nor march with the new. He was enthusiastically received by the educated, but he never

reached the great public. Born a Dane, and married first to a German, then to a French lady, he fluttered from one country and language and literature to another—made a noise in all, and became great in none. Of his Danish writings, his *Komiske Fortællinger*, in verse (1785), and his *Labyrinthen*, in prose (1792-93, 2 vols.), are entertaining. Of his German writings, his *Haideblumen* are not without merit. His letters, of which he wrote thousands in different languages, are very interesting. D. in Hamburg, Oct. 3, 1826.

Baginsky, baā-khin'skĕe, ADOLF: German specialist in children's diseases; b. at Ratibor, May 22, 1843; M. D., University of Berlin, 1866; became Lecturer on Diseases of Children, University of Berlin, 1882; author of *Handbuch der Schulhygiene* (Stuttgart, 1883); *Lehrbuch der Kinderkrankheiten* (Berlin, 1884; 3d ed. 1889); *Praktische Beiträge für Kinderheilkunde* (Tübingen, 1884); editor of *Archiv für Kinderheilkunde* (Stuttgart).

Bagirmi, baā-geer'mĕe, or **Baghirmi**: a sultanate of Central Africa; southeast of Lake Chad; on the lower Shari river, between Bornu and Wadai. Area, 56,600 sq. miles. The greatest length is about 250 miles. Capital, Massenya. The surface is for the most part nearly level; the soil is the most fertile and the best watered of the Sudan. It was founded by a heathen chief about 300 years ago, but Mohammedanism soon became the ruling religion. It is tributary to both Bornu and Wadai. The natives are physically well-formed and warlike. Bagirmi was visited by Dr. Barth in 1852. Pop. about 1,500,000. See Barth's *Travels in Central Africa*.

Baglivi, baā-glee'vĕe, GIORGIO, F. R. S.: an Italian medical writer; b. at Ragusa, Sept., 1669. He became in 1692 the pupil of Malpighi at Rome, and subsequently Professor of Anatomy at the College Della Sapienza in that city. He gained distinction as the author of the system of *Solidism*—i. e. the theory that diseases originate in the solids. He published *Opera Omnia Medico-practica* (1704). D. in Rome, Mar., 1707.

Bagnacavallo, BARTOLOMEO RAMENGI: See RAMENGI.

Bagnères de Bigorre, baān'yār'de bĕe'gōr' (anc. *Vicus Aquen'sis*): a town and fashionable watering-place in the S. of France; department of Hautes-Pyrénées; on the river Adour; 14 miles by rail S. S. E. of Tarbes (see map of France, ref. 9-D). It is situated in the romantic valley of Campan, and is among the most frequented watering-places in France. It has a college, a public library, a theater, a museum, and good hotels. The springs, of which there are thirty-two, and whose temperature ranges from 72° to 124° F., are visited by about 25,000 persons annually. Barèges and woolen stuffs are made here. Pop. (1891) 8,638.

Bagnères de Luchon, baān'yār'de lū'shōn' (anc. *A'qua Convena'rum*): a town of France; department of Upper Garonne, and in the Pyrenees; 42 miles by rail from Bagnères de Bigorre (see map of France, ref. 9-E). It has sulphurous thermal springs, and is a place of summer resort. Pop. (1891) 3,528. About 10,000 patients visit the town annually.

Bagnes: a French word signifying "galleys"; is now the name of the convict prisons of France in which criminals were confined and employed at hard labor, since the galleys were abolished in 1748. Large numbers of convicts were thus confined at Brest and Toulon, and were employed in mechanical and other work. Various trades or mechanical arts were taught to the convicts. In the reign of Napoleon III. the bagnés were gradually abolished, and the penal colonies substituted in their place.

Bagnes-le-Chable: a parish and village of Switzerland; in Valais, on the Dranse; 12 miles E. S. E. of Martigny. Pop. of the parish, which is coextensive with the Val-de-Bagnes, 4,256. This valley was inundated in 1818 by a *débâcle* which carried away 400 cottages.

Bago'as: a Persian eunuch and soldier in the service of Artaxerxes Ochus. In 338 B. C. he poisoned that king and several of his sons. He raised to the throne of Persia Darius Codomannus, who put Bagoas to death about 336 B. C.

Bag'ot, Sir CHARLES: an English diplomatist; b. in Blithfield, Staffordshire, Sept. 23, 1781. He was minister plenipotentiary at Washington 1816-19; ambassador to St. Petersburg 1820-24; to Holland 1824-34; to Austria 1834-42. He in 1842 became Governor-General of Canada, where he died May 18, 1843.

Bagot, LEWIS: b. in London, Jan. 1, 1740; was educated at Westminster School and Christ Church, Oxford, England. In 1777 he became dean of Christ Church, and was made Bishop of Bristol in 1782. He was transferred to Norwich in 1783, and to St. Asaph in 1790. D. in London, June 4, 1802.

Bagpipe: a wind instrument supposed to be of great antiquity. It consists of a leathern bag which the player inflates by blowing with his mouth through a tube, or, in some cases, by a bellows worked by the elbow. The music proceeds from three or four pipes, whose mouthpieces are inserted into the bag, the wind being forced out by pressing the bag under the arm. One of the pipes, called the "chanter," is pierced with eight holes, while the others, or "drones," sound each only one continuous low note. Though generally fallen into disuse, the bagpipe is still a popular instrument in the Highlands of Scotland and the west of Ireland, and the Highland regiments are always accompanied by their pipers, dressed in proper costume. The bagpipe is still used in Southern Italy, as formerly in Spain.

Bagradites: the name of a royal family of Georgia and Armenia; of Jewish extraction. In Armenia from a very early period it had the privilege of crowning the Armenian monarchs. In 748 it came to regal authority, and maintained it till 1079. In Georgia the Bagradites ruled the country from 574 till 994 in direct line, and in collateral branches till 1424.

Bagra'tion, PETER IVANOVITCH: a Russian general; b. in 1765; was descended from the noble Georgian family of Bagradites. He served with distinction under Suwarow in Italy in 1799. In Nov., 1805, he kept in check for six hours a superior force of French under Murat. He led the vanguard at Austerlitz, Dec., 1805, and rendered important services at Eylau and Friedland (1807). He was mortally wounded at Borodino, Sept. 7, and d. Oct. 7, 1812.

Bagshot Beds [named from Bagshot Heath, Surrey]: a British geologic formation of Eocene age. The Eocene rocks of England occupy two synclinal basins in the southeastern part of the island. The Bagshot beds constitute the upper part of the series in the London basin, where they rest on the London clay. They range in thickness from 200 to 700 feet, and consist chiefly of sand. In the lower part are clays and marls containing marine shells and the remains of sharks and turtles. They are ordinarily classified in three subdivisions, of which upper is referred to the newer Eocene, and the middle and lower to the Middle Eocene. The sandy beds are in the main unconsolidated or feebly coherent, but at a few horizons are cemented into firm sandstones. In districts where much of the formation has been eroded away, scattered blocks of the sandstone remain, and the distribution of these "Druid stones" is popularly ascribed to prehistoric races. See STONEHENGE.

Bahama, ba-haa'ma, **Grand**: the most western island of the Bahama group, 57 miles E. of Florida. It is 74 miles long and 9 miles wide. Area, 428 sq. miles. The soil is moderately fertile. Pop. 1,020.

Bahama Islands, or **Lucayos**, loō-kī'ōs: a group of islands in the Atlantic Ocean; lying N. E. of Cuba, from which they are separated by the old Bahama Channel. They belong to Great Britain. They consist of 26 islands, 647 keys, and 2,387 reefs and cliffs, together 3,060 islands and islets, 25 of which are inhabited. They extend like a chain from lat. 21° to 27° 31' N., in a northwestern direction for a distance of about 700 miles. They are generally long and narrow, and have little elevation above the sea. The climate in winter is very mild and salubrious. The soil is thin, but produces maize, cotton, oranges, pineapples, etc. The area is 5,450 sq. miles. Capital, Nassau, in New Providence. In 1890 the receipts amounted to £54,826, and the expenses to £48,688. The value of the imports was £222,512, and of the exports £168,121. The names of the larger islands are Grand Bahama, Abaco, Eleuthera, New Providence, Andros, San Salvador (or Cat island), Exuma, Long island, Crooked island, Inagua, and Caicos. These are mostly covered with forests of the madeira tree, the mastie, *lignum vitæ*, etc. San Salvador (or perhaps Watling's island) was the first land discovered by Columbus in 1492. The Bahamas were then inhabited by a gentle race of aborigines, who were soon exterminated by the Spaniards. The English obtained possession of them in 1629. The chief island politically is New Providence (area, 85 sq. miles), on which is the capital, Nassau (pop. 12,000), a handsome city, and a winter health-re-

sort for Americans and West Indians. Among the exports are canella, arrowroot, sponges, salt, conch-shells, eleuthera bark, fresh and canned pineapples, etc. Pop. (1888) 48,000.

Revised by M. W. HARRINGTON.

Bahia, bãă-ce'ãã (i. e. bay): a state of Brazil; bounded N. by Pernambuco, E. by Sergipe and the Atlantic Ocean, S. by Minas Geraes and Espírito Santo, and W. by Goyaz. Area, 164,649 sq. miles. The large river São Francisco flows along or near the northwestern border of the province, which is traversed by a high mountain-range about 200 miles from the seacoast. The soil of the lowlands is fertile. The chief products are sugar, tobacco, cotton, rice, manioc, and coffee. Diamonds and gold are found in this province. Pop. (1888) 1,821,089.

Bahia, or **São Salvador**, sowni'-saül-vãã-dör': an important maritime city of Brazil; capital of province of same name; situated about 740 miles N. N. E. of Rio Janeiro; lat. 13° S., lon. 38° 32' W. The name is derived from Bahia de Todos-os-Santos (All Saints' Bay), at the entrance to which it is pleasantly situated. The upper part of the city is several hundred feet higher than the lower, and presents a very fine appearance from the sea. The upper town is the most populous, most beautiful, and contains the important public buildings, among which are the governor's palace, the cathedral, the theater, the mint, and many fine churches and convents. It is the seat of the Archbishop of São Salvador. A public library was founded here in 1811. The harbor of Bahia is one of the best in America, and admits vessels of the largest size. It is defended by several forts, and has a lighthouse at the entrance. The chief exports of Bahia are sugar, cotton, coffee, tobacco, rum, dye-stuffs, hides, and horns. Bahia is the oldest city of Brazil, having been founded in 1549, and was until 1763 the capital. It is, next to Rio de Janeiro, the largest commercial city of Brazil. The Bahia Steam Navigation Company, organized in 1861, has a large number of steamers in use here. Pop. estimated (1890) 80,000.

Bahia Honda: a port of north Cuba, W. of Havana; has one of the finest harbors in Cuba. Pop. 1,900.

Bähr, bayr', or **Baehr**, JOHANN CHRISTIAN FELIX: an eminent German philologist; b. in Darmstadt, June 13, 1798, and educated at Heidelberg, where in 1826 he became Professor of Classical Literature. He published a *History of Roman Literature* (Karlsruhe, 2 vols., 1828; 4th ed. 1868-73; with supplement of Christian Latin literature, 3 parts, 1836-40), and edited several of Plutarch's *Lives*. He also published a Latin translation of Herodotus, with valuable notes (1856-61). D. in Heidelberg, Nov. 28, 1872.

Bahraich, bãă-rîch': city and district of Faizabad, Oudh, India. The district is in lat. 27° to 28° N., lon. 81° to 82° E. Area, 2,741 sq. miles; pop. 900,000. It is at the foot of the Himalayas, on the Goggra river. The city is 62 miles N. E. of Lucknow. It is a city of great activity, and has manufactures of fireworks and native cloth. Pop. 19,439.

Bahrđt, baart, KARL FRIEDRICH: German theologian; b. in Bischofswerda, Aug. 25, 1741. A representative of extreme rationalism in religion, he occupied various positions as professor of theology and preacher. Died as an innkeeper near Halle, Apr. 23, 1792. See J. Leyser, *Karl Friedr. Bahrđt* (Neustadt, 1867; 2d ed. 1870). JULIUS GOEBEL.

Bahrein, bãă-rayn', **Islands** (anc. *Ty'los* or *Ty'ros*): a group of British islands in the Persian Gulf; near the Arabian coast; about 200 miles S. of Bushire. The chief island is 27 miles long and 10 wide, and is surrounded by several small islands. Manama, the capital, on the northern extremity, has a good harbor. These islands derive their importance from their pearl-fisheries, the annual product of which is estimated at \$1,000,000. Area, 270 sq. miles. Pop. about 25,000.

Bahr-el-Abiad, baar'-el-ãã-beë-aad' [Arab., white stream]: the old Arabic name of the White Nile, which is the main branch of the Nile after it receives the Bahr-el-Ghazal, and until it unites with the Blue Nile at Khartum. The river is said to be navigable 1,000 miles above Khartum. The upper divisions of the Nile above the confluence of the Bahr-el-Ghazal going south are Bahr-el-Jebel (river of the mountains), or the Kir, a name applied below the outlet of Albert Nyanza; and the Victoria Nile, which unites the Victoria and Albert Lakes. The White Nile also receives the eastern tributary, Sobat, about 90 miles below Bahr-el-Ghazal. See NILE.

Bahr-el-Azrek, baar'-el-ããz-rek' [Arab., blue river]: one of the two great branches of the Nile. It unites with the other branch, the Bahr-el-Abiad ("white river") in lat. 15° 37' N. Its sources are in lat. about 13° N. at the center of Tana Lake, and 37° 30' E. long., but its course, traced through all its windings, will probably exceed 1,000 miles. In this distance it descends with immense impetuosity from an elevation of 9,000 feet to one of 1,500 feet. The Blue river is navigable up to Fazogl, under the twelfth parallel, 1,500 miles from Rosetta. Its upper waters before it breaks through the mountains and reaches its confluence with Yabus river are known as the Abai, a rapid mountainous stream which makes an enormous fish-hook bend from Lake Tana to the Yabus, extending over three degrees of latitude and five of longitude, encircling the southern end of the Abyssinian mountains.

Bahr-el-Ghazal, baar-el-gaã-zaal' (i. e. Gazelle river): a name applied to two distinct African rivers, and sometimes to the area of their basins, both in the Sudan. One in the Eastern Sudan joins the Bahr-el-Jebel to form the Bahr-el-Abiad, or White Nile. Its basin is very extensive, reaching from 5° to 15° N. lat. and 23° to 30° E. lon. It is very rich in river courses, some of which, however, come from the desert and do not bring down much water. The principal river contains much water, but has often no perceptible current, and is much obstructed by vegetable growths. The southern watershed of its valley forms the northeastern boundary of the Congo Free State. The basin includes the northwest of British East Africa, a large part of Dar-Fur, Dar-Fertil, and some unnamed territory. The second is a desert watercourse on the east side of Lake Chad. It lies in the district between Wadai and Borku, east of Kanem and northwest of Dar-Fur, between the parallels 13° and 18° N. and the meridians 16° and 22° E. It is a desert area, inhabited by Arabs, and is very little known. M. W. H.

Bahrens: See BAEHRENS.

Baiæ (mod. *Baja*, baa'yaã): an ancient town of Italy; beautifully situated on the bay of same name, in Campania, 10 miles W. of Naples. It was the favorite watering-place of the ancient Romans, who were attracted by the beauty of its position and adjacent scenery, the amenity of the climate, and the virtues of its warm mineral springs. Julius Cæsar and Pompey had country-houses at Baiæ, and Horace preferred it to all other places. The society of Baiæ was proverbially voluptuous and dissolute. Ruins of ancient temples and villas are visible in this vicinity. These include temples of Mercury, of Venus, and of Diana, all of which are in reality only parts of Roman baths.

Baier, bi'er, JOHANN WILHELM: German Lutheran theologian; b. in Nuremberg, Nov. 11, 1647; d. as court-preacher in Weimar, Oct. 19, 1695. His *Compendium theologicæ positivæ* (Jena, 1686; last ed. Berlin, 1864) was for long years a standard manual.

Baïf, bãă'eef', JEAN ANTOINE, dc: French poet; member of the PLÉIADE (*q. v.*); b. in Venice, Feb., 1532; d. in Paris, 1589. The son of Lazare Antoine de Baïf, prothonotary of Francis I. and ambassador to Venice, the young man had the best education possible in the Greek and Latin classics. He was a fellow-student of Ronsard, and helped the latter much in his Greek studies. In 1551 he published a French version of the Latin distiches written for the tomb of Marguerite de Valois. In 1552 appeared his *Ravissement d'Europe* and his *Amours de Meline*; in 1555 his *Amours de Francine*. After a sojourn in Italy he translated the *Antigone* of Sophocles and the *Eunuchus* of Terence (1565). In 1567 he wrote *Le Brave*, a comedy in the manner of Plautus. In his later years he attempted to introduce ancient meters into French and to simplify French orthography. To this end he devised an academy of music and poetry, which was authorized by Charles IX. and endured twenty years (from Nov., 1570). In 1574 he published his *Étrennes de poésie française*, in which he used the orthographic system of Ramus. In 1576 he brought out two books of *Mimes*. See *Choix des poésies de Baïf*, with introduction, by Becq de Fouquières (Paris, 1874); *Les Mimes, etc., de Baïf*, ed. by Blanchemain (2 vols., Paris, 1880). A. R. MARSH.

Baikal, bi'kaal [Tartar, the rich lake], called also the HOLY SEA: a large lake in the southern part of Siberia, between Irkutsk and Transbaikal; an expansion of the river Angara. It is situated between lat. 51° 28' and 55° 41' N., and lon. 103° and 110° E. It is about 400 miles long, and has an average width of nearly 45 miles. Area, estimated at

13,200 sq. miles. It is in some places 300 fathoms deep, and lies in a depression or crevice, with the Baikal Mountains on the west and the Bargasinsk on the east, which approach the lake so as to divide it into the great and little parts. It receives the Selenga, Barguzin, and other rivers, and discharges its waters by the Angara, an affluent of the Yenisei. In summer steamboats navigate this lake, which is frozen from November to April. Here are valuable seal and sturgeon fisheries. The waters of this lake are said to have a curious ground swell called *zyb*, the nature of which has never been explained. One basis, among many, for the legend of Prester John, the mythical Christian king of the twelfth century in Farther India, has been found in Gur Khan of Kara-Khitai, whose dominions lay from Baikal Lake to the great Chinese wall.

Baikie, WILLIAM BALFOUR: traveler; b. at Kirkwall, Orkney, Aug. 27, 1825; assistant surgeon Royal Navy, 1848; surgeon and naturalist to the Niger expedition (1854), in which, after the death of the captain, he succeeded to the command of the *Pleiad*, which was wrecked on the second expedition in 1857. He founded a settlement, built roads, opened the Niger to navigation, and collected a native vocabulary. D. at Sierra Leone, Dec. 12, 1864. Author of *List of Books and Manuscripts Relating to Orkney; Observations on the Haussa and Fulfulde Languages* (1861); and of works on natural history. C. H. T.

Bail [Old Fr. *bail*, power, eustody; *bailler*, control, deliver]: The original signification of this word is to "deliver." It is used both as a noun and a verb, and refers to property, as well as to a person, in the custody of the law. It implies safe-keeping or delivery for a special purpose. It may signify the delivery of a person arrested, either on civil or criminal process, from the eustody of the sheriff or some other officer of the law, into the safe-keeping of persons who bind themselves for his appearance in court or obedience to its processes. Again, it denotes the persons into whose keeping the party discharged from actual arrest is delivered, and sometimes the amount of security given or required for the defendant's appearance.

In all civil actions the defendant may give bail as a matter of right, and generally in criminal proceedings, unless he is charged with a capital offense. The amount of bail is in the discretion of the court, controlled by the somewhat vague constitutional provision that excessive bail shall not be required.

Bail below, or *bail to the sheriff*, is bail given to the sheriff to secure the appearance of the defendant in the action, or his putting in special bail on a required day. **Bail to the action**, or *bail above*, is given either to satisfy the judgment if one should be recovered, or to deliver up the defendant to custody. In some of the States the defendant when arrested gives bail to render himself at all times amenable to the process of the court, which takes the place of bail below and bail above.

Common bail is the formal entry of fictitious security with the clerk of the court. It is given for the appearance of the defendant and his future obedience in cases where he has not actually been arrested. **Special bail** is responsible bail, given when the defendant has actually been arrested. Bailors must in general possess certain prescribed qualifications. They must be *freeholders* or *householders*; must be within reach of the process of the court, and must not be privileged from arrest; must be competent to make a contract, and of sufficient means to pay the amount for which they become responsible. They can be compelled, on suitable application in the action, to justify; this means, to show by satisfactory evidence that they possess the qualifications required by law.

While the prisoner, when released on bail, is in fact generally allowed to go at large, he is regarded by the law as in custody of his bail. They can take possession of his person at any time or in any place, even though it is necessary to break into his house. By delivering him to the sheriff and complying with legal forms of surrender, they can discharge themselves from liability.

It should be remarked that when a prisoner is held under final process—that is, process to enforce a judgment of the court—he can not be released on bail. However, by statute law he is sometimes allowed in civil cases, on giving security of the nature of bail, to be released from strict confinement in jail, at the same time being partially restrained of his liberty by the action of rules defining territorial limits beyond which he can not lawfully go. T. W. DWIGHT.

Bailey, GAMALIEL, M. D.: b. at Mt. Holly, N. J., Dec. 3, 1807. In conjunction with J. G. Birney he founded in 1836 the *Cincinnati Philanthropist*, an anti-slavery journal. Although his press was destroyed by a mob, he continued the publication till 1847, when he issued the first number of the *National Era* at Washington. The celebrated novel *Uncle Tom's Cabin* first appeared in this journal. Died at sea, on his way to Europe, June 5, 1859.

Bailey, GILBERT STEPHENS, D. D.: b. at Dalton, Pa., Oct. 17, 1822; educated at Oberlin College, O.; pastor of a Baptist church in Cornwall, N. Y., 1845–46; pastor in Illinois 1846–63; superintendent of missions for the Baptist General Association of Illinois 1863–67; and from 1867 to 1875 secretary of the Baptist Theological Union at Chicago. He is the author of several works, mostly denominational. Dr. Bailey originated the system of "ministers' institutes" now prevalent in the Baptist denomination, holding the first at Chicago in 1864.

Bailey, JACOB WHITMAN: soldier and naturalist; b. at Ward (now Auburn), Mass., Apr. 29, 1811; graduated at West Point 1832; served as lieutenant of artillery in Charleston harbor (1832–33) during threatened nullification of South Carolina; at Bellona arsenal, Va., 1834–35; as assistant professor at Military Academy 1834–35, and acting Professor of Chemistry, Mineralogy, and Geology 1835–38, becoming, upon resigning his lieutenantcy, July 8, 1838, full professor, which position he held, to the great benefit of the academy and advantage to cadets, till his death. He was the inventor of *Bailey's Indicator*, and of many improvements in the microscope, in the use of which he achieved the highest distinction, particularly in the examination of infusoria, algæ, and the products of the deep-sea soundings of the coast survey, U. S. exploring expeditions, and the Atlantic telegraph plateau, of which he made valuable collections and numerous delineations, bequeathing them to the Boston Society of Natural History. He was president of the American Association for the Advancement of Science 1857, and member of various societies of savants at home and abroad, and author of over fifty able papers in various scientific journals. His health, always delicate, was completely shattered by exposure in the Hudson river while attempting to rescue his wife and daughter, lost in the burning of the steamer *Henry Clay*. D. at West Point, Feb. 26, 1857.

Bailey, JAMES MONTGOMERY: editor of *The Danbury News*; a well-known humorist; b. in Albany, N. Y., Sept. 25, 1841; commenced journalism on the *Danbury Times* (afterwards *News*) in 1865, which paper soon acquired a celebrity throughout the U. S. from an incessant flow of humor which the pen of its editor imparted to its columns. He published *The Danbury News Man* (1872) and *Life in Danbury* (Boston, 1873). D. in Danbury, Mar. 4, 1894.

Bailey, JOSEPH: soldier; b. in Salem, O., Apr. 28, 1827; served on the Federal side in the civil war, and distinguished himself by his successful attempt in 1864 to save thirteen gunboats, etc., of the Mississippi flotilla. The water of the Red river, La., having fallen so low that Admiral Porter's squadron was unable to pass the rapids, Col. Bailey in the course of eleven days constructed dams which, by raising the water, enabled the boats to descend safely, for which he received the thanks of Congress and was made a brigadier-general. D. near Nevada, Vernon co., Mo., Mar. 21, 1867.

Bailey, LIBERTY HYDE: horticulturist; an associate editor of this cyclopædia and editor of *American Gardening*; b. in South Haven, Mich., Mar. 15, 1858; graduated at the Michigan Agricultural College in 1882; two years assistant to the late Dr. Asa Gray at Harvard University; Professor of Horticulture and Landscape Gardening at the Michigan Agricultural College 1885–88; then Professor of General and Experimental Horticulture at Cornell University; employed in 1886 on the geological and natural history survey of Minnesota; has given particular attention to the genus *Carex*, upon which he has published a number of papers and two preliminary monographs; author of *Annals of Horticulture*, a yearly *résumé* of progress in horticulture, which has now reached four volumes; also *Talks Afield, about Plants and the Science of Plants; Horticulturists' Rule-book; Nursery-book, or Handbook of Plant Propagation and Pollination; Field Notes on Apple Culture; Cross-breeding and Hybridizing; American Grape Training*; also many special reports and monographs.

Bailey, LORING WOART: See the Appendix.

Bailey, NATHAN: an English lexicographer and classical scholar, who kept a school at Stepney, where he died June 27, 1742. In 1721 he published his *Universal Etymological English Dictionary*, the first English dictionary which aimed at completeness, and which was the basis of Dr. Johnson's more celebrated work (1755). He wrote also a *Domestic Dictionary* (1766), and other books on education. He was a Seventh-day Baptist.

Bailey, PHILIP JAMES: poet; b. in Nottingham, England, Apr. 22, 1816. He studied law, and was called to the bar in 1840. In 1839 he published *Festus* (8th ed. 1868), a poem which treats of the highest themes of philosophy and religion. It excited much admiration, and had a wide temporary success, to which its extravagance and defects contributed. He wrote other poems, entitled *The Angel World*, afterward incorporated with *Festus* (1850); *The Mystic* (1855); *The Age*, a satire (1858); and *The Universal Hymn* (1867).

Bailey, THEODORUS: b. in Dutchess co., N. Y., Oct. 12, 1758; member of Congress from New York 1793-97 and 1799-1803; U. S. Senator 1803-04, when he resigned, and was appointed postmaster of New York. D. in New York city, Sept. 6, 1828.

Bailey, THEODORUS: rear-admiral U. S. N.; b. at Chateaugay, N. Y., Apr. 12, 1805; entered the navy as a midshipman, Jan. 1, 1818. He did good service on the west coast of Mexico in the Mexican war, and during a part of 1861-62 commanded the frigate Colorado, western Gulf blockading squadron. On Apr. 24, 1862, he commanded the right column of Farragut's fleet in the passage of Forts St. Philip and Jackson, and at the capture of the Chalmette batteries and the city of New Orleans, where he led the fleet, and was conspicuous for his great gallantry and self-possession. From 1862 to 1865 he was in command of the eastern Gulf blockading squadron. D. in Washington, D. C., Feb. 10, 1877.

Bailey, WILLIAM WHITMAN, B. P.: b. at West Point, Orange co., N. Y., Feb. 22, 1843; was educated at Brown University, Providence, R. I., whence he graduated in 1864; was botanist of the U. S. geological survey of the fortieth parallel in 1867; deputy secretary of State of Rhode Island in 1868; assistant librarian of Providence Athenæum 1869-71; then instructor (1877), but since Professor of Botany at Brown University. He published *Botanical Collector's Handbook* (Boston, 1881), and many contributions to periodical literature in prose and verse.

Baillie: a Scottish law-term having several applications. The most common and popular is to a superior officer or magistrate of a municipal corporation, with judicial authority within the city or burgh. In royal burghs the office is in some respects analogous to that of alderman in England.

Bailiff [O. Fr. *baillif* < Late Lat. *bajuli'vus*, adjec. from Lat. *ba'jul'us*, carrier, manager]: in Great Britain a deputy of a sheriff or of a local magistrate; also a magistrate of certain towns and a keeper of a castle. Bailiff may be defined as the keeper or superintendent of some duty or charge legally imposed on him. As officers of the law, bailiffs arrest culprits, summon juries, and collect fines. There is a class of men employed by the sheriff on account of their adroitness and dexterity who are called bound bailiffs, because the sheriff being responsible for their official misdemeanors, they are annually bound in an obligation with surties for the due performance of their service. The sheriff himself is the queen's bailiff. The term bailiff is seldom used in the U. S.

Baillie, JOANNA: poetess; b. in the manse of Bothwell, Lanarkshire, Scotland, Sept. 11, 1762. In early life she went to reside in London with her brother, Matthew Baillie, the celebrated physician. She published in 1798 the first volume of *Plays on the Passions*, which had great success. Several other volumes of the same appeared in 1802, 1812, etc. Among the most popular of her other works are *De Montfort*, a tragedy, and *Basil*, a drama. She wrote several ballads and songs which were much admired. She was an intimate friend of Sir Walter Scott, and her house was the resort of many other British and foreign literary celebrities. Her *Dramatic and Poetical Works Complete in one Volume* (London, 1851). D. in London, Feb. 23, 1851.

Baillie, MATTHEW, M. D.: a brother of the preceding, was born at Shots, in Lanarkshire, Scotland, Oct. 27, 1761. His mother was a sister of the great anatomists, John and William Hunter. He studied anatomy under his uncle, and

entered Oxford, where he graduated as M. D. In 1783 he succeeded Dr. Hunter as Lecturer on Anatomy in London. He acquired a high reputation as a teacher and expositor of that science. He published in 1795 an excellent work on *The Morbid Anatomy of Some of the Most Important Parts of the Human Body*, which had a remarkable influence on the study of medicine. He practiced medicine in London with great success, and was appointed physician to the king in 1810. D. at Duntisbourne, Gloucestershire, Sept. 23, 1823. See his *Life* by Wardrop prefixed to his *Works* (London, 1825, 2 vols.).

Baillie, ROBERT: an eminent Scottish Presbyterian theologian: b. in Glasgow in 1599. He was distinguished for his learning and moderation. He was one of the commissioners sent to London in 1640 to prepare charges against Laud; became Professor of Divinity at Glasgow in 1642; and was principal of the University of Glasgow after the Restoration. He wrote various works and letters. D. in Glasgow in July, 1662.

Baillie of Jerviswood, ROBERT: a Scottish patriot of excellent abilities and character. He opposed the tyrannical measures of the Duke of Lauderdale, and about 1676 was fined and imprisoned for four months. Having entered into a correspondence with Russell and Sidney, he was arrested and charged with complicity in the Rye House Plot. He was condemned on insufficient evidence, and executed, in Edinburgh, Dec. 24, 1684.

Bailly, JEAN SYLVAIN: French astronomer and statesman; b. in Paris, Sept. 15, 1736. He was admitted into the Academy of Sciences in 1763, and published in 1771 a remarkable *Treatise on the Light of the Satellites of Jupiter*. In 1775 he produced the first volume of his *History of Astronomy, Ancient and Modern* (4 vols., 1775-83), which by its eloquent diction and ingenious ideas obtained great popularity. He became a member of the French Academy in 1784, and of the Academy of Inscriptions in 1785. Fontenelle was the only Frenchman who before that time had had the honor to be a member of the three great academies of Paris. He was the first president of the States-General or National Assembly in 1789, and was elected mayor of Paris in July of that year. His influence was exerted to promote order and moderation. He offended the Jacobins by commanding the national guard to fire on a riotous crowd in July, 1791, and resigned his office soon after that date. During the Reign of Terror he was proscribed by the Jacobins, and after insulting treatment was guillotined, Nov. 12, 1793. Among his works is *Memoirs of the Revolution by an Eye-witness* (3 vols., 1804). See his *Life* by F. Arago (Paris, 1852; Eng. trans. in *Biographies of Distinguished Scientific Men*, Boston, 1859); J. F. Nourrisson (Paris, 1885).

Bailly, JOSEPH A.: a French sculptor; b. in Paris in 1825; emigrated to Philadelphia in 1850. Among his best works are *Adam and Eve*, a group of *Eve and her Two Children*, and a marble monument of *Washington* (1869), placed in front of the State-house in Philadelphia. D. June 15, 1883.

Bailment [O. Fr. *bailement*, deriv. of *bailler*, deliver]: a delivery of goods for some particular purpose, or on mere deposit, upon contract, express or implied, that after the purpose has been performed the identical goods shall be redelivered to the bailor, or otherwise dealt with according to his direction. If the contract permits the return of an equivalent instead of the goods bailed, there is no bailment, but the transaction constitutes a debt or some cognate engagement. Also a delivery of a thing in trust for some special object, and upon contract, express or implied, to conform to the object of the trust.

Bailment includes the borrowing, lending, hiring, or keeping of chattels, and the carrying or working upon them for another. The party making the delivery or *bailing* the property is termed the *bailor*; the party to whom it is delivered, the *bailee*.

Bailments have been classified as follows: 1. *Depositum*, or deposit; a delivery of goods to be kept by the bailee, and returned on demand, without recompense. 2. *Mandatium*, or mandate; where the bailee agrees to do something with or about the thing bailed, without recompense. 3. *Commodatum* (see *LOAN*); where the thing bailed is lent for use, without recompense. 4. *Pignus*, or pledge; where the thing bailed is security for a debt or other engagement. 5. *Locatio*, or hiring; where the use of something is to be

given, or labor performed about it, for a compensation. *Locatio* is subdivided as follows: *Locatio rei* (hiring of a thing) where the bailee by hire gains the temporary use of a thing; *Locatio operis faciendi* (hiring work to be done), where the bailee agrees to perform labor and services, or bestow care and attention upon the thing bailed, for a recompense; *Locatio operis mercium vehendarum* (hiring the work of carrying goods) where goods are delivered to a bailee to be transported to another place, for a recompense.

The question which most frequently arises and presents the greatest difficulty in the law of bailment relates to the responsibility which attaches to a bailee if the property is lost or injured, and the degree of care which he is bound to bestow upon it. With reference to this question, bailments have been divided into three groups: 1. Where the bailment is for the benefit of the bailor alone. This class includes deposits and mandates. Here, as the bailee receives nothing for his services, he is held only to the care which prudent men are supposed to give to their own affairs, and he is responsible only for such loss or injury as results from the absence of such care. The degree of care depends much upon the circumstances of each case; for example, upon the bulk of the article, its fragility, or its exposure to thieves from the dense population of a city as compared with the scanty population of a country district. In each case it is a question of fact whether the proper care was used. 2. Where the bailment is for the benefit of the bailee only. This class includes *commodatum*. Here the greatest care is required of the bailee, and he is responsible for the slightest negligence. It is also a rule that he must keep strictly within the privilege conferred on him with respect to the thing bailed, or he will be liable for any loss or injury to it, even though he is guilty of no negligence. 3. Where the bailment is for the benefit of both bailor and bailee. This is the case in *pignus* and *locatio*. Here the bailee is held to the exercise of the care and attention which prudent men under the circumstances would reasonably be expected to take.

There is a class of bailments of an exceptional nature, embraced under the head of *locatio*, where the policy of the law imposes upon the bailee responsibilities for loss or injury to the property delivered to his charge, entirely irrespective of the question of his care or negligence; this class includes innkeepers and common carriers, the liabilities of whom will be considered in another place. In these cases the bailees are often called insurers. See CARRIERS, HIRING, and INN-KEEPERS.

The relation of bailor and bailee is largely one of trust, and the law requires good faith of each party. As a rule, the bailee will not be allowed to dispute the title of his bailor. He has a right to the possession of the thing bailed during the bailment, and in some instances a special property in it. In other cases he has a bare custody. This would enable him to maintain an action against any one who should unlawfully interfere with the chattel or deprive him of its possession. In such an action he would hold the proceeds beyond what was sufficient to indemnify him for his special interest as a trustee for the bailor.

T. W. DWIGHT.

Bai'ly, EDWARD HODGES: an English sculptor; b. in Bristol, Mar. 10, 1788; was a pupil of Flaxman. He gained the gold and silver medals of the Royal Academy 1809, and became a royal academician in 1821. Among his masterpieces are *Eve at the Fountain*, which is exquisitely graceful; *Apollo Discharging his Arrows*; *The Graces Seated*; *Eve Listening to the Voice*; and a statue of Lord Nelson. D. in Holloway, May 22, 1867.

Baily, FRANCIS, D. C. L.: English astronomer; b. in Newbury, Berkshire, Apr. 28, 1744; became a stock-broker in London 1799. He retired from business in 1825, and thenceforth devoted himself to science. He was one of the founders of the Astronomical Society (1820), and rendered important services to astronomy by the improvement of the *Nautical Almanac* and the production of the *Astronomical Society's Catalogue of Stars*. He wrote several standard works on life annuities, and a *Life of Flamsteed* (1835). D. in London, Aug. 30, 1844.

Bain, ALEXANDER, LL. D.: b. in Aberdeen, Scotland, in 1818; graduated as M. A. at Marischal College in 1840. In 1845 he was appointed Professor of Natural Philosophy in the Andersonian University at Glasgow; in 1857 Examiner in Logic and Moral Philosophy in the London University; in 1860 Professor of Logic in the University of Aber-

deen, of which he was elected lord rector in 1881. He has published *The Senses and the Intellect* (1855), *The Emotions and the Will* (1859), forming together a complete course of mental philosophy; *Study of Character, including an Estimate of Phrenology* (1861); *English Composition and Rhetoric* (1866); *Mental and Moral Science* (1868); *Logic, Deductive and Inductive* (2 vols., 1870); *Mind and Body: Theories of their Relation* (1873); *Education as a Science* (1879); *James Mill and John Stuart Mill* (1882); *Practical Essays* (1884); *Manual of Rhetoric* (part i, 1887; part ii, 1888). He belongs to the Spencerian or experimental school, and his psychology is physiological.

Bain'bridge: town and railroad junction; capital of Decatur co., Ga. (for location of county, see map of Georgia, ref. 7-G); on Flint river, 50 miles from its mouth and at the head of navigation; 236 miles W. S. W. of Savannah; has public and private schools, a cotton manufactory, and is a shipping-point for cotton and tobacco. Pop. (1880) 1,436; (1890) 1,668; (1900) 2,641.

Bainbridge: on Susquehanna river and A. and S. R. R., Chenango co., N. Y. (for location of county, see map of New York, ref. 5-G); 32 miles E. of Binghamton. It has five churches and a beautiful park. It has various industries, including the manufacture of patent food-preparations, children's sleds and wagons, cigars, furniture, lumber, butter, cheese, etc. Pop. (1870) 681; (1880) 781; (1890) 1,049; (1900) 1,092. EDITOR OF "REPUBLICAN."

Bainbridge, WILLIAM: commodore; b. in Princeton, N. J., May 7, 1774. He obtained the rank of captain in 1800, and commanded the frigate Philadelphia in the war against Tripoli. This vessel, having run aground, was captured by the enemy Nov. 1, 1804. He remained a prisoner until peace was concluded, June, 1805, and was afterward raised to the rank of commodore. In Sept., 1812, he obtained command of a squadron consisting of the Constitution, of forty-four guns, the Essex, and the Hornet. In Dec., 1812, he captured the British frigate Java, mounting forty-nine guns. D. in Philadelphia, Pa., July 28, 1833. See his *Life* by Thomas Harris (Phila., 1837).

Baini, bān-ee'nēē, GIUSEPPE: Italian musician; b. in Rome, Oct. 21, 1775; became director of the Papal Orchestra, 1814. D. May 21, 1844. Author of *The Biography of Palestrina*, numerous sacred compositions, and *History of the Papal Orchestra*. He is chiefly famous for his work in the history of music.

Bains, bān (i. e. baths): the name of several watering-places in France. The most important of these is Bains-les-Bains, in the department of Vosges, 14 miles S. W. of Épinal, situated about 1,000 feet above the sea. The place has thirteen springs. Among these "La grosse source" has a temperature of about 120° F.

Bai'ram: a feast of the Mohammedans; begins at the end of the fast of Ramadan. It is inaugurated with great public rejoicings and illuminations. Its observance is commanded by the Koran. "Little Bairam" occurs seventy days later.

Baird, ABSALOM: soldier; b. in Washington, Pa., Aug. 20, 1824; graduated at West Point 1849 in artillery; captain and assistant adjutant-general Aug. 3, 1861; major and inspector-general Nov. 12, 1861; lieutenant-colonel June 13, 1865; brigadier-general U. S. vols. 1862-66. He served at various posts 1849-61; in Florida hostilities 1851-53; as assistant professor at military academy 1856-59; assistant adjutant-general at Washington, D. C., 1861; in Manassas campaign 1861; engaged at Blackburn's Ford and Bull Run; in the adjutant-general's office 1861; in the Virginia Peninsula campaign 1862; engaged at Yorktown and Williamsburg; in command of a brigade in the army of the Ohio, 1862; engaged in the capture of Franklin in Rosecrans' Tennessee campaign 1863; engaged at Tullahoma, Shelbyville, Dug Gap, Chickamauga (brevet lieutenant-colonel), and occupation of Chattanooga; in command of a division in the Fourteenth corps in the operations about Chattanooga (brevet colonel) 1863-64; engaged at Missionary Ridge and skirmished in pursuit of the enemy in the invasion of Georgia 1864; engaged at Resaca, Pine Mountain, Kenesaw, Vining's Station, Peach Tree Creek, Atlanta (brevet brigadier-general), Jonesboro; pursuit of Hood's army; in the "march to the sea" and surrender of Savannah; in the invasion of the Carolinas 1865; engaged at Bentonville, Raleigh, and surrender of Johnston's army at Durham Station. He was breveted major-general U. S. army

Mar. 13, 1865, for gallant and meritorious services in the field, and major-general U. S. vols., Sept. 1, 1864, for distinguished conduct in Atlanta campaign and at Savannah. Became inspector-general of army 1885. Retired Aug. 20, 1888.

Baird, Lieut.-Col. ANDREW WILSON, F. R. S.: b. in Aberdeen, Apr. 28, 1842; educated at Marischal College, Aberdeen University; obtained a commission in the corps of Royal Engineers 1861; entered the service of the Bombay Government 1864; was employed as field engineer in the Abyssinian expedition; employed on the great trigonometrical survey of India 1868; selected to superintend the results of the harmonic analysis of tidal observations in India, where, beginning at the Gulf of Cutch, he established over thirty tidal observatories from Aden to Burma; lieutenant-colonel 1888; mint master of Calcutta 1889; is especially noted for his collaboration with G. H. Darwin in producing *The Harmonic Analysis of Tidal Observations* (1885), presented to the Royal Society of London, for his account of the *Spirit-leveling Operations of the Great Survey of India*, and for his official reports upon these and kindred subjects. He is a fellow of the Royal Geographical Society.

Baird, HENRY MARTYN, Ph. D., D. D., LL. D.: son of the Rev. Robert Baird, D. D.; b. in Philadelphia, Jan. 17, 1832; graduated at the University of the City of New York 1850; attended lectures in the National University (then University of Otho), Athens, Greece, 1851-52; studied theology in the Union Theological Seminary, New York, 1853-55, and Princeton, N. J., 1855-56. He was tutor of Greek in the College of New Jersey 1855-59, and in 1859 became Professor of the Greek Language and Literature in the University of the City of New York. In 1866 he was ordained as an evangelist. He has published *Modern Greece* (1856); *The Life of the Rev. Robert Baird, D. D.* (1866); *History of the Rise of the Huguenots of France* (1879); *The Huguenots and Henry of Navarre* (1886); *The Edict of Nantes and its Recall* (1886); and many articles in the quarterlies.

Baird, ROBERT, D. D.: theologian and writer; b. near Uniontown, Fayette co., Pa., Oct. 6, 1798. He graduated at Jefferson College, Washington, Pa., in 1818, and at Princeton Theological Seminary in 1822. He spent several years (1835 to 1843) in Europe, where he did much to promote Protestant Christianity and the temperance cause. He was corresponding secretary of the American and Foreign Christian Union 1849-55, 1861-63. Among his works are *History of the Waldenses, Albigenses, and Vaudois*; *History of the Temperance Societies* (French orig. Paris, 1836); *Religion in America* (Glasgow and New York, 1844). D. at Yonkers, N. Y., Mar. 15, 1863. See his *Life* by his son, Henry M. Baird (New York, 1866).

Baird, SPENCER FULLERTON, LL. D.: naturalist; b. in Reading, Pa., Feb. 3, 1823; entered Dickinson College in 1836, and graduated in 1840. He got his first love for natural history from his father, who was fond of out-of-door studies of nature, and he was greatly stimulated in this direction by an early acquaintance with Audubon, which he formed as early as 1838. From 1846 to 1850 he was Professor of Natural History in Dickinson College, and just before resigning this position he began his first important literary work—that of translating and editing the *Iconographic Encyclopædia*. In 1850 he was appointed assistant secretary of Smithsonian Institution, which position he held until the death of Prof. Henry, in May, 1878, when he succeeded to the position of secretary, and held it till his death. His most elaborate original memoirs are the catalogue of North American serpents (1853); *Mammals of North America* (1858); the *Review of North American Birds* (1864-66); and a *History of North American Birds* in connection with Mr. Brewer and Mr. Ridgway. From 1870 to 1878 he was scientific editor of the periodicals published by Harper & Brothers. In his writings Prof. Baird covered nearly every branch of natural history. In 1871 he was placed at the head of the newly created U. S. commission of fish and fisheries—an unsalaried office. Mainly through his exertions this commission was raised to its present important position. Not only was he honored by being made an honorary member of nearly every American scientific society, but he was also either a foreign or corresponding member of most of the important scientific societies in England, France, Germany, Austria, and Spain, and was a member of the council of the American National Academy of Sciences. In 1879 he was awarded the gold medal of the Société d'Acclimatation of France, and in 1880 the "erster

Ehrenpreis" of the Internationale Fischerei Ausstellung, at Berlin—the gift of the Emperor of Germany. In 1875 he received from the King of Norway and Sweden the decoration of "knight of the royal Norwegian order of St. Olaf." Other honors and medals were received by him. He was director of the National Museum. D. in Wood's Hole, Mass., Aug. 19, 1887.

Baireuth, or **Bayreuth**, bī'roit: a city of Bavaria; capital of the circle of Upper Franconia; on the Red Main; 126 miles by rail N. of Munich (see map of German Empire, ref. 6-F). It is pleasantly situated and well built, and has gardens and public fountains. The principal buildings are the new palace, the mint, opera-house, town-hall, and the theater built for Wagner, who is buried near here. Here are manufactures of cotton, woolen, porcelain, and leather. Pop. (1890) 24,364.

Bairut: See BEYROUT.

Bai'us (*Bajus*), the Latinized name of MICHAEL DE BAY: a Flemish theologian; b. in Melin, Hainault, in 1513. He became Professor of Divinity at Louvain in 1550, and in 1578 chancellor of that university. He adopted the doctrines of St. Augustine, and wrote works on free will and grace, which were condemned by Pope Pius V. in 1567. Baius retracted or submitted, but his doctrines were propagated in the Netherlands and afterward maintained by the Jansenists. He condemned the Jesuits as Pelagians. His works (Cologne, 1696, 2 vols.) were put in the *Index*. D. in Louvain, Dec. 16, 1589.

Baja: See BALÆ.

Baja, bō'yō: an important market-town of Hungary; in the county of Bács; on the Danube; 90 miles S. of Pesth (see map of Austria-Hungary, ref. 7-H). Here is an important market or annual fair for swine. Large quantities of grain and wine are produced in the vicinity. Pop. about 20,000.

Baja California: the Mexican territory comprising Lower California.

Bajada de Parana: See PARANA.

Bajazet: See BAYAZID.

Ba'ker, ABIJAH RICHARDSON, D. D.: b. in Franklin, Mass., Aug. 30, 1805; graduated at Amherst in 1830; became a teacher in Medway, Dorchester, and Andover, Mass.; ordained pastor of a Congregational church in Medford, Mass.; and was subsequently settled in Lynn, Wellesley, and Boston. D. in Boston, April 30, 1876. He published a *School History of the United States*; *The Catechism Tested by the Bible*; an *Exposition of the Sermon on the Mount*, etc.—His wife, HARRIETTE NEWELL WOODS, a daughter of Rev. Dr. Leonard Woods, was born at Andover in 1815. She has published over 160 volumes, mostly for children, written under the pseudonym of "Madeline Leslie."

Baker, Sir BENJAMIN, F. R. S., Hon. LL. D., Hon. Master of Engineering, V.-P. Inst. C. E.: civil engineer; b. near Bath, England, in 1840. His professional training began with hammer and chisel in one of the oldest workshops in Wales. Thence he was articled to Mr. H. H. Preece, in whose office and shops he obtained experience in foundry, forge, and manufacturing processes, and the designing of machinery. Three years later he obtained some experience in works of masonry. Going to London, he entered the office of Sir John Fowler, and took an active part in the many important engineering works then being carried out, including the Metropolitan Railway (underground) of London. It has fallen to him to repair and strengthen the three historical bridges of Telford, the Menai suspension bridge, the Buildwas cast-iron arched bridge, and the masonry bridge over the Severn, near Gloucester. In 1877 Mr. Baker designed the cylindrical ship in which Cleopatra's Needle was transported. He superintended the loading of the obelisk in Egypt and its re-erection in London. His great work is the Forth bridge, of which Sir John Fowler and himself were the engineers. He is consulting engineer to the Cape of Good Hope Government, the Chinese Government, and one of the consulting engineers of the Bristol Railway Company, of the Chignecto Ship-railway, and the Hudson River Tunnel, representing together a capital of \$750,000,000. Among his writings are *Long Span Iron Bridges*; *The Metropolitan Railway*; *The River Nile*; *Transportation and Re-erection of Cleopatra's Needle*; *The Strength of Beams*; *The Pressure of Earthwork*; *On Timber and Metal Arches*; *Rivets in Girder-flanges*; *Lattice*

versus Box Girders; Pin Connections versus Rivets; Victoria Bridge; Suspension versus Cantilever Bridges; Manufacture and Wear of Rails; Steel for Tires and Axles, etc.

WILLIAM R. HUTTON.

Baker, DANIEL, D. D.: Presbyterian minister; b. in Midway, Liberty co., Ga., Aug. 17, 1791; graduated at Princeton in 1815; was ordained to the Presbyterian ministry in 1818; was pastor at Washington, D. C., Savannah, Ga., Frankfort, Ky., Tuscaloosa, Ala., and Holly Springs, Miss.; was for a time president of Austin College, Huntsville, Tenn.; was a popular and successful preacher; and the author of several practical and polemical religious works. D. in Austin, Tex., Dec. 10, 1857.

Baker, WILLIAM MUMFORD: clergyman and author; son of Daniel Baker; b. in Washington, D. C., June 5, 1825; graduated at Princeton in 1846; is the author of a *Life of his father* (1858), and of several other popular works, such as *Inside, a Chronicle of Secession* (1866); *The New Timothy* (1870); and *His Majesty Myself* (1879). He was a Presbyterian minister in Galveston (1850) and Austin, Tex. (1850-65); at Zanesville, O. (1866-72); Newburyport, Mass. (1872-74); South Boston, Mass. (1874-81); Philadelphia, Pa. (1881); resigned shortly before his death in South Boston, Mass., Aug. 20, 1883.

Baker, Col. EDWARD DICKINSON: a lawyer; b. in London, England, Feb. 24, 1811; emigrated to the U. S. in his youth. He was M. C. from Springfield, Ill., 1844-46, 1849-51; removed to California in 1852, and became a popular orator of the Republican party. In 1860 he was elected U. S. Senator for Oregon. Having obtained command of a brigade of the Union army, he was killed at Ball's Bluff, Va., on the Potomac, Oct. 21, 1861.

Baker, GEORGE AUGUSTUS: portrait-painter; b. in New York in 1821, and died there Apr. 2, 1880. He was a student in the schools of the National Academy of Design, New York, and visited Europe in 1844, where he remained two years. He was elected a National Academician in 1851.

Baker, IRA OSBORN, B. S., C. E.: b. in Linton, Ind., Sept. 23, 1853; graduated at University of Illinois 1874; was Assistant Professor of Civil Engineering in that institution 1874 to 1880, and Professor of Civil Engineering since 1880. Author of *Engineers' Surveying Instruments* (1886); *Treatise on Masonry Construction* (1889); and *Brick Pavements* (1891).

Baker, JAMES HUTCHINS: See the Appendix.

Baker, JOHN GILBERT, F. R. S., F. L. S.: botanist; b. in Guisborough, England, Jan. 13, 1834; educated at the Friends' schools at Ackworth and York. He is keeper of the herbarium and library of the Kew Gardens, and has published a new edition of Hooker's *Synopsis Filicum* (1883); a *Handbook of the Fern Allies* (1887); *Handbook of the Amaryllidæ* (1888); *Handbook of the Bromeliaceæ* (1889); besides many papers on botanical subjects.

Baker, OSMON CLEANDER, D. D.: Methodist; b. in Marlow, N. H., July 30, 1812; studied at Wesleyan University, Connecticut; became teacher in the Newbury Wesleyan Seminary (Vermont) 1834, and its principal 1839-44. He was one of the founders of the Methodist theological schools, and professor in the Biblical Institute at Concord, N. H., 1847-52. In 1852 he was elected bishop. D. at Concord, N. H., Dec. 20, 1871. *Baker on the Discipline of the Methodist Episcopal Church* (New York, 1855) is a standard work.

Baker, Sir RICHARD: author of *The Chronicle of the Kings of England*; b. in Sisinghurst, near Cranbrook, Kent, 1568; educated at Oxford; put into the Fleet Prison, London, for debt in 1635, where he wrote his *Chronicle*. D. a prisoner and in poverty, Feb. 18, 1644-5.

Baker, Sir SAMUEL WHITE: explorer; b. in London, June 8, 1821; organized an extensive agricultural colony at Nerverra Ellia, in Ceylon, 1847, which afterward became a place of considerable importance. In 1861 he went to Africa, with the design of visiting the sources of the Nile. He fell in with Speke and Grant, and afterward explored the western arm of the Nile, and discovered the Albert Nyanza Lake. In 1869 he set out, under the direction of the Khedive of Egypt, with 1,000 picked men, with the design of suppressing the slave-trade and spreading the cultivation of cotton. In 1873 he returned from this expedition, reporting complete success. He has published *The Rifle and Hound in Ceylon* (1854, 1874); *Eight Years' Wanderings in Ceylon* (1855); *The Albert Nyanza* (1866, 2 vols.); *The Nile Tribu-*

aries of Abyssinia (1867); *Ismaila* (1874, 2 vols.); *Cyprus, as I Saw It* (1879); *Wild Beasts and their Ways* (1891). D. Dec. 30, 1893.

Baker, WILLIAM, D. D.: head-master Merchant Taylors' School, London; b. at Reigate, Dec., 1841; educated at St. John's College, Oxford; prebendary of St. Paul's Cathedral, London, 1880; fellow of St. John's, Oxford (1860-70); author of *Historical and Dogmatical Position of the Church of England* (1882); *A Plain Exposition of the XXXIX. Articles* (1883); *Daily Prayers for Younger Boys* (1886).

Baker, WILLIAM BLISS: landscape-painter; b. in New York in 1859; pupil of Albert Bierstadt, M. F. de Haas, and of the National Academy, New York. His landscapes are notable for almost photographic exactness, but are painted with breadth and much truth of observation. One of his best works, *Silence*, is in the collection of Thomas B. Clarke, New York. D. in Ballston, N. Y., in 1889. W. A. C.

Baker, WILLIAM HENRY, M. D.: gynæcologist; b. in Medford, Mass., Mar. 11, 1845; graduated at Harvard Medical School; Professor of Gynæcology in Harvard Medical School; visiting physician of gynæcological department of Boston Dispensary; author of *The Treatment of Cancer of the Uterus*; *Diseases of the Urethra and Bladder*, etc.

Baker, WILLIAM SPOHN: See the Appendix.

Baker City: capital of Baker co., Or. (for location of county, see map of Oregon, ref. 3-I); situated on the east fork of Powder river, in a farming, stock-raising, and gold-mining region. Pop. (1880) 1,258; (1890) 2,604; (1900) 6,663.

Baker's Creek, Battle of: See CHAMPION HILLS.

Baker's Falls: a cascade of the Hudson river, in Kingsbury township, Washington co., N. Y. The stream falls 56 feet in 60 rods, and the scene is one of remarkable beauty. The falls furnish a great water-power. Here are two machine-shops and some paper-mills.

Baker Island, or New Nantucket: a low coral island in the North Pacific. It is in lat. 0° 13' N., lon. 176° 29' E., E. of the Gilbert Archipelago and N. of the Phoenix islands. It is a low coral island (20 feet high), and had a large deposit of guano, which was worked by the American Guano Company. Its surface is very nearly level, and it is devoid of vegetation except for a few patches of grass. The outline is quadrilateral, a mile long E. and W., three-quarters of a mile wide N. and S. Fresh water is not found, but must be obtained by distilling. The guano was worked out in 1872. The island is now uninhabited, though the wooden houses remain. M. W. H.

Baker Lake (Keewatin, Canada): an extension of Chesterfield inlet of Hudson Bay, with which it is connected by two channels; lat. 63° 50' N., lon. 98° W. It is 50 miles long E. and W., by 30 miles broad. It receives the drainage of many lakes, including the Doobaunt on the W. and the Yathkyed on the S. There is said to be a fine waterfall in the river coming in from the west. It is within the sterile Arctic plains, beyond the timber line, which are destitute of agricultural possibilities. M. W. H.

Baker, Mount: volcano in the Cascade Range, N. W. part of the State of Washington; height, 11,100 feet; frequently in eruption; very active in 1880.

Bakersfield: town; capital of Kern co., Cal. (for location of county, see map of California, ref. 10-E); is situated on Kern river, about 60 miles from Visalia. It is the center of a considerable cotton trade. Fruit-growing is a thriving industry. Pop. (1880) 801; (1890) 2,626; (1900) 4,836.

Bake'well: an old market-town of Derbyshire, England; on the river Wye, near its confluence with the Derwent; 25 miles by rail N. W. of Derby. It has an ancient Gothic church, and chalybeate springs with warm baths, which are visited by many persons. Quarries of black marble and mines of coal and lead are worked in the vicinity. Chatsworth House, the splendid mansion of the Duke of Devonshire, is 3 miles from this town, which is surrounded by beautiful scenery. Pop. (1891) 2,748.

Bakewell, ROBERT: an English agriculturist; b. in Dishley, Leicestershire, in 1725. He gained distinction by his improvement of domestic animals, especially sheep and horned cattle. He originated a breed of sheep formerly called by his name, but now known as the Leicester breed. D. in Dishley, Oct. 1, 1795.

Bakhmut, baakh-moot': a Russian town, province of Ekaterinoslav; 127 miles S. E. of Kharkov. In the vicinity

are large coal mines. It manufactures much tallow, and is a market for meat and grain. Pop. (1882) 17,999.

Bakhchisarai, *baakh-shēe-sā-rī'* (Turkish, The Garden Palace): a Tartar town of Russia; government of Taurida (Crimea); 15 miles S. W. of Simferopol. It was formerly the capital of the Tartar khans, whose palace is a remarkable Oriental edifice and in good repair, with spacious galleries, brilliant paintings, and pavilions of light and airy form. Pop. 13,500.

Bakhtegan, *baakh-tā-gaan'*, **Lake**: in Persia; is 50 miles E. of Shiraz. It is 60 miles long, with an average breadth of 8 miles, and receives at its western extremity the river Bundemir (anc. *Araxes*). The lake yields large quantities of salt.

Bakhuysen, *baak-hoi'-zen*, or **Baekhuysen**, LUDOLF: a celebrated Dutch marine-painter; b. at Emden, Dec. 18, 1631. He was a close student of nature, and often ventured out to sea during storms. His paintings are said to express the poetry of the sea. Among his works is a marine view which the magistrates of Amsterdam presented to Louis XIV. of France. D. in 1709. Several of his best works are in the gallery of the Louvre at Paris.

Baking is the mode of cooking food in an oven usually nearly or quite air-tight. The term is also employed in the manufacture of bricks, porcelain, etc. (The baking of bread will be treated under BREAD.) In baking, strictly so called, the oven is so closed that the steam and aroma arising from the substances within are confined; but by opening ventilators a current of air may be produced, and then these ovens may be used for oven-roasting. The offensive taste that often characterizes baked dishes is thus avoided. Baking, although a convenient mode of cooking, is not so good a process for cooking meats as roasting. See COOKERY (*Roasting*).

Baking-powders: mixtures of substances prepared for use in bread-making (see BREAD) in place of yeast. In the fermentation caused by the yeast, carbon dioxide, or carbonic acid gas, is given off, and this makes the bread rise. Baking-powders are made of substances that give off carbon dioxide when they are brought together, and the effect thus produced upon the dough is the same as that produced by the carbon dioxide resulting from the action of the yeast. At the same time other slight changes are caused by the yeast that may be of importance in determining the quality of the bread. Most baking-powders are made of tartaric acid and bicarbonate of soda mixed with starch. When the tartaric acid acts upon the bicarbonate of soda, three products are formed, viz., water, sodium tartrate, and carbon dioxide. Cream of tartar, or acid potassium tartrate, is frequently used instead of tartaric acid. When this acts upon bicarbonate of soda, the products are water, carbon dioxide, and Rochelle salts. Instead of bicarbonate of soda, bicarbonate of ammonia is sometimes used. There is no good objection to the use of the latter substance, though the effort is sometimes made to convince the public that anything related to ammonia is highly objectionable, because ammonia is formed by the decomposition of animal matter. Such reasoning is absolutely worthless. It is only necessary to call attention to the fact that both water and carbon dioxide also are produced by the decomposition of animal matter. As substitutes for the somewhat expensive tartaric acid other substances are often used. Among these alum is perhaps the most prominent. When ordinary alum acts upon bicarbonate of soda the products are sulphate of soda, sulphate of potash, and hydrate of alumina, or aluminium hydroxide. It appears, however, that ammonia alum is used practically to the exclusion of potash alum, and therefore sulphate of ammonia instead of sulphate of potash is formed when the baking-powder is used. Again, most baking-powders contain acid phosphate of calcium ("superphosphate"), and this acting with the other ingredients gives some products in addition to those mentioned. There is no objection to the use of phosphoric acid or of acid phosphate calcium, but objection has frequently been made to the use of alum. Whether or not the use of alum in baking-powders is objectionable on sanitary grounds is difficult to decide positively. From investigations carried out by Prof. J. W. Mallet, of the University of Virginia, among other conclusions the following is drawn: "From the general nature of the results obtained the conclusion may fairly be deduced that not only alum itself, but the residues which its use in baking-powder leaves in bread, can not be viewed as harm-

less, but must be ranked as objectionable, and should be avoided when the object aimed at is the production of wholesome bread."

IRA REMSEN.

Bako'ny-Wald (forest of Bakony): a densely wooded mountain-range of Hungary; extends between the river Raab, the Danube, and Lake Balaton. It is a spur of the Styrian Alps, projecting into the largest plain of Europe, and is 56 miles long and 23 miles wide. The average height is 2,000 feet. Large herds of swine are annually driven hither to feed on mast (acorns). Quarries of good marble are worked in these mountains.

Baku, *baā-koo'*, or **Badku**: a seaport of Asiatic Russia; capital of a province or government of the same name; on the west shore of the Caspian Sea, and on the south side of the peninsula of APSHERON (*q. v.*); 550 miles from Batoum on the Black Sea, with which it is connected by rail viâ Tiflis (see map of Russia, ref. 12-H). In the immediate neighborhood are many naphtha springs, some of which ignite spontaneously, and this circumstance has caused Baku to be regarded as a holy city by the Parsis, who have built several temples here. In 1893 458 oil-wells were operated some part of the year, with a yield of 33,104,126 barrels (of 42 gal.) of crude oil, an increase over 1880 of over 31,000,000 barrels. The oil refineries here give employment to nearly 5,000 persons. In 1806 Baku became a Russian possession. For three hundred years before that it had been, with brief exceptions, under Persian control. The harbor, which is spacious and well sheltered, is strongly fortified. Pop. (1897) 112,253.

Bakunin, *baā-koo'nēen*, MICHAEL: Russian agitator and earliest advocate of Nihilism; b. in Torschok, in the government of Tver, 1814, of a rich family of high rank. He graduated at the Military School of St. Petersburg, and was appointed ensign in the artillery, but resigned and devoted himself to science with great success. In 1841 he left Russia and went to Berlin, where he occupied himself with philosophy, especially Hegelianism; to Dresden, where he studied with Arnold Ruge; and finally (1843) to Paris, where he lived with the Polish emigrants. In Switzerland he became acquainted with the communistic and socialistic societies, and often attended their meetings. In 1847, in a speech at Paris, he advocated a Russian republic and a Russo-Polish fraternity, aiming to revolutionize Russia. On demand of Russia he was expelled from France, Jan., 1848. From this time he took part in all the revolutions of Europe, was put into prison in Saxony, sentenced to death in Austria, delivered up to Russia, and finally exiled to Siberia (1855). In 1860 he escaped to Japan, whence through the U. S. he returned to London. Here he took up again his revolutionary work, and advocated with fervor and boldness the overthrow of the contemporary government in Russia and the foundation of a great Slavonic federal republic. In a speech at Geneva in 1868 he announced himself the bearer of a new gospel. The next year he organized the Social Democratic Alliance, which was speedily absorbed in the International, and in turn he was expelled from the latter organization by the Marx faction in 1872 at The Hague Congress. He attempted to lead a revolt in Lyons (1870), and his views have perceptibly toned the socialism of Mediterranean Europe. His teachings involve a pure materialistic naturalism. Men free from every artificial or historical restraint will act in accordance with natural law, and nothing else is needed. His aim was to destroy the *Lie*; but the beginning of the *Lie* was God, the belief in whom we therefore were to get rid of. Having got rid of it, the next lie to be destroyed was *Right*; for *Right* was but a fiction invented by *Might*, simply in order to insure and strengthen her reign, and *Might* formed the sole groundwork of society, making and unmaking laws. "Therefore our first work," he said, "must be destruction and annihilation—destruction of everything as it now exists, the good with the bad; for if but an atom of this old world remains, the new will never be created." By these means he would secure perfect equality for all persons; the control of the natural sources of subsistence and of industry by the workers, and a solution of the social problem by ultimate solidarity of labor associations of all countries. Views like these form the very platform of the Russian conspiracy known as Nihilism. While Bakunin detested communism, he advocated the abolition of marriage and inheritance, and taught that conscience is a mere matter of education. D. in Bern, July 1, 1876. See his *Dieu et l'État* (God and the State).

Balaam [Heb. *Bileam*, devourer]: son of Beor, the prophet of Pethor, in Aram, by the river Euphrates, who was hired by Balak, King of Moab, to curse Israel, but who instead blessed them, and foretold a great future for them in words of wonderful eloquence. He later advised the Moabites to invite the Israelites to the licentious worship of their god Baal Peor. In punishment of their transgression God sent a plague which slew 24,000 Israelites. When the plague was stayed Israel fought Moab, and in the general overthrow Balaam fell. The narrative is found in Num. xxii-xxv., xxxi.; cf. Josh. xiii. 22; and its historicity is assumed in Deut. xxiii. 4, 5; Josh. xxiv. 9, 10; Neh. xiii. 2; Micah vi. 5. It is alluded to in the New Testament, wherein Balaam is a synonym for avarice, impurity, and impiety (2 Pet. ii. 15, 16; Jude 11; Rev. ii. 14). It is probable that he was a heathen prophet and necromancer of great celebrity, who was hired by Balak like any other diviner. He mistook the real divine possession for the "possession" with which his arts had made him cognizant, and thought not that he was but a tool in the hand of God. The story must have come from some Moabite captive.

The above interpretation is on the theory that the narrative is truthful and a unit. Many biblical critics of standing affirm that it is made up of different and contradictory elements, and contains at most only a modicum of truth. But to those who accept the testimony of the New Testament writers upon historical matters, their confirmation of the narrative will be entirely satisfactory, especially since Peter expressly states his belief in the only portion of the narrative—the speaking ass—which is antecedently improbable.

Josephus and Philo tell the story of Balaam, and the former (*Antiq.* iv. 6) considers him a prophet of the true God, but the latter as a necromancer. In the Talmud he is spoken of as a godless prophet. In the Fathers he is mentioned, of course, for the story is one of the most striking in the Bible. Origen (*Contra Celsum*, i. 59) applies Balaam's prophecy of the star out of Jacob (Num. xxiv. 17) to the star which the Magi saw. Tertullian, Augustine, Ambrose, Jerome judge him variously. He is alluded to in the Koran (Sale's trans., chap. vii., Al'Araf), and the Mohammedans tell various tales about him, as that he was of the Anakim, the giants of Palestine, and that he learned the mystical name Jehovah from the books of Abraham, and by the use of it worked miracles.

SAMUEL MACAULEY JACKSON.

Balænicep'idæ: See SHOE-BILL.

Balaghât, baā-laā-gawt' [Pers.-Hind. *Bālāghāt*, lit., upper plateaus]: a name applied to several sub-Alpine districts in India; but specifically to a district in Nagpur, Central Provinces, between parallels 21° and 23° N., and meridians 80° and 81° E. It is the eastern portion of the central plateau which divides Nagpur E. and W. These highlands remained desolate and neglected until 1866, when the Balaghât district was formed and immigration encouraged. It contains extensive forests, which, however, do not produce timber of value, and much of the area is covered by jungle and is incapable of cultivation. Rice, wheat, and other cereals, oil-seeds, sugar, and tobacco are raised. Iron ore exists and is smelted by the natives. There are no roads, and the towns are small. Although but lately an impenetrable waste, there are some evidences that this district once enjoyed a high civilization. Of such a character is a handsome Bûddhist temple of cut stone belonging to a period of which no historical traces remain. Area, 3,146 sq. miles. Pop. about 350,000. M. W. H.

Balaguer, baā-laā-gār', VICTOR: Spanish poet and historian; b. in Barcelona, Dec. 11, 1824; known principally for his investigations of the early literature and history of Catalonia. In 1854 he was appointed archivist of Barcelona, and soon after Professor of History in the university there. He was also in 1886 made Ministro de Ultramar in Sagasta's cabinet. Among his historical essays and works are *Estudios históricos y políticos* (1876); *Historia de Cataluña* (1878); *Historia política y literaria de los trovadores* (6 vols., 1878-80). As poet he has treated mainly subjects drawn from his native province. His *Tragedias* were published in 1879, and his *Poesías completas* in 1884. A. R. MARSH.

Balakireff, MILY ALEXEJEVITCH: See the Appendix.

Balaklava, baā-laā-klā'va, or **Balaclava**: a small port and town of Russia, in the Crimea, and on the Black Sea, about 7 miles S. from Sevastopol; is separated from the harbor of Sevastopol by a rocky peninsula (see map of Russia, ref. 11-C). It has a good landlocked harbor, supposed to be the

port of the Læstrigonians at which Ulysses landed. The ruins of churches and mosques attest the ancient magnificence of this town. Pop. in 1882, 695. A few days after the battle of Alma, which occurred in Sept., 1854, Balaklava was occupied by the British army, and the harbor became the headquarters of the fleet. The British army suffered here great privations in consequence of the inefficiency of the War Office and the mismanagement of the commissariat. Soldiers perished with hunger and cold, while ample stores of food and clothing were in the holds of ships in the harbor. Here occurred the battle of Balaklava between the British and Russians, Oct. 25, 1854. The charge of the British cavalry in this action was a famous but unsuccessful exploit.

Balance [viâ Fr. from vulg. Lat. **bilancia*; cf. Lat. *bilanx*, adjec. (sc. *libra*); *bi-*, two + *lanx*, pan]: a lever of the first kind, the fulcrum being between the power and the weight; used to ascertain the weight of bodies in standard units. The ordinary balance consists essentially of a metallic bar or lever, called the beam, either delicately suspended or supported on a stand by the intervention of a wedge-shaped prism, technically termed a knife-edge, exactly at its middle point. An index is fixed at right angles to the beam, and made to travel over a graduated arc, so as to show when the beam is horizontal. A scale-pan is suspended from each end of the lever. Since the arms of the balance are equal, it is plain that there can not be equilibrium unless the weights placed in each scale are also equal. When this is the case, the beam is perfectly horizontal and the index vertical. The balance is then said to be true. When the beam is horizontal with unequal weights, the balance is false. Thus it is easy to test the truth of a balance by first placing in the scales weights which apparently are equal, and then transferring each into the other scale. If the weights are not really equal, one of them will appear heavier than the other after the transfer. There are, however, two methods of finding the exact weight of a body by means of a false balance. The body may be weighed with standard weights in each scale successively, and the true weight is the mean proportional between the two apparent weights. Or the body (placed in one scale) may be balanced by a sufficient quantity of any convenient substance—sand, for instance—so that the beam is horizontal, and then replaced by standard weights until the sand is balanced; the weight thus obtained is the true one. A good balance must have its beam in stable equilibrium, for which purpose the center of gravity of the beam and its appendages must fall a little below the knife-edge. The points of suspension of the scale-pans and the fulcrum of the beam should be in the same straight line. Both when the scales are empty and when equal weights are placed in them the beam should be horizontal and the index vertical, the arms, of course, being exactly equal to one another. It is often of importance that the balance should be very sensitive and indicate very slight inequalities in the weights. The sensibility of a balance becomes greater, first, as the length of the arms is increased, which renders the movement about the fulcrum more obvious; and secondly, as the weight of the beam is diminished, for when the beam is displaced by the inequality of the weights, its own weight gives it a tendency to return to its first position. But this displacement is less for a given inequality in the weights as the weight of the beam is increased; so that the less the beam weight, the more sensitive the balance becomes. The sensitiveness of the balance also depends on the distance between the point of suspension and the center of gravity, the sensitiveness increasing as the distance diminishes.

The balance of a watch is a wheel nicely poised on its axis, the pivot-holes in which it turns being frequently formed in rubies or other jewels. The natural effect of an impulse given this wheel would be complete rotation, but this is arrested by the balance-spring, so that it recoils, and a vibratory motion results. The balance-spring is a coil of steel wire so fine and delicate that 4,000 springs weigh only about 1 oz. One of the extremities of the spring is fastened to a point independent of the balance, and the other end is attached near its axis. When the impulse is given to the balance, it moves round just so far as the impulse given is able to overcome the elastic resistance of the spring. When that resistance becomes equal to the impulse, the balance is driven back by the elastic recoil of the spring. In marine chronometers a cylindrical helical spring is used. See the articles TORSION BALANCE and WEIGHING-MACHINES.

Revised by E. L. NICHOLS.

Balance of Power [Fr. *équilibre politique*, i. e. political equilibrium or equilibrium of states]: a phrase used in modern European diplomacy to express a state of political equilibrium among neighboring powers, or a political system so arranged and counterpoised that no nation or monarch may be so powerful as to endanger the independence of other states. Such a balance was aimed at in the political combinations in behalf of Greece; in those of Italy just before the Reformation; in the policy of Europe under the lead of France against Austria and Spain; in the alliances against Louis XIV., against Napoleon I., and more recently against Russia in order to preserve the independence of Turkey. It was the characteristic justification of the foreign policy of William III. of Great Britain, who shaped it into a European principle. Its object is to prevent *political aggrandizement* only. There were in Europe, after the overthrow of Napoleon in 1815, five monarchies recognized as the great powers—namely: France, Austria, Great Britain, Russia, and Prussia, to which, in 1859, the kingdom of Italy was added. The victories of the Prussians in 1866 and 1870 established the German empire, and for a time prostrated the armies of France and Austria. But now the military and political re-establishment of these two powers has given rise to a fresh application of the balance of power principle. This is seen in the Tripartite alliance—a defensive treaty of alliance whereby Germany, Austria, and Italy on the one hand are balanced against France and Russia on the other. See INTERNATIONAL LAW. Revised by THEODORE S. WOOLSEY.

Balance of Trade: the difference in value between the exports and imports of a country. If the country's exports exceed the imports in value, the balance of trade is said to be in its favor, and it is assumed that such a country is growing rich, just as a man grows rich when he produces more than he consumes. In point of fact, a fall in imports does not denote prosperity, or at least not to the extent which is often assumed. In one important sense the true advantage of foreign trade to a country is found in the imports. By its means people obtain those things which they can not themselves produce, except at great sacrifice. The custom-house statistics are fallacious at this point, because they represent the value of the goods in the exporting country, not their value to the importing country. If we import British goods which cost \$100,000,000, and which sell for \$110,000,000, the advantage to us is measured by the latter figure, not by the former. In this sense both nations may gain, and generally do gain, by international trade.

The balance of trade does not consist of the simple difference between exports and imports. Many other elements enter into a nation's accounts. Some of the chief items are as follows:

INCOME.	EXPENSE.
Exports.	Imports.
Payments by foreigners to home ship-owners.	Payments to foreign ship-owners.
Interest from foreign investments.	Interest on securities owned abroad.
Receipts from foreign travelers and immigrants.	The expenses of travelers abroad.

The difference between these two is the balance of trade, properly speaking; but as this balance may be settled either in cash or by securities, another important factor is brought in. It will quite generally be found that the years when our balance of trade appears most favorable are those when Europe is sending our securities home to us in large numbers; and that the apparent favorable result means a loss, rather than a gain, in the productive resources of the country, because of the unwillingness of foreign investors to continue to aid us with their capital. See EXCHANGE.

A. T. HADLEY.

Balanoglossus [Mod. Latin, from Gr. *βάλανος*, acorn + *γλῶσσα*, tongue]: a genus of worm-like forms belonging to the group of *Enteropneusta* (*q. v.*), the position of which is very uncertain. The larva presents many resemblances to those of echinoderms, and the adult has characteristics which elsewhere are found only in vertebrates. The animals live in the sand of the sea, are usually brightly colored, and in size might be compared to an earthworm.

Balanus [Gr. *βάλανος*, acorn]: a genus of barnacles, distinguished by the absence of a flexible stalk and the possession of a symmetrical shell. The name is derived from the Greek word for *acorn*, and the animals are commonly known as the "acorn-barnacles." The base is usually formed

of a thin calcareous plate, the sides of six valves; and four small valves form the operculum, exactly closing the aperture at the top. This genus comprises many species, which are found in nearly all seas, attached to stones, shells, and other objects. It is remarkable that in the early stage of their existence they are capable of active locomotion, and have large eyes which disappear, along with the organs of locomotion, when they become stationary. Some of the large species were esteemed a delicacy by the ancient Romans. The Chinese collect and eat the *Balanus tintinnabulum*, which is said to resemble lobster in taste; and *Balanus psittacus*, a South American species, is also eaten. This species is sometimes 4 inches in diameter and 8 or 9 inches in height. There are several species found in the U. S.

Revised by D. S. JORDAN.

Balasore, *baā-laā-sōr'*: a district and city of the Orissa division, Bengal Province, British India. The district is a strip of alluvial coast-land, near the head of the Bay of Bengal, W. of the Gangetic delta, between the parallels 20° and 21° N. and the meridians 86° and 87° E. It runs to the hills behind the coast and varies from 9 to 34 miles in breadth. The coast strip proper is incapable of cultivation, but is used for the production of salt. Behind this comes the arable land, a characteristic feature of which is the numerous cup-shaped depressions which bear the finest crops. This is destitute of natural forests and passes gradually into the foothills, which are rocky and sterile. The district has several streams of considerable size, but they are subject to destructive floods. Area, 2,066 sq. miles. Pop. about 950,000.

The town of Balasore, capital of the district, is 8 miles from the seacoast, on the river Burabalang (see map of S. India, ref. 2-II). The English settlement here was made in 1642, and soon became a large trading-post, protected by a fortification. It was one of the seats from which the British Indian empire took its rise. The importance of the city rapidly declined in the eighteenth century, because of a bar which formed across the mouth of the river and which still remains. Pop. 20,000.

M. W. H.

Balas-ruby: See SPINEL.

Balatka, HANS: See the Appendix.

Bal'aton, Lake [Ger. *Platten-see*; Hun. *Balatony*; anc. *Pelso*]: the largest lake in Hungary; 55 miles S. W. of Pesth; is 51 miles long and 7 miles wide. The area is estimated at 450 sq. miles. It receives numerous streams, the largest of which is the Szala, and discharges its water through the Sio and Sarvitz into the Danube. This lake is often celebrated in the old romantic ballads of the Magyars.

Balbi, *baal'bēc*, ADRIANO: an eminent Italian geographer; b. at Venice, Apr. 25, 1782. He became a resident of Paris, where he passed many years. He published in 1826 an *Ethnographical Atlas of the Globe*, which is highly esteemed. His other chief work is a *Compendium of Geography* (*Abrégé de Géographie*, 1 vol. 8vo), which was considered one of the best treatises on that science that had then appeared. His works are mostly written in French. He removed from Paris to Italy in 1832. D. at Padua, Mar. 14, 1848.

Balbi, GASPARO: Venetian merchant of the sixteenth century; in pursuit of his business he visited Aleppo; made a trip to India lasting several years, the published account of which (1590) was the first description of India beyond the Ganges.

Balbo, CESARE: Italian statesman and author; b. at Turin, Nov. 21, 1789. He was in government service 1807-21. He advocated the independence of Italy in a work called *Speranze d'Italia* (*Hopes of Italy*, 1843), which widely extended his reputation. As a moderate and liberal patriot he took a prominent part in the revolutionary movements of 1848. Among his works is a *History of Italy from the Beginning to 1814* (1849), which is highly esteemed. D. at Turin, June 3, 1853. See his life by H. Reuchlin (Nördlingen, 1861).

Balbo'a, VASCO NUÑEZ, de: a famous Spanish navigator and explorer; b. at Xeres de los Caballeros in Estremadura in 1475. He emigrated to Hayti about 1500, and in 1510 accompanied Enciso in an expedition to Darien. Having quarreled with Enciso, Balboa obtained the chief command of the party, and Sept. 25, 1513, discovered the Pacific Ocean from the top of a mountain. He descended to the shore and took possession of the ocean in the name of his sovereign. In 1514 Pedrarias Dávila was sent from Spain to supersede Balboa, who was punished by a fine for his insubordination. He served as a deputy under Pedrarias, who,

actuated by cruelty and jealousy, accused Balboa of treasonable designs, and put him to death at Castilla de Oro, Darien, in 1517. See Irving, *Voyages and Discoveries of the Companions of Columbus*; M. J. Quintana, *Vidas de Españoles Cebres*; and Justin Winsor, *Narrative and Critical History of America*.

Balbuena, baal-bway'na, BERNARDO, de: Spanish poet; b. at Val-de-Peñas in 1568. He became Bishop of Porto Rico in 1620. Of his works only three have been preserved: *La grandeza Mejicana* (Mexico, 1609; Madrid, 1829); *El Siglo de Oro* (1608); and *El Bernardo*, an epic poem (1624 and 1808). D. at Porto Rico in 1627.

Balbus, L. CORNELIUS, surnamed MAJOR: a Roman officer; b. at Gades (Cadiz); became an intimate friend of Cæsar, whom he accompanied to Spain in 61 B. C. In 40 B. C. he was chosen consul, being the first adopted citizen who received that honor. He wrote a diary of the events of his own and Cæsar's life.

Baleh, GEORGE B.: rear-admiral U. S. N.; b. in Tennessee, Jan. 3, 1821; entered the navy as a midshipman in 1837. From 1862 to 1865 commanded first the steamer Pocahontas and afterward the steamer Pawnee, South Atlantic blockading squadron, during which period, in co-operation with the army, he was almost constantly engaged with the enemy's batteries and forts on the Stone and Black rivers, S. C. He was superintendent of the Naval Academy at Annapolis (1879-81). Retired Jan. 3, 1883.

Bal'dachin [from Ital. *baldacchi'no*, deriv. of *Baldacco*, Ital. name of *Bagdad*, whence came the rich material of which the baldachins were made]: a canopy in the form of a crown or umbrella, made of costly materials, richly adorned, and raised over a throne, couch, pulpit, or altar. In the Church of St. Peter in Rome there is a magnificent baldachin cast in bronze, by Bernini, and supported by four twisted columns. The baldachin is used in processions of the Roman Catholic Church, one of silk or stuff supported on four poles being carried over the pope.

Bald Eagle: the *Halia'ëtus leucoceph'alus*; so called on account of the snowy-white color of the head and neck of the adult bird; a native of North America, where it is widely



Bald eagle.

distributed. The length of this bird is about 40 inches, the stretch of wing from 7 to 8 feet. The white feathers of the neck and tail are not acquired until the third year. The nest of the bald eagle is generally made upon some lofty tree, and sometimes becomes of great size, as the bird is in the habit of using the same nest year after year and making additions to it every season. The female bird generally lays her eggs in January, two or three in number and of a dull white color, and they are hatched by the middle of February. It is strongly attached to its young and will not forsake them, even if the tree on which they rest be enveloped in flames. The bald eagle will eat almost anything, even car-

rion, but it is especially fond of fish, which it steals from the osprey when practicable, but also takes them from the water with much skill. Young lambs, pigs, also ducks, geese, and gulls, are seized by the eagle with avidity. For an interesting description of the manner in which it takes its prey the reader is referred to the account given by Audubon. E. Coues speaks of it as a "piratical parasite of the osprey, otherwise notorious as the emblem of the republic."

Revised by D. S. JORDAN.

Balder: See BALDR.

Bal'deric, or **Baudry**, bō'dree': a French chronicler, Bishop of Dol; b. about the middle of the eleventh century. He took part in all the Church councils of the time, and made active efforts to restore the rigor of monastic discipline. He visited England and left an account of his travels. He wrote a chronicle of the first crusade, entitled *Historie Hierosolomytanæ*.

Baldi d'Urbino, baal'dēe-dōor-bee'nō, BERNARDINO: mathematician and man of letters; b. at Urbino, June 6, 1553; accomplished as a writer and in science as well; under the tutelage of Commandino developed a remarkable zeal for the study of mathematics. He learned the Hebrew and Chaldean tongues the better to understand the Bible. He is said to have been acquainted with twelve languages. His multitudinous writings deal with almost every branch of science. Chief among his works are *Cronica de' Matematici* (Chronology of Mathematicians); *Nautica*, a didactic poem on navigation; an Arabic grammar and dictionary; and a translation of the *Targum* of Onkelos. He began the preparation of a geographic dictionary, but got no farther than the letter C. D. at Urbino, Oct. 10, 1617.

Baldness: same as ALOPECIA; the loss or absence of the hair of the scalp. There are some few cases on record in which the hair has never been developed. This is termed congenital baldness. Accidental baldness is caused by an atrophy of the hair-follicles. Baldness in the comparatively young may occur from wearing waterproof caps or unventilated hats, which, by preventing evaporation from the head, occasion an unhealthy state of skin. It may be complete or partial, occurring in patches. Senile baldness (*calvities*) arises, like the preceding variety, from an atrophy of those parts on which the hairs depend for nutrition. It generally commences on the crown of the head. Women are not so frequently bald as men. The causes of baldness are defective supply of nutrition, a hereditary tendency, dissipation, but especially old age. The hair falls off after severe illnesses or after other causes of general debility. Alopecia is sometimes the result of syphilis. The treatment consists in cleanliness, and in exciting the circulation of the scalp by using a hairbrush and the application of stimulants, as the Spanish-fly ointment, two drachms to an ounce of lard, mixed with the same quantity of pomatum, or some equivalent preparation. Any constitutional debility should be remedied. Shaving the head is sometimes resorted to and is often useful. FAVUS (*q. v.*) permanently destroys the hair.

Bald'pate, or **American Wid'geon** (*Mareca americana*): a duck found throughout North America, breeding



The baldpate, or American widgeon.

to the southward, and prized for the delicacy of its flesh. It takes its name from its white crown. It is variously marked

with reddish brown, gray, white, and chestnut. The male has a green band running from the eyes to the nape.

Baldr, Balder, or Baldur: often called BALDR THE GOOD; the second son of Odin, in the Northern mythology. He was supposed to make all things bright and cheerful, and is identified by some scholars with the bright summer sun; hence he has been termed the "Apollo of the North." His abode was Breiðablik ("widely shining"), where nothing impure could enter. The account of his death, as given in the *Prose Edda*, is as follows: He dreamed one night that his life was in the utmost danger; and when he related this dream the gods were so distressed that his mother, Frigg, exacted an oath from all things, animate and inanimate, that they would not injure Baldr. She did not, however, exact any oath from the mistletoe, because it seemed so harmless and insignificant. Now the gods were accustomed to amuse themselves by shooting arrows and throwing stones at Baldr, to all of which he proved invulnerable. When Loki, the god of evil, found that the mistletoe had not taken the oath, he obtained the plant and went to the assembly of gods, where he found Baldr's brother Höðr, standing apart from the others. He asked him why he also did not throw something at Baldr. "Because I am blind," answered Höðr, "and have nothing to throw." "Come," said Loki, "do like the rest; show honor to Baldr by casting this trifle at him, and I will direct your hand." Höðr did as the tempter bade him, and Baldr, pierced through by the mistletoe, fell dead. So great was the grief of the gods that Hermóðr visited the realms of death, and besought Hel to release her prey and allow Baldr to return to the dwelling of the gods. Hel answered that if everything mourned him, then he should return; but if anything whatever failed to weep, then Baldr must remain in the world of shades. All things animate and inanimate were requested by the gods to weep for Baldr, and all did so except a giant hag named Þökk, or Þökt (afterward found to be Loki himself, who had assumed this form in order to prevent Baldr from returning to life). She answered the request by jeers, and Baldr was accordingly forced to remain in the abode of the dead. It is possible that this story has been influenced by Christian teaching and Christian legend. In any case there is no certain evidence that a god Baldr was known to any Teutonic tribe outside of Scandinavia.

Revised by G. L. KITTRIDGE.

Baldung, baal'doong, HANS: German painter and engraver; b. in Gmünd about 1475; d. in Strassburg, 1545. His best work is his engraving on copper, although this is marked by exaggeration and fantastic ornament. A number of his paintings remain, but are not of great value.

Baldur: See BALDR.

Baldwin: on railroad, Douglas co., Kan. (for location of county, see map of Kansas, ref. 5-J); 15 miles S. of Lawrence; has Baker University. The surrounding region is agricultural. Pop. (1880) 325; (1890) 935; (1900) 1,017.

Baldwin I.: King of Jerusalem; b. in 1058; was a brother of Godfrey of Bouillon. He joined the first crusade in 1096, and fought bravely against the infidels. He was chosen Count of Edessa by the Christian inhabitants of that city. On the death of Godfrey, in 1100, he succeeded him as King of Jerusalem. He defeated the Saracens in several battles, and captured Acre, Cæsarea, and Sidon. He was more ambitious and worldly than his brother Godfrey. D. in Egypt in Mar., 1118. See Gibbon, *Decline and Fall of the Roman Empire*.

Baldwin II. (BALDWIN DU BOURG): King of Jerusalem; was a cousin of Baldwin I., whom he succeeded in 1118. He waged war against the Saracens. During his reign the military order of Templars was instituted for the defense of the Holy Land. D. in Jerusalem, Aug. 21, 1131, and left the throne to his son-in-law, Foulques of Anjou.

Baldwin III.: the son of Foulques of Anjou; was born in 1129, and became King of Jerusalem in 1143. He defeated Noor-ed-Deen, the Sultan of Aleppo, at Jerusalem, in 1152 and 1157. He acquired much renown and influence, and was respected even by the Saracens. His wife was Theodora, a daughter of the Greek Emperor Manuel. D. at Tripolis, Syria, Feb. 10, 1162, and was succeeded by his brother, Amalric or Amaury.

Baldwin IV.: King of Jerusalem; surnamed THE LEPER; was born in 1160. He succeeded his father Amalric in 1174. He defeated the famous Saladin near Tiberias in 1182, but

was afterward defeated by that prince. D. in Jerusalem, 1186, and was succeeded by his nephew, Baldwin V., who died in childhood.

Baldwin I.: the first Latin Emperor of Constantinople; was born at Valenciennes in 1171. He was Baldwin IX., Count of Flanders, having inherited that title from his father, Baldwin VIII. He joined the fourth crusade in 1200, and co-operated with the Venetians in an enterprise against Constantinople, the throne of which was occupied by Alexis, an usurper. The crusaders defeated Alexis, captured the city, and elected Baldwin emperor in 1204. He was defeated and taken prisoner by the Bulgarians in 1205, and died in captivity, 1206, leaving the throne to his brother Henry. See A. Cahour, *Baudouin de Constantinople* (1850).

Baldwin II.: Emperor of Constantinople; b. in 1217; was a son of Peter de Courtenay, and a nephew of Baldwin I. He succeeded to the throne in 1228, and was placed under the guardianship of John de Brienne. He began to reign in 1237, and encountered much opposition from the Greeks and Bulgarians. In 1261 his capital was taken by Michael Palæologus, and Baldwin fled to Italy, where he died 1273. The English family of Courtenay claims to be descended from the stock of this emperor.

Baldwin, CHARLES H.: rear-admiral U. S. N.; b. in the city of New York Sept. 3, 1822; entered the navy as a midshipman Apr. 24, 1839. He served on west coast of Mexico during Mexican war, and was in several sharp engagements with the enemy on shore near Mazatlan. He commanded steamer Clifton of mortar flotilla at passage of Forts St. Philip and Jackson by Farragut's fleet, Apr. 24, 1862, and at attack on Vicksburg, June 28, 1862. In command of Mediterranean squadron from Mar. 10, 1883, to date of his retirement, Sept. 3, 1884. D. in New York city, Nov. 17, 1888. Revised by S. B. LUCE.

Baldwin, HENRY PORTER: b. at Coventry, R. I., Feb. 22, 1814; emigrated to Detroit in his youth; was Governor of Michigan (1869-73), and U. S. Senator (1879) for unexpired term of Senator Chandler, ending Mar. 4, 1881. He was for years a leading member and office-bearer of the diocese of Michigan, and repeatedly represented the diocese in the general convention, the Board of Missions, and other organized bodies of the Protestant Episcopal Church. D. at Detroit, Mich., Dec. 31, 1892.

Baldwin, JAMES MARK, Ph. D.: psychologist and sociologist; b. in Columbia, S. C., Jan. 12, 1861; educated at Princeton, Leipzig, and Berlin Universities; instructor in French at Princeton 1886-87; Professor of Philosophy in Lake Forest University 1887-89, and in Toronto University 1889-93; Professor of Psychology at Princeton since 1893. He is coeditor of *The Psychological Review*, and author of *Handbook of Psychology* (2 vols., 2d ed. 1889-91); *Elements of Psychology* (1893); *Mental Development in the Child and the Race* (4th ed. 1898); *Social and Ethical Interpretations in Mental Development* (2d ed. 1898), a work awarded the gold medal of the Danish Academy of Sciences. He is a member of the Institut International de Sociologie and other learned societies, president of the American Psychological Association (1898), etc.

Baldwin, JOHN DENISON: b. at North Stonington, Conn., Sept. 28, 1810; and was long the editor and proprietor of the *Worcester Spy* (Mass.); member of Congress 1863-69; published *Raymond Hill and Other Poems* (1847); *Prehistoric Nations* (1869); *Ancient America* (1872). D. July 8, 1883.

Baldwin, JOSEPH G.: of Sumter, Ala.; was a native of Virginia. He was a lawyer and politician; author of *Flush Times in Alabama and Mississippi* and of *Party Leaders* (1840); judge of the Superior Court of California in 1857-63, and chief justice of California in 1863. D. Sept. 30, 1864.

Baldwin, ROBERT: Canadian statesman; b. in Toronto, May 12, 1804. He began the practice of law in 1825; was elected to the Upper Canada Assembly in 1829; and visited London in 1836 in the interest of responsible government for Canada, but failed in his mission. He became an executive councillor in 1836, solicitor-general in 1840, and in 1842 premier and attorney-general of Upper Canada, which offices he held till 1843. In 1848 he resumed office in the Baldwin-Lafontaine government; retired from official life in 1851. He is regarded as the father of the Reform party of Canada. D. in Toronto, Dec. 9, 1858. NEIL MACDONALD.

Baldwin, STEPHEN LIVINGSTON, D. D.: secretary of the Missionary Society of M. E. Church; b. at Somerville, N. J.,

Jan. 11, 1835; educated at Newark Wesleyan Institute and Concord Biblical Institute; has been pastor in Newark and New England conferences, and superintendent of the Foochow (China) Mission. Author of a translation of *Judges* and *Daniel* into Foochow colloquial; article on *Confucianism* in Reid's *Doomed Religions*; editor of *Chinese Recorder*.

Baldwinsville: village forming part of Lysander and Van Buren towns, Onondaga co., N. Y. (for location of county, see map of New York, ref. 4-F); on Delaware, Lackawana and Western R. R., 12 miles N. W. of Syracuse, and on Seneca river, which furnishes excellent water-power; has graded schools and an academy and five churches. Baldwinsville is a manufacturing town, in a rich agricultural district; is center of the tobacco-raising industry of the Onondaga region. First settled in 1807, and named Columbia, then (1815) Baldwin's Bridge, and soon after Baldwinsville. Pop. (1880) 2,121; (1890) 3,040; (1900) 2,992.

EDITOR OF "GAZETTE AND FARMERS' JOURNAL."

Bâle, or Basle, French form of BASEL (*q. v.*).

Bale, bayl, JOHN: English theologian and dramatist; b. at Cove, Suffolk, in Nov., 1495; became a Carmelite; was educated at Jesus College, Oxford; turned Protestant; and, after eight years of exile in Flanders, was made Bishop of Ossory, Ireland, in 1552. During the reign of Queen Mary he took refuge in Switzerland. On the accession of Elizabeth he was appointed a prebend in Canterbury Cathedral, and died in Nov., 1563. Besides numerous controversial writings, he published in Latin the first literary history of England, *Scriptorum Illustrum Majoris Britanniae Catalogus* (1548-59), and wrote a number of interludes and morality plays in the Protestant interest, the most important of which was the historical play of *King John*. See his *Select Works* (Parker Society, Cambridge, 1849).

HENRY A. BEERS.

Balear'ic Crane (*Balearica pavonina*): a beautiful crane found in Northern and Western Africa, conspicuous for its crown of golden plumes and its scarlet cheeks. It is readily tamed, often indulging in fantastic dances, running about



Balearic crane.

with great speed, and screaming with a harsh and ringing voice. It is of a bluish-slate color, and is 4 feet high. It is exceedingly gentle, and, unlike some other cranes, is quite harmless.

Balearic Isles (anc. *Baleares* or *Baleares In'sulæ*): a group of five islands in the Mediterranean, forming a Spanish province, the area of which is 1,860 sq. miles. Pop. (in 1887) 312,646. Capital, Palma. Their names are Majorca, Minorca, Iviça, Formentera, and Cabrera. The soil is mostly fertile, though badly cultivated. The climate is very fine. Vegetation has a tropical aspect. The chief exports are olive oil, figs, oranges, wool, mules, wine, hats, brooms, brandy, capers, saffron, cheese, salt, woodenware, baskets, etc. The ancient natives of these islands were very expert slingers, and served in the Carthaginian army. The name is supposed to refer to their expertness through the Greek word βαλλειν, to sling. The Balears were made an independent kingdom in 1256, but soon became feudal to Aragon, to which kingdom they were annexed in 1344. The Moors were long masters here, but were expelled in 1285.

The Kings of Spain long retained the title of "King of the Balearic Islands" as one of their secondary honors. The language is made up of various dialects (Mallorquin, Minorquin, etc.) of the Catalan, mingled with Arabic (and perhaps Punic) elements. The Archduke Ludwig Salvator is publishing (1893) an elaborate work on these islands. Vol. iv., *Minorca*, appeared in 1891. The work is not in the trade. See MAJORCA and MINORCA.

Baléchou, baä'lā'shoo', JEAN JOSEPH NICOLAS: a very eminent French engraver; b. at Arles in 1715. He was the first burinist of his time. His works are remarkably neat, and his style brilliant, vigorous, and bold; but his drawing is often defective, and he paid too little attention to detail. His *Women Bathing*, *Storm*, and *Calm* (after C. J. Vernet), *Saint Genéviève* (after Charles Vanloo), and his full-length portrait of Augustus, King of Poland, are his most famous works. The last mentioned is one of the great triumphs of the engraver's art. D. in Avignon, Aug. 18, 1764.

Baleen' [O. Fr. *baleine*, whale, whalebone < Lat. *balaena*, whale]: a substance commercially known as whale-fin and whalebone; procured from the mouth of the right whale, and various other species. It grows from the roof of the mouth of all the *Balanidæ* or true whales, though in some it is too small to be of commercial importance. It is never found in the sperm whales or the dolphins. From single whales as much as 2 tons of baleen has been taken. It consists of horny plates of albuminous matter charged with phosphate of lime. Baleen takes the place of teeth, and serves as a strainer for separating from the water the little animals which serve as food for the whale. See WHALEBONE.

Balen, baal'en, or **Ballen,** baal'en, HENDRIK, van: a Flemish painter; b. in Antwerp in 1560; studied with Adam van Oort and in Italy, and was the first instructor of Vandyck. In spite of a certain coldness and mannerism, his harmonious coloring, correct taste, and skillful composition have given him a more than respectable rank among painters. Of his numerous works, the best known are scriptural and ecclesiastical pieces. His nude figures are well executed. D. in Antwerp, July 17, 1632.

Balestier, bäl'es-teer, WOLCOTT: novelist; b. at Rochester, N. Y., Dec. 13, 1861. After a short course in Cornell University, and a trip to Colorado and Mexico, he went to New York and connected himself with the publishing-house of Lovell & Co. As London agent of that house he went to England in 1888. D. in Dresden, Saxony, Dec. 6, 1891. Balestier's fictions deal largely with frontier life in Colorado. They include, besides a number of short stories in the magazines and three early novels of inferior merit, *The Naulahka*, written in co-operation with his brother-in-law, Rudyard Kipling, and *Benefits Forgot*, written in 1885 and published serially in *The Century* (1892).

HENRY A. BEERS.

Bales'tra, ANTONIO: an Italian painter; b. at Verona in 1666. After his father's death he followed commercial pursuits until he came of age, when he went to Venice and became a pupil of Belucci (an able colorist), and afterward studied at Rome with Carlo Maratti. His *Defeat of the Giants* gained the prize at the Academy of St. Luke in 1694. Among his other famous pictures are a *Saint Theresa* at Bergamo, a *Virgin* at Mantua, a *Life of Saints Cosmas and Damian* at Padua, and his own portrait at Florence. He was one of the last able artists of the Venetian school, though not a slavish follower of any school. He was a skillful designer, a good colorist, a laborious and faithful student of his art, and was possessed of a vigorous hand and spirit. The works of Giovanni Balestra, a skillful engraver, are often incorrectly assigned to the subject of this notice. D. in Verona, Apr. 21, 1740.

Balfe, MICHAEL WILLIAM: opera-composer; b. in Dublin, Ireland, May 15, 1808, and d. at Rowney Abbey, Hertfordshire, England, Oct. 20, 1870. His first studies in music were as a violinist, and he appeared as a solo performer when a boy. He also studied the piano, but specially devoted himself to singing and dramatic composition, and became, while still young, one of the most popular stage composers of the period. From the beginning to the end of his career he had uninterrupted success. His operas were sung everywhere. The list is a long one, but the following include not only the best known but also the best works: *The Siege of Rochelle* (1835); *The Bohemian Girl* (1843); *The Daughter of St. Mark* (1844); *The Enchantress* (1845); *The Rose of Castile* (1857); *Satanella* (1858); *The Armorer of Nantes*

(1863); *Blanche de Nevers* (1863); *The Knight of the Leopard*, produced in Italian as *Il Talismano* (1874); and *Pittore e Duca*, produced in English as *Moro, the Painter of Antwerp* (1881). Several of these attained wide popularity. *The Bohemian Girl* was performed in German as *Die Zigeunerin*, and in French as *La Zingarella*. This was in a special five-act version made by Balfe for the Paris Grand Opéra. Many of his songs have also become favorites. *Come into the Garden, Maud*, is a famous tenor show song. He also composed several cantatas and concert choruses. A polacca which he composed for full orchestra, scoring it himself, was played in Dublin when he was seven years old. He was sometimes called the "English Rossini," and for fertility in genial melody he deserved the title, but his work lacked seriousness of purpose.

D. E. HERVEY.

Balfour, balf'foor, The Right Hon. ARTHUR JAMES, P. C., LL. D., F. R. S.: British statesman; b. July 25, 1848; educated at Eton and at Trinity College, Cambridge; private secretary to his uncle, the Marquis of Salisbury (1878-80), as such attending the Berlin Congress; member of Parliament for Hertford 1879, and for East Division of Manchester 1885; president of Local Government Board, without seat in the cabinet, 1885; Secretary for Scotland, Aug. 3, 1886; admitted to the Cabinet, Nov. 19, 1886; Chief Secretary for Ireland, Mar. 5, 1887; leader of the House of Commons and First Lord of the Treasury, Nov., 1891, retiring on the accession of the Gladstone ministry in the summer of 1892, when he became leader of the Conservative opposition. On the return of the Unionist Party into power, June, 1895, he again became First Lord of the Treasury and leader of the House. Author of *Defense of Philosophic Doubt* (London, 1879) and various magazine articles. Up to 1878 Mr. Balfour was known only as a brilliant young scholar. His development of rare political capabilities has since been very rapid.

C. K. ADAMS.

Balfour, FRANCIS MAITLAND: embryologist; brother of Arthur J. Balfour; b. at Edinburgh, 1851; educated at Harrow and at Trinity College, Cambridge; became Professor of Morphology at Cambridge after declining offers from Oxford and Edinburgh; published (1880-81) *Comparative Embryology*, on which his fame rests; lost his life July 19, 1882, in attempting to climb one of the spurs of Mont Blanc.

Balfour, ISAAC BAYLEY, M. A., M. D., D. Sc., F. R. S.: botanist; b. in Edinburgh, Mar. 31, 1853; educated in the universities of Edinburgh, Strassburg, and Würzburg; botanist to the transit of Venus expedition to Rodriguez 1874; leader of natural history exploration of Socotra 1879; Professor of Botany in University of Glasgow 1879-84; Professor of Botany in University of Oxford 1884-88; since then Professor of Botany in University of Edinburgh, keeper of Royal Botanic Gardens, and Queen's Botanist of Scotland. His principal publications are *Botany of Rodriguez* (Phil. Trans., 1879) and *Botany of Socotra* (Trans. Roy. Soc. Edin., 1888), and he was editor of the English translations of Goebel's *Outlines of the Classification and Special Morphology of Plants*; De Bary's *Comparative Morphology and Biology of Fungi, Mycetozoa, and Bacteria*; De Bary's *Bacteria*; and Solms-Laubach's *Fossil Botany*. Since 1887 he has been one of the editors of the *Annals of Botany*.

CHARLES E. BESSEY.

Balfour, JOHN BLAIR, Q. C., LL. D., P. C.: Scottish lawyer; b. at Clackmannan, 1837; educated at Edinburgh Academy and at University of Edinburgh; called to the Scottish bar 1861; Solicitor-General for Scotland 1880; privy counselor 1883; Lord Advocate for Scotland 1881-85, 1886, and again in Mr. Gladstone's cabinet of 1892.

Balfour, JOHN HUTTON, M. D., F. R. S.: botanist and physician; b. in Edinburgh, Sept. 15, 1808; nephew of Hutton, the geologist. In 1845 he became Professor of Botany at Edinburgh. He published a *Manual of Botany* (1849) and a *Class-book of Botany* (1852), and contributed the articles on botany to the eighth and ninth editions of the *Encyclopædia Britannica*. D. in Edinburgh, Feb. 11, 1884.

Balfour, THOMAS GRAHAM, M. D., F. R. S.: physician; b. in Edinburgh, Mar. 18, 1813; M. D., University of Edinburgh 1834; gazetted to the medical staff of the army 1836; promoted to be head of the newly formed statistical branch on the reorganization of the Army Medical Service in 1859; became surgeon-general in 1873; retired in 1876; represented the Army Medical Department in the International Medical Congress at London in 1880; member of numerous learned societies; author of five volumes of statis-

tical reports *On the Health of the Army* (with Sir A. Tulloch); of thirteen Annual Reports of the statistical branch, and of numerous articles. D. in Wimbledon, Jan. 17, 1891.

C. H. THURBER.

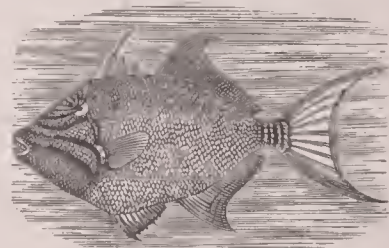
Bali, baa'lēe, or **Bally**, baal'lēe: an island of the Malay Archipelago; about 3 miles E. of Java; area, 1,999 sq. miles. It is nearly 70 miles long and 35 miles wide. The chief exports are rice, cotton, coffee, tobacco, hides, etc. The island is divided into several small states, of which Badong is the chief. The Balinese mostly profess Brahmanism. They are said to be superior to the Javanese in mind and other respects. Their language resembles that of Java. Bali is a Dutch dependency. Pop. about 500,000.

Baliol, or **Balliol**, EDWARD: a son of King John Baliol; invaded Scotland in 1332 at the head of discontented barons. Having gained several victories over the Scottish army, he was crowned king at Scone in September of that year. About three months later he was surprised in his camp at Annan by Archibald Douglas, and lost his crown. His subsequent career was unfortunate. The last of his house, he died near Doncaster, 1367.

Baliol, or **Balliol**, JOHN: Lord of Galloway and King of Scotland; b. about 1259. He became the rival of Robert Bruce, and claimed the crown as a grandson of David, who was a brother of King William the Lion. The dispute was referred to Edward I. of England, as arbiter, who decided that Baliol was the rightful heir, and imposed the condition that he should do homage to the King of England. He was crowned in 1292, and swore fealty to Edward, but soon renounced his allegiance. Edward invaded Scotland, defeated Baliol's army, and compelled him to resign the crown July 7, 1296. After thirteen years' residence in Normandy he died in 1315.

Baliol College: See OXFORD, UNIVERSITY OF.

Balis'tidæ: the trigger-fishes; a family of plectognath fishes with the pelvic bone well developed and movable, without ventral spines, and with the spinous dorsal represented by at most three spines. They are mostly found in tropical or subtropical seas, and are divisible into two sub-families. The typical species (*Balistine*) have brilliant colors and a curious provision for fixing the first dorsal spine in an erect position or lowering it at will. For this reason they are sometimes called trigger-fishes. The fool-fishes (*Monacanthinæ*) are generally dull in color, and have one spine, supplemented by a second small one behind.



Trigger-fish: balistes.

Revised by D. S. JORDAN.

Balkan, baal-kaan' (anc. *Hæmus*): an important mountain-chain of Europe; extends from Sofia eastward to Cape Emineh on the Black Sea, and forms the southern boundary of the basin of the Danube. Some peaks of this range are over 5,000 feet high. The Balkan is connected with the mountains of Middle Europe by the ranges of Montenegro and Herzegovina. It is an important natural barrier, sloping abruptly to the S.

Balkan Peninsula: the easternmost of the southern peninsulas of Europe, so named from the Balkan Mountains within it. It lies between the Black and Aegean Seas on the E., and the Adriatic and Ionian on the W. The northern boundary is not well defined, but may conveniently be taken as the Danube river and its tributaries, the Save and the Una. Thus defined it is almost entirely surrounded by water, and includes Bosnia, Herzegovina, Montenegro, Servia, Bulgaria, Rumelia, Turkey in Europe, and Greece. The peninsula is very mountainous, culminating in an elevated triangular plateau of which the angles are Sarajevo (capital of Bosnia), Sofia (in Eastern Bulgaria), and Metsovan (on the Grecian frontier). The climate is varied. It is rigorous in the Danubian plain of Bulgaria, but rapidly grows mild toward the south. Constantinople is celebrated for the mildness of the climate and serenity of its sky. The summers of Thrace and the lower plains of Macedonia are cooled and refreshed by sea-breezes. The winters are very severe in the north and over the central plateau. The population is turbulent, and very diverse as to race and religion. In Macedonia the races are confused, but elsewhere they are

more distinct. Bosnia, Serbia, Herzegovina, and Montenegro are chiefly occupied by a branch of the Slavs called the Servo-Croats. In Bulgaria and Eastern Rumelia the dominant people is the Bulgarian, another branch of the Slavs. Albania is largely occupied by an aboriginal race, the Arnauts or Skiptars. Greece and a littoral band several leagues wide, extending from Salonica to Constantinople, are occupied by Greeks, the latter part being more distinctly Byzantine than the former, and there is a large population of Greeks in Constantinople, Adrianople, and other large cities of Thrace and Macedonia. The Turks are generally disseminated through the proper Turkish part of the peninsula, but are in the majority only in Stamboul (a quarter of Constantinople) and in Adrianople. In Salonica Jews of Spanish origin make up nearly two-thirds of the population. There are three principal religions: the Greek Orthodox, professed by the Greeks, Servians, Bulgarians, and Southern Albanians; the Roman Catholic, professed by the Bosnians and Northern Albanians; and Mohammedanism, professed by the Turks and some Bosnians and Albanians.

The Balkan Peninsula has played an important part in history. The Greeks, the Macedonians, the Byzantines, and the Turks have alternately advanced or retarded civilization within its borders. The Turks formerly controlled the whole peninsula. Successive revolts and invasions, especially during the nineteenth century, have generally given a more or less complete autonomy to the various races mentioned above. Serbia, Montenegro, and Greece are independent; Bosnia and Herzegovina are controlled by Austria-Hungary; Bulgaria is nominally tributary to the Sultan of Turkey; the remainder of the peninsula is Turkish, but the Albanians are practically independent. MARK W. HARRINGTON.

Balkash, baäl-kaash' (Kalmuck, great lake; called by the Khirgiz *Ak Tenghiz*, i. e. white sea, or simply *Tenghiz Sea*): a large lake of Asiatic Russia having no visible outlet; is between the provinces of Semipalatinsk and Semiryetshensk, in lat. 45° N., lon. 79° E. Its length from N. E. to S. W. is 390 miles, and its greatest breadth 50 miles. Area, 7,120 sq. miles; elevation above sea-level, 781 feet.

Balkh, baalkh (anc. *Bactria*): a province of Afghan Turkestan between the Hindu Kush and Oxus. It is the best-watered and most fertile part of the country. The population is variously estimated, but probably does not surpass 500,000. Area about 3,000 sq. miles. Capital, Masar-i-Sherif.

Balkh [Turkish *balik*, city]: former capital (anc. *Zarias'pa* and *Bactra*) of the province of Balkh; about 22 miles S. of the Oxus river, and 150 miles N. N. W. of Cabul. The ancient Bactra was an important city, the remains of which cover a space about 20 miles in circuit, and comprise eighteen aqueducts now in ruins. It was destroyed by Jengis Khan. The modern town is insignificant. Pop. about 2,000.

Ball, GAME OF: This was a favorite gymnastic exercise among the ancient Greeks and Romans, the latter of whom called it *pita*. At Rome it was played by persons of all ages and by men of high rank. The Greeks prized the game as the means of giving grace and elasticity to their figures and motions. In the sixteenth century this game was fashionable in the courts of French and Italian princes. The French *jeu de paume* and English *tennis* were modifications of the game of ball. The ball was struck with a mallet (Fr. *mail* or *maille*; Eng. *mallet*), sometimes called pall-mallet or pell-mell, from the Italian *palla*, a ball. A form of this game, called *cricket*, is much played by the English. The popular game of the U. S. is *base-ball*. See BASE-BALL, CRICKET, and TENNIS.

Ball, GEORGE H., D. D.: b. at Oxford, Sherbrook co., East Canada, Dec. 7, 1818; studied at the Theological Seminary of New York, whence he graduated in 1847; was pastor of the Niagara Square Baptist church, Buffalo, N. Y., for about twenty years; pastor of Roger Williams church, Providence, R. I., for two years; editor of the *Baptist Union*, and published *Guide to the Lord's Supper*, *Christian Baptism*, etc.

Ball, SIR ROBERT STAWELL, LL. D., F. R. S.: astronomer; b. in Dublin, July 1, 1840; educated at Trinity College; Professor of Astronomy at Dublin and Astronomer Royal for Ireland 1874; Professor of Astronomy, Cambridge, and Director of the Observatory 1892; President Royal Astronomical Society in 1897; knighted 1886. Author of *Experimental Mechanics* (London, 1871; 2d ed. 1888); *Elements of Astronomy* (1880); *The Story of the Heavens* (1885; 3d ed. 1890), etc., as well as numerous magazine articles.

Ball, THOMAS: sculptor; b. in Charlestown, Mass., June 3, 1819. Employed in the Boston Museum, he cleaned and imitated the pictures, and gradually passed on to miniature and then to portrait painting. During this period he sang in oratorios, his voice passing from soprano to a rich deep bass, effective in *Elijah*. His first published plastic work was a small bust of Jenny Lind during her visit to America, which was pirated by Italians and sold in vast numbers. His life-size bust of Webster, just after that statesman's death, led to a commission for a full statue, and launched him on his especial career. He went to Florence, opened a studio, and commissions flowed in upon him. For many years his time was passed in Italy, interrupted by visits to America. In 1865 he made an equestrian statue of Washington, cast in bronze and now in the Boston Public Garden. An heroic bronze statue of Webster by Ball stands in Central Park, New York. Boston has decorated her public buildings with busts or statues of Rufus Choate, Edward Everett, Gov. John Andrews, and other portrait work by the same artist. In idealization he produced a *Coriolanus*, with Edwin Forrest for a model, an *Eve*, and, besides many other pieces, a colossal group representing *Emancipation*, which is in Washington, D. C., and is the culmination of his art. His later years were passed in Boston. His *Three Score Years and Ten* (Boston, 1891), an autobiography, is a genial and rather garrulous collection of reminiscences of a life rich in acquaintance with artists and noted men.

Ballad Poetry: The word *ballad* in English signifies a narrative song, a short tale in lyric verse, which sense it has come to have, probably through the English, in some other languages. It means, by derivation, a dance-song, but though dancing was formerly, and in some places still is, performed to song instead of instrumental music, the application of the word in English is quite accidental. The *popular* ballad, for which our language has no unequivocal name, is a distinct and very important species of poetry. Its historical and natural place is anterior to the appearance of the poetry of art, to which it has formed a step, and by which it has been regularly displaced, and, in some cases, all but extinguished. Whenever a people in the course of its development reaches a certain intellectual and moral stage, it will feel an impulse to express itself, and the form of expression to which it is first impelled is, as is well known, not prose, but verse, and in fact narrative verse. The condition of society in which a truly national or popular poetry appears explains the character of such poetry. It is a condition in which the people are not divided by political organization and book-culture into markedly distinct classes, in which consequently there is such community of ideas and feelings that the whole people form an individual. Such poetry, accordingly, while it is in its essence an expression of our common human nature, and so of universal and indestructible interest, will in each case be differenced by circumstances and idiosyncrasy. On the other hand, it will always be an expression of the mind and heart of the people as an individual, and never of the personality of individual men. The fundamental characteristic of popular ballads is therefore the absence of subjectivity and of self-consciousness. Though they do not "write themselves," as William Grimm has said, though a man and not a people has composed them, still the author counts for nothing, and it is not by mere accident, but with the best reason, that they have come down to us anonymous. Hence, too, they are extremely difficult to imitate by the highly civilized modern man, and most of the attempts to reproduce this kind of poetry have been ridiculous failures.

The primitive ballad, then, is popular, not in the sense of something arising from and suited to the lower orders of a people. As yet, no sharp distinction of high and low exists, in respect to knowledge, desires, and tastes. An increased civilization, and especially the introduction of book-culture, gradually gives rise to such a division; the poetry of art appears; the popular poetry is no longer relished by a portion of the people, and is abandoned to an uncultivated or not over-cultivated class—a constantly diminishing number. But whatever may be the estimation in which it may be held by particular classes or at particular epochs, it can not lose its value. Being founded on what is permanent and universal in the heart of man, and now by printing put beyond the danger of perishing, it will survive the fluctuations of taste, and may from time to time serve, as it notoriously did in England and Germany a hundred years

ago, to recall a literature from false and artificial courses to nature and truth.

Of the European nations the Spaniards and those of Scandinavian-German stock have best preserved their early popular poetry. We have early notices of the poetry of the Germans. Their ballads, mythical or historical, are several times spoken of by Tacitus, who says that these were their only annals. The earth-born Tuiseo and his son Mannus were celebrated in the one, and the hero Arminius in the other. The historian of the Goths, Jornandes, writing in the sixth century, says that these people were accustomed to sing the exploits of their fathers to the harp, and seems to have taken not a little of his history from such songs. The like is true of Paulus Diaconus, the Lombard historian, who wrote in the eighth century, and mentions songs about Alboin (who died in 563) as existing among all the nations of German speech. Charlemagne had the old traditional songs of his people collected and committed to writing, and even made them one of the subjects of school instruction. Side by side with heroic ballads, social, 'convivial, and funeral songs (which may, to be sure, have been pretty much the same thing) seem to have been in use from the earliest recorded times. To all this popular poetry, by reason of its heathen derivation and character, the Christian clergy opposed themselves with the most determined hostility. Not succeeding in extirpating it by the use of the spiritual and legal means at their command, the German churchmen of the ninth century conceived the idea of crowding it out by substituting poetry of a Christian subject and tone—an expedient which has been tried more than once since then. Though popular song lived on in obscure places, the foreground of history is filled for 600 years with religious and courtly poetry, and with the chivalrous and native epic. Nothing is left of the old heroic songs but a fragment of the *Hildebrandslied*, from the eighth century (best known in a modernized form of the fifteenth century); and of the Christianized song we have also but a single specimen, the *Ludwigslied*, of the year 881. The former is in the ancient alliterative meter, the latter in the then newly introduced rhymed stanza. During the fifteenth and the early part of the sixteenth century a second growth of the genuine popular song appears, some of it springing, doubtless, out of shoots from the old stock which had lived through this long interval, some of it a fresh product of the age. These ballads were popular in the large and strict sense; that is, they were the creation and the manifestation of the whole people, great and humble, who were still one in all essentials, having the same belief, the same ignorance, and the same tastes, and living in much closer relations than now. The diffusion of knowledge and the stimulation of thought through the art of printing, the religious and intellectual consequences of the Reformation, the intrusion of cold reflection into a world of sense and fancy, broke up the national unity. The educated classes took a direction of their own, and left what had been a common treasure to the people in the lower sense, the ignorant or unschooled mass. German ballads have been collected in considerable numbers. The sources have been "flying leaves," manuscripts, printed song-books (mostly of the sixteenth century), and oral tradition. In interest they are decidedly inferior to the Scandinavian and English.

Christianity and foreign culture, which in different ways have been equally destructive in their effects upon ancient national poetry, were introduced into the Scandinavian countries much later than into Germany and England. In the Scandinavian countries, too, the peasantry long maintained a much higher position. They were not an oppressed and ignorant class, but free men, who shared fully in the indigenous culture, and so were well fitted to keep and transmit their poetical heritage. While, therefore, the heroic ballads of Germany and England have been lost—those of England utterly, those of Germany being preserved only in epic conglomerates like the *Nibelungenlied*—and while the mythical cycle in both countries is but feebly, if at all, represented, Scandinavia has kept a great deal of both. The story of Thor's Hammer forms the subject of a ballad still known in all the Scandinavian countries; a volume of ballads concerning Sigurd has been gathered from tradition in the Faroe isles within this century, and several ballads of this cycle and of that of Dietrich of Bern are found in Danish manuscript ballad-books. Svend Grundtvig, the editor of the still unfinished but truly magnificent collection of the old Danish ballads, has arranged them in four classes:

first, the Heroic; second, the Trylleviser, or ballads of giants, dwarfs, nixes, elves, mountain-spirits, enchantment, spells, and ghosts; third, the Historic; and fourth, ballads of Chivalry. The historic ballads (intending their original, not their actual, form) mostly fall within the period from 1150 to 1300; the chivalrous are later, and the two other classes belong to a still earlier term, which may extend over the first half of the twelfth century, and into, or perhaps through, the eleventh—that is, to the epoch of the introduction of Christianity. Ballads are best preserved by oral tradition in Norway and the Faroe isles, but not at all, there, in old manuscripts; Sweden has a few manuscripts, and Denmark a great number, written mostly by noble ladies living on their estates, and giving the ballads as they were sung three or four hundred years ago, as well in the lord's castle as in the peasant's hut. The Danish ballads were collected in a printed form earlier than any others except the Spanish. Vedel published a hundred in 1591; another collection, called *Tragica*, or old Danish historic love-ballads, appeared at Copenhagen in 1657; and in 1695 Syv republished Vedel's ballads, with the addition of another hundred.

The English have preserved but a moderate number of very early ballads, and the date of many of these it is impossible to fix. There are some narrative poems in Anglo-Saxon which, without stretch of language, might be called ballads. The Norman Conquest, and the predominance of the French language for more than two hundred years, had of course momentous literary consequences, but there is no reason why the production of the native ballad should have stopped. The story of the Saxon outlaw Hereward, which begins with the second year after the Conquest, and has been handed down to us in Latin prose of the twelfth century, is full of such adventures as form the themes of ballads, and very likely was made up from popular songs. Such ballads, if they existed, are lost, but ballads concerning outlaws are among the earliest and best ones of the English. In place of Hereward of the Conqueror's time, and Fulk Fitz-Warin of John's time (whose history was also extremely popular), we have Robin Hood of uncertain time. Songs of Robin Hood and of Randolph, Earl of Chester (probably the third earl, who died in 1232), we know, from Piers Ploughman, were current among the lower orders at the middle of the fourteenth century, and one Robin Hood ballad exists in a manuscript which may be as old as the first quarter of the next century. Another occurs in a manuscript dated at about 1500, others in the Percy manuscript. The *Little Gest* of Robin Hood, which is a miniature epic made up of half a dozen ballads, was printed by Wynken de Worde, "probably," says Ritson, "in 1489." We may reasonably place the origin of the Robin Hood ballads as early as the thirteenth century. To the thirteenth century may belong Hugh of Lincoln, which is founded on an incident that occurred in 1255. An Anglo-Norman ballad on the same subject twice refers to a King Henry, and is therefore put within the reign of Henry III., which ended 1276. After this there are only one or two ballads with dates till we come to the Battle of Otterbourn, 1388, from which time we have a succession of ballads founded on ascertained events, down to the middle of the eighteenth century. Ballads like those of Grundtvig's second class exist in a small number; one of them in a manuscript of the middle of the fifteenth century. The little that we have of ballads of the Arthur cycle, and many of the best of all kinds, we owe to the Percy manuscript, written just before 1650. A few ballads besides those named have been gleaned from manuscripts and early prints, but a large part of our whole stock has been recovered within the last 130 years from the oral tradition of Scotland. The first impulse to the collecting of this poetry was given by the publication of Percy's *Reliques* in 1765. The *Reliques* inspired Bürger and Herder, through whom, and especially through Herder's *Volklieder* (1778-79), that interest in the literature of the people was awakened in Germany which has spread over the whole of Europe, and has led to the collecting and study of the traditional songs and tales of all the European, and some of the Asiatic, African, and American races.

The Spanish alone of the Latin nations can boast a ballad poetry of great compass and antiquity. Following the law of analogy where documents are wanting, the origin of these ballads would be put between the years 1000 and 1200, the period when the Spanish nationality and language had been developed to that degree which invariably

incites and leads to expression in epic song. Some sort of popular poetry about the Cid (whose time is 1040-99) is known to have been sung as early as 1147; the poem of the Cid itself is placed about 1200. During the century that follows we find occasional mention of ballad-singers, but no ballads. As in Germany, the popular poetry, after the first bloom of the national genius, was supplanted by art-poetry, among the higher classes, and it passed out of notice for two or three hundred years. A reaction set in in the sixteenth century. This was the glorious period of Spanish history, and the return to the national poetry was a natural consequence of the powerful stirring of the national mind. Omitting "flying leaves" or broadsides, and a few ballads in the *Cancionero General* of 1511, the earliest collection of Spanish ballads is an undated *Cancionero de Romances*, printed at Antwerp about 1546; and this, it must be observed, is the first ballad-book printed in any language, and was gathered in part from the memory of the people. Other similar collections followed, from which was made in 1600 the great *Romancero General*. Toward the end of the seventeenth century the national ballads declined in favor, with a decline of national spirit, but since the beginning of the present century they have been restored to a high estimation at home, and have gained the admiration of the world. The oldest ballads are those which relate to the history and traditions of Spain, and recount the exploits of Bernardo del Carpio, Fernan Gonzalez, the Seven Lords of Lara, and the Cid. Then comes a variety of romantic and chivalrous ballads, and then ballads of the Carolingian cycle. These oldest and most characteristic of the Spanish ballads have been excellently edited by Wolf and Hofmann, and the entire body of this literature, amounting to more than 1,900 pieces, is included in the *Romancero General*, edited by Duran in 1849-51. The collections of ballads in the other Latin languages will be found below.

The ballads of other European nations are scarcely less interesting than those which have been noticed, and those of races which possess little or no other literature are peculiarly instructive, by reason of the light which they throw on the history of national poetry; for instance, the songs of the Slavic races. The Slavic songs as a class are distinguished from the Teutonic by the absence of the sentiment of *romantic* love and of *chivalrous* heroism. In their form, too, they are much less dramatic, and even the division of epic from lyric songs is not easy. Many songs begin with a few narrative verses, and then become entirely lyric, and the narrative part is almost always descriptive. The Servians—especially those of Turkish Servia, Bosnia, and Montenegro, who have not been much affected by civilization—afford a capital example of a race that has not outlived the ballad era. Vuk has collected many hundreds of their songs, one-third of them epic, and every one of them from the mouths of the people. A few of these are, in their actual form, as old as the fifteenth century, some belong to a remoter time, and indeed many retain marks of an ante-Christian origin. So far the Servians are like the German nations: the distinction is that the fountain of popular poetry still flows, and that heroic poems have been produced among the Servians in this century which are essentially similar to the older ones, and not at all inferior. We find the national poetry there in a condition closely resembling that in which it was among the races of Northern and Eastern Europe many hundred years ago. New songs appear with new occasions, but do not supersede the ancient ones. The heroic ballads are chanted at taverns, in the public squares, in the halls of chiefs, to the accompaniment of a simple instrument. Sometimes they are only recited, and in this way are taught by the old to the young. All classes know them: the peasant, the merchant, the hayduk (the klepht of the modern Greek, a sort of Robin Hood), as well as the professional bard. No class scorns to sing them—not even the clergy or the chiefs.

One or two general remarks are required to prevent misconceptions and to supply omissions. From what has been said, it may be seen or inferred that the popular ballad is not originally the product or the property of the lower orders of the people. Nothing, in fact, is more obvious than that many of the ballads of the now most refined nations had their origin in that class whose acts and fortunes they depict—the upper class—though the growth of civilization has driven them from the memory of the highly polished and instructed, and has left them as an exclusive possession to the uneducated. The genuine popular ballad had its rise in a time when the distinctions since brought about by ed-

ucation and other circumstances had practically no existence. The vulgar ballads of our day, the "broadsides" which were printed in such huge numbers in England and elsewhere in the sixteenth century or later, belong to a different genus; they are products of a low kind of *art*, and most of them are, from a literary point of view, thoroughly despicable and worthless.

Next it must be observed that ballads which have been handed down by long-repeated tradition have always departed considerably from their original form. If the transmission has been purely through the mouths of unlearned people, there is less probability of willful change, but once in the hands of professional singers there is no amount of change which they may not undergo. Last of all comes the modern editor, whose so-called improvements are more to be feared than the mischances of a thousand years. A very old ballad will often be found to have resolved itself in the course of what may be called its propagation into several distinct shapes, and each of these again to have received distinct modifications. When the fashion of verse has altered, we shall find a change of form as great as that in the *Hildebrandslied*, from alliteration without stanza to stanza with rhyme. In all cases the language drifts insensibly from ancient forms, though not at the same rate with the language of every-day life. The professional ballad-singer or minstrel, whose sole object is to please the audience before him, will alter, omit, or add, without scruple, and nothing is more common than to find different ballads blended together.

There remains the very curious question of the origin of the resemblances which are found in the ballads of different nations, the recurrence of the same incidents or even of the same story, among races distinct in blood and history, and geographically far separated. The Scottish ballad of May Colvin, for instance—the German Ulinger—is also found in Danish, Norwegian, Swedish, Icelandic, Dutch, Low German, Spanish, Portuguese, Italian, French, Polish, Servian, Bohemian, Wendish, Magyar, and there are traces of it in other languages. Some have thought that to explain this phenomenon we must go back almost to the cradle of mankind, to a primeval common ancestry of all or most of the nations among whom it appears. But so stupendous an hypothesis is scarcely necessary. The incidents of many ballads are such as might occur anywhere and at any time; and with regard to agreements that can not be explained in this way we have only to remember that tales and songs were the chief social amusement of all classes of people in all the nations of Europe during the Middle Ages, and that new stories would be eagerly sought for by those whose business it was to furnish this amusement, and be rapidly spread among the fraternity. A great effect was undoubtedly produced by the crusades, which both brought the chief European nations into closer intercourse and made them acquainted with the East, thus facilitating the interchange of stories and greatly enlarging the stock.

Some of the more important collections of popular ballads are:

English.—*Reliques of Ancient English Poetry*, by Thomas Percy, 1st ed. 1765, 4th improved ed. London, 1794, and often since then; *Ancient and Modern Scottish Songs*, by David Herd, 2d ed. 2 vols., Edinburgh, 1776; *Minstrelsy of the Scottish Border*, by Sir Walter Scott, 3 vols., Edinburgh, 1802-03, and often since then; *Popular Ballads and Songs*, by Robert Jamieson, 2 vols., Edinburgh, 1806; *Ancient Scottish Ballads*, by George R. Kinloch, Edinburgh, 1827; *Minstrelsy, Ancient and Modern*, by William Motherwell, Glasgow, 1827; *Ancient Ballads and Songs of the North of Scotland*, by Peter Buchan, 2 vols., Edinburgh, 1828; *The English and Scottish Popular Ballads*, by F. J. Child, Boston, 1882-92, 8 parts, and one to follow, which will contain a full bibliography.

Scandinavian.—*Danmarks Gamle Folkeviser* (The Ancient Ballads of Denmark), by Svend Grundtvig, 5 vols., the last half of the 5th, by Axel Olrik, unfinished, Copenhagen, 1853-90; *Jyske Folkeviser*, in *Jyske Folkeminder*, by E. T. Kristensen, vols. i., ii., x., Copenhagen, 1871-89; *Ancient Danish Ballads*, translated from the originals by R. C. Alex. Prior, 3 vols., London, 1860; *Norske Folkeviser* (Norwegian Ballads), by M. B. Landstad, Christiania, 1853; *Gamle Norske Folkeviser* (Ancient Norwegian Ballads), by Sophus Bugge, Christiania, 1858; *Svenska Folkvisor* (Swedish Ballads), by Geijer and Afzelius, 3 vols., Stockholm, 1814-16, improved ed. by Bergström and Höijer, 3 vols., Stockholm, 1880; *Svenska Fornsånger*, by A. I. Ar-

widsson, 3 vols., Stockholm, 1834-42; *Færøiske Kvæder* (Ballads of the Faroe Isles), by V. U. Hammershamb, Copenhagen, 1851-55; *Færøsk Anthologi*, by the same, Copenhagen, 1886, 1891; *Islensk Fornkvæði*, by Grundtvig and Sigurðsson, Copenhagen, 1854-85.

High German.—*Des Knaben Wunderhorn*, Arnim and Brentano, 3 vols., Heidelberg, 1806-08, 4 vols., Berlin, 1853-54; *Alle teutsche Volkslieder in der Mundart des Kuhländchens*, J. G. Meinert, Vienna and Hamburg, 1817; *Oesterreichische Volkslieder*, Ziska and Schottky, Pesth, 1819; *Die Volkslieder der Deutschen*, F. K. von Erlach, 5 vols., Mannheim, 1834-36; *Deutsche Volkslieder*, A. Kretzschmer and A. W. v. Zuccaliniaglio, 2 vols., Berlin, 1840; *Schlesische Volkslieder*, Hoffmann von Fallersleben and Riecher, Leipzig, 1842; *Alle hoch- und niederdeutsche Volkslieder*, L. Uhland, 2 vols., Stuttgart, 1844-45; *Die deutschen Volkslieder*, K. Simrock, Frankfurt-am-Main, 1851; *Deutsche Volkslieder*, F. L. Mittler, Marburg and Leipzig, 1855; *Fränkische Volkslieder*, F. M. von Dittfurth, 2 parts, Leipzig, 1855; *Schwäbische Volkslieder*, E. Meier, Berlin, 1855; *Weltliche u. geistliche Volkslieder*, H. Pröhle, Asehersleben, 1855; *Deutscher Liederhort*, L. Erk, Berlin, 1856; *Die historischen Volkslieder der Deutschen*, R. von Lilieneron, 4 vols., Leipzig, 1865-69; *Altdeutsches Liederbuch*, F. M. Böhme, Leipzig, 1877; *Westfälische Volkslieder*, A. Reifferscheid, Heilbronn, 1879.

Low German, Netherlandish.—Uhland, as above; *Oude Vlaemsche Liederen*, J. F. Willems, Ghent, 1848; *Niederländische Volkslieder*, Hoffmann von Fallersleben, 2d ed. Hanover, 1856; *Chants Populaires des Flamands de France*, E. de Coussemaker, Ghent, 1856; *Oude en nieuwe Liedjes*, F. A. Snellaert, 2d ed. Ghent, 1864; *Chants Populaires Flamands*, A. Lootens and J. M. E. Feys, Bruges, 1879.

Spanish and Portuguese.—*Romanceero General* (vols. x. and xvi. of *Biblioteca de autores Españoles*), Agustín Durán, Madrid, 1849, 1851; *Primavera y Flor de Romances*, F. J. Wolf and C. Hoffmann, 2 vols., Berlin, 1856; *Romanzen Asturiens*, u. s. w., José Amador de los Rios, in *Jahrbuch für romanische- u. englische Literatur*, iii. 268, 1861; *Colección de los viejos romances que se cantan por los Asturianos*, J. M. Pidal, Madrid, 1885; *Cansons de la Terra, Cants populars Catalans*, F. Pelay Briz, 5 vols. (i, y Candi Candi, ii, y J. Saltó), Barcelona, 1866-75; *Romance-rillo Catalan*, M. Milá y Fontanals, Barcelona, 1882; *Romanceiro*, Almeida-Garrett, 3 vols., Lisbon, 1863; Th. Braga, *Cancioneiro Popular*, Coimbra, 1867, *Romanceiro Geral*, Coimbra, 1867, *Cantos Populares do Archipelago Açoriano*, Porto, 1869; *Romanceiro Portuguez*, V. E. Hardung, 2 vols., Leipzig, 1877; *Romanceiro do Archipelago da Madeira*, A. Rodrigues de Azevedo, Funchal, 1880; *Cantos pop. do Brazil*, S. Roméro, 2 vols., Lisbon, 1883.

Italian.—*Canti popolari Toscani, Corsi, Illirici, Greci*, N. Tommaso, 4 vols., Venice, 1841-42, 2d ed. of vol. i., 1848; *Canti pop. inediti Umbri, etc.*, O. Marcoaldi, Genoa, 1856; *Saggio di canti pop. Veronesi*, E. S. Righi, Verona, 1863; *Volkslieder aus Venetien, gesammelt von G. Widter*, ed. A. Wolf, Vienna, 1864; *Canzoni pop. Comasche*, G. B. Bolza, Vienna Academy, 1867; *Canti pop. Veneziani*, G. Bernoni, Venice, 1872; *Canti e Racconti del Popolo Italiano*, D. Comparetti and A. d'Ancona, Turin and Florence, vols. i.-v., viii., ix., 1870-91; *Archivio per lo Studio delle Tradizioni pop.*, Pitre and Imbriani, i.-xi., 1882-92; *Canti pop. Umbri*, G. Mazzatinti, Bologna, 1883; *Canti pop. del Piemonte*, C. Nigra, Turin, 1888; *Canti pop. Siciliani*, G. Pitre, 2d ed. 2 vols., Palermo, 1891.

French.—*Instructions relatives aux Poésies populaires de la France*, J. J. Ampère, Paris, 1853; *Étude sur la poésie populaire en Normandie*, Eug. de Beaurepaire, Avranches, 1856; *Chansons pop. des Provinces de France* (Jules Fleury), Paris, 1860; *Chants populaires du pays castrais*, A. Combes, Castres, 1862; *Noëls et Chants pop. de la Franche-Comté*, M. Buehon, Salins, 1863; *Chants pop. de la Provence*, Damase Arbaud, 2 vols., Aix, 1862-64; *Romanceero de Champagne*, P. Tarbé, 5 vols., Reims, 1863-64; *Chants pop. recueillis dans le pays messin*, Comte de Puymaigre, Metz, 1865, 2d ed. 2 vols., 1881; *Chants et chansons pop. des provinces de l'ouest, Poitou, etc.*, J. Bujeaud, 2 vols., Niort, 1866; *Chansons pop. du Canada*, E. Gagnon, Quebec, 2d ed. 1880; *Chants pop. du Languedoc*, A. Montel et L. Lambert, Paris, 1880; *Chants pop. du Velay et du Forez* (Victor Smith), in *Romania*, Paris, 1872-81; *Poésies pop. de la Gascogne*, J. F. Bladé, 3 vols., Paris, 1881-82; *Chansons pop. de l'Ain*, C. Guillon, Paris, 1883; *Chansons pop. d'Ille-et-Vilaine*, L.

Decombe, Rennes, 1884; *Chansons et Ballades pop. du Valois*, Gérard de Nerval, Paris, 1885; *Vieux Chants pop. recueillis en Quercy*, J. Daynard, Cahors, 1889; *Chants pop. du Bas-Quercy*, E. Soleville, Paris, 1889; *Recueil de Chansons pop.*, 6 vols., E. Rolland, Paris, 1883-90; *Traditions, etc., des Ardennes*, A. Meyrac, Charleville, 1890.

Roumanian.—*Balade*, B. Alexandri, 2 vols., Jassy, 1853-54, and *Poesii Populare ale Românilor*, Bucharest, 1866; *Ballades et Chants pop. de la Roumanie, recueillis et traduits par V. Alexandri*, Paris, 1855; *Rouman Anthology, National Ballads of Moldavia, etc.*, H. Stanley, Hertford, 1856; *Poesia Popurala, Balade*, Marienescu, Pesth, 1859; *Balade populare române*, M. Pompiliu, Jassy, 1870.

Romaic.—*Chants populaires de la Grèce moderne*, C. Fauriel, 2 vols., Paris, 1824-25; the same in German, by W. Müller, Leipzig, 1825; *Canti popolari Toscani, Corsi, Illirici, Greci*, N. Tommaso, 4 vols., Venice, 1841-42; *Neugriechische Volks- u. Freiheitslieder*, D. H. Sanders, Leipzig, 1842; *Das Volksleben der Neugriechen, etc.*, D. H. Sanders, Mannheim, 1844; *Τραγούδια ἔθνικὰ*, 2 parts, A. Manousos, Coreyra, 1850; *Chants du Peuple en Grèce*, Comte de Marcellus, 2 vols., Paris, 1851; *Ἀισματα δημοτικὰ τῆς Ἑλλάδος* (Popular Songs of Greece), Spyr. Zampelios, Coreyra, 1852; *Carmina popularia Graeciae recentioris*, A. Passow, Leipzig, 1860; *Anthologie neugriechischer Volkslieder*, Th. Kind, Leipzig, 1861; *Συλλογὴ τῶν κατὰ τὴν Ἠπειρον δημοτικῶν ᾠμάτων*, G. Chr. Chasiotes, Athens, 1866; *Neugriechische Volks-gesänge*, J. M. Firmenich-Riehartz, 2 parts, Berlin, 1840, 1867; *Δημοτικὴ Ἀθολογία*, M. S. Lelekos, Athens, 1868; *τὰ Κυπριακά*, 3d vol., A. A. Sakellarios, Athens, 1868; *Νεοελληνικὰ Ἀνάλεκτα*, Athens, 1871-81; *Recueil de chansons populaires Grecques*, É. Legrand, Paris, 1874; *Kretas Volkslieder*, A. Jeannarakis, Leipzig, 1876; *Griechische Märchen, Sagen, und Volkslieder*, A. Schmidt, Leipzig, 1877; *Συλλογὴ δημοῶδων ᾠμάτων τῆς Ἠπειροῦ*, P. Arabantinos, Athens, 1880; *Τραγούδια τοῦ Ὀλύμπου*, A. K. Oikonomides, Athens, 1881; *Δελτίον τῆς ἱστορικῆς καὶ ἐθνολογικῆς ἐταιρίας τῆς Ἑλλάδος*, Athens, 1883 ff.; K. N. Kanellakes, *Χιακὰ Ἀνάλεκτα*, Athens, 1890; *Ζωγραφεῖος Ἀγών*, vol. i., Constantinople, 1891.

Russian.—Bylinas, Popular Epics, Heroic Ballads: the collections of Kirsha Danilof and Kalaidovitch, Moscow, 1818, 3d ed. 1878; of P. N. Rybnikof, vols. i., ii., Moscow, 1861-62, vol. iii. Petrozavodsk, 1863, vol. iv., St. Petersburg, 1867; of P. V. Kirveevsky, ed. Bezsonof, 10 parts, 2d ed., Moscow, 1868-75; of A. F. Hilferding, St. Petersburg, 1873; *Untersuchungen über die Volksepik der Grossrussen*, W. Wollner, Leipzig, 1879; *The Epic Songs of Russia*, Isabel Florence Hapgood, New York, 1886. *Piesni russkago naroda* (Songs of the Russian People), 5 vols., J. P. Sakharof, St. Petersburg, 1838-39, and his *Skazaniya r. n.*, 3d ed. vol. i., St. Petersburg, 1841; *Kalyeki Perekhozhie* (Wandering Psalm-singers), 2 vols., P. Bezsonof, Moscow, 1861-62; *Russkiya narodnyya piesni*, P. V. Shein, Moscow, 1870.

South Russian (Little Russian, Ruthenian, White Russian).—*Piesni ludu ruskiego w Galieyi*, Z. Pauli, Lemberg, 1839-40; *Prósni wieśniacze z nad Niemna i Dzwiny*, J. Czeezot, Wilna, 1844, 1846; *Sbornik ukrainskikh piesen*, M. A. Maksimović, Kiev, 1849; *Narodnyya yuzhnorusskiya piesni*, A. Metlinsky, Kiev, 1854; *Belorusskiya piesni*, P. A. Bezsonof, Moscow, 1871; *Belorusskiya narodnyya piesni*, P. V. Shein, St. Petersburg, 1874; *Tchumatzkiya narodnyya piesni*, I. Ya. Rudtchenko, Kiev, 1874; "Trudy" of the Russian Geographical Society, southwest division, vol. v., St. Petersburg, 1874; *Istoricheskiya piesni malorusskago naroda*, V. L. Antonovitch and M. Dragomanof, vols. i. and ii. 1, Kiev, 1874-75; *Narodnyya piesni galitzkoi i ugarskoj Rusi*, J. F. Golovatsky, 4 vols., Moscow, 1879. See also Polish, below.

South Slavic (Serbian, Croat, Illyrian, Slovenian).—*Narodne srpske pjesme* (Songs of the Serbian People), Vuk St. Karadžić, 3d ed. 5 vols., Vienna, 1841-65; *Volkslieder der Serben*, Talvj (Mrs. Robinson), 2d ed. 2 vols., Leipzig, 1853; *Die Gesänge der Serben*, S. Kapper, 2 parts, Leipzig, 1852; *Poésies pop. Serbes*, A. Dozon, Paris, 1859; *Pievaniya tzer-nogorska i hertzevatehka*, S. Milutinović, Vienna, 1833, Leipzig, 1837; *Srpske narodne pjesme iz Bozne i Hertze-govine*, B. Petranović, Belgrad, 1867; *Srpske narodne pjesme*, K. X. Ristić, Belgrad, 1873; *Pjesme: s dodatkom narodnih pjesamah puka hrvatskoga*, I. Kukuljević, Agram, 1847; *Narodne pjesme* (Croat, Dalmatian, Bosnian, Servian), L. Zupan, Agram, 1848; *Narodne pjesme izdala Matica Dal-matinska*, Zara, 1865; *Narodne pjesme*, V. Bogišić, Belgrad, 1878; *Jačke ili narodne pjesme puka hrvatskoga*, F. Kurelac, Agram, 1871; *Južno-slovijske narodne po-*

pievke, Chansons nationales des Slaves du Sud, F. Kuhač, 4 vols., Agram, 1878-81; *Narodne pjesni ilirske* (Styria, Carinthia, West Hungary), Stanko Vraz (= Jacob Fras), Agram, 1839; *Volkslieder aus Krain*, übersetzt von A. Grün (Count Auersperg), Leipzig, 1850; *Ovrtje slovenskega naroda*, A. Janežič, Klagenfurt, 1852; *Narodne pesmi koroških slovencev* (Carinthian), J. Scheinigg, Laibach, 1889.

Bulgarian.—*Bolgarskiya piesni*, P. Bezsonof, Moscow, 1855; *Bulgarski narodni piesni*, D. and K. Miladinof, Agram, 1861, 2d ed., Sophia, 1891; *Chansons pop. bulgares inédites*, A. Dozon, Paris, 1875; *Sbornik zapadno-bolgarskikh piesen*, V. Katchanovski, St. Petersburg, 1882; *Sbornik* of the Bulgarian Ministry of Public Instruction, Sophia, 1889-91, vols. ii., iii., v.

Polish.—*Pieśni polskie i ruskie ludu galicyjskiego* (Polish and Russian people in Galicia), W. z Oleska, Lemberg, 1833; *Pieśni ludu bialo-chrobotów, mazurów, i rusi z nad Bugu* (White Chrobatians, Massovians, and Russianians on the Bug), K. W. Wojciecki, Warsaw, 1836; *Piosnki wieśniacze z nad Niemna*, J. Czeczot, Wilna, 1837; *Pieśni ludu polskiego w Galicyi*, Z. Pauli, Lemberg, 1838; *Piosnki ludu wielkopolskiego*, J. J. Lipiński, Posen, 1842; *Pieśni ludu podhalan*, L. Zeiszner, Warsaw, 1845; *Pieśni ludu polskiego*, Oskar Kolberg, Warsaw, 1859, and in many of twenty subsequent volumes of his *Lud*, 1867-88, as also in his *Mazowsze*, 4 vols., Cracow, 1885-88, and his *Pokucie*, 4 vols., Cracow, 1882-89; *Pieśni ludu polskiego w Górnym Szląsku* (Silesia), J. Roger, Wrocław, 1863; *Lud, Pieśni, etc.*, K. Kozłowski, Warsaw, 1869; *O Mazurach*, W. Kętrzyński, Posen, 1872; *Lud okolic Zarek*, M. Fedorowski, Warsaw, 1888-89; *Z. Powreści i Pieśni górali beskidowych*, R. Zawiliński, Warsaw, 1889; *Jagodne*, Z. Wasilewski, Warsaw, 1889.

Bohemian, Moravian, Slovakian.—*Slowanské národní písně* (Bohemian, Moravian, Slovakian, and other), F. L. Čelakowský, 3 parts, Prague, 1822-27 and 1839-44; *Národní zpěvanky čili písně světské slováků v Uhrách* (Popular Songs of the Slovaks in Hungary), J. Kollár, 2 vols., Buda, 1834-35; *Prostonárodní české písně, etc.*, K. J. Erben, 3d ed. Prague, 1862-64; *Böhmische Granaten, Czechische Volkslieder*, M. Waldau, 2 vols., Prague, 1858-60; *Moravské národní písně*, F. Sušil, 2d ed. Brünn, 1860; *Sborník slovenských národních písní, etc.*, Matica Slovenská, Turc St. Martin, i. 1870, ii. 1, 1874; *Národní pohádky písně, etc.*, by the society "Slavia," Prague, 1873-75 (Národní písně, pohádky, etc.), 1877-78; *Nové národní písně moravské*, F. Bartoš, Brünn, 1882.

Wendish.—*Volkslieder der Wenden in der Ober- u. Nieder-Lausitz*, L. Haupt and J. E. Schmalzer, Grimma, 1841-43; *Dehjoluziske pjesnje*, E. Muka, Bautzen, 1877; *Dodawki k ludowym pjesnjam*, E. Muka, Bautzen, 1883.

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Breton.—*Barzuz-Breiz, Chants populaires de la Bretagne*, Th. Hersart de la Villemarqué, Paris, 1867; *Chants populaires de la Basse-Bretagne*, F. M. Luzel: Gwerziou Breiz-Izel, 2 vols., Lorient, 1868, 1874, *Soniou Breiz-Izel*, 2 vols., Paris, 1890; *Chansons et Danses des Bretons*, N. Quellien, Paris, 1889.

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Finnish.—*Finnische Runen* (Finnish and German), by H. R. von Schröter, Stuttgart, 1834, Upsala, 1819, Stuttgart, 1875; *Kanteletar*, E. Lönnrot, 2 vols., Helsingfors, 1840, in one vol., 1864; *Kalevala*, ed. E. Lönnrot, Helsingfors, 1849, 1866 (compounded from popular epic songs); *Les Variantes du Kalevala*, J. Krohn (1st part), Helsingfors, 1888. **Esthonian.**—*Ehstnische Volkslieder*, original and translation, H. Neus, Reval, 1850-52; *Vana kannel, Vollständige Sammlung alter estnischer Volkslieder*, 2 vols., J. Hurt, Dorpat, 1884-86. **Magyar.**—*Népdalok és Mondák* (Songs and Tales), J. Erdélyi, 3 vols., Pesth, 1846-48; *Ausgewählte ungarische Volkslieder*, translated and edited by K. M. Kertbeny, Darmstadt, 1851; *Vadrózsák* (Wild Roses, a collection of Szekler Popular Poetry), J. Kríza, Klausenburg, 1863; *Magyar Népköltési Gyűjtemény* (Collection of Magyar Popular Poetry), L. Arany and P. Gyulai, 3 vols., Pest, 1872, 1882; *Koszorúk* (Garlands from Alföld), L. Kálmány, Arad, 1877. **Turkish.**—*Proben der Volkshitteratur*

der türkischen Stämme Süd-Siberiens, W. Radlof, 6 vols. of text and 6 of translation, St. Petersburg, 1866-86.

Of comprehensive works and collections the most noticeable are: *Stimmen der Völker in Liedern*, J. G. v. Herder, 1778, ed. by J. v. Müller, Tübingen, 1807; Talvj (Mrs. Robinson), *Versuch einer geschichtlichen Charakteristik der Volkslieder germanischen Nationen, etc.*, Leipzig, 1840; *Hausschatz der Volkspoesie*, O. L. B. Wolff, Leipzig, 1853; *Volksdichtungen nord- u. südeuropäischer Völker alter u. neuer Zeit*, J. M. Firmenich, 1867. F. J. CHILD.

Ballanche, baäl'lääñsh', PIERRE SIMON: a French social theorist; b. at Lyons, Aug. 4, 1776; was at first a simple printer, but soon gave signs of a certain strange literary power. In 1812 Mme. Récamier made his acquaintance, and a deep, as well as lasting, friendship began between the two, which led Ballanche to sell his printing business and remove to Paris. Here he at once attracted attention because of his mystical speculations upon the course of human history, and his predictions of the speedy coming of a new order of things in society and government. Taking up Bonnet's theory of individual palingenesis, he transferred it to states, and brought it into the form of a system, which he developed in the following works: *Antigone* (1815); *Essai sur les Institutions Sociales* (1818); *Vieillard et jeune homme* (1819); *L'Homme sans nom* (1820); *Essais de palingénésie sociale* (never completed). His system bears the name of "Ballanchisme." See *Œuvres de Ballanche* (4 vols., Paris, 1830; *ibid.*, 5 vols., 1833); L. de Loménie, *M. Ballanche, par un homme de rien* (1841); Albert Aubert, *P. S. Ballanche* (1847). See his *Life* by J. J. Ampère, Paris, 1848. D. in Paris, June 19, 1847. A. R. MARSH.

Bal'lantine, WILLIAM: English lawyer; b. in London, Jan. 3, 1812; called to the bar 1834; created sergeant 1856; assisted in the famous Müller murder trial, the Tichborne case, and the defense of the Gaikwar of Baroda; said to have received a fee of 20,000 guineas for the latter case to induce him to visit India. Author of *Experiences of a Barrister's Life*, London (1882); *Old World and the New* (1884). D. in Margate, Jan. 9, 1887.

Ballantine, WILLIAM GAY: Congregationalist; b. at Washington, D. C., Dec. 7, 1848; graduated at Marietta College, Ohio, 1868, and at Union Theological Seminary, New York, 1872. He was professor at Ripon College (1874-76), at Indiana University (1876-78), and in Oberlin Theological Seminary (1878-91), president of Oberlin College (1891-96). He is one of the editors of the *Bibliotheca Sacra*. GEORGE P. FISHER.

Ballantyne, JAMES: b. at Kelso, Scotland, 1772; d. in Edinburgh, Jan. 17, 1833; and JOHN, b. at Kelso, 1774; d. at Edinburgh, June 16, 1821: Sir Walter Scott's printers. See *The History of the Ballantyne Press* (Edinburgh, 1871); and SCOTT, SIR WALTER.

Bal'larat: an Australian city and gold-field in Victoria; 75 miles W. N. W. of Melbourne (see map of Australia, ref. 8-II). The gold mines of this place, which were opened in 1851, are among the richest in the colony of Victoria. Surface digging is a thing of the past; many of the mines are hundreds of feet deep. Quartz reefs are also worked, and there is extensive crushing machinery for extracting the gold. Ballarat is unrivaled in the fineness of its gold, which averages 23½ carats, the pure metal being 24 carats. Pop. (1895) 45,326 (estimated).

Bal'last [nautical term common to most European languages. Perhaps from Scand. *bar*, bare, mere + *last*, load]: material carried by a ship or other vessel to increase its stability. Hence, in railroad engineering, material placed below and around the cross-ties of a railroad track, such as gravel, cinders, furnace slag, or broken stone. Its office is to make a solid roadway over which trains may pass smoothly, to secure quick and thorough drainage, and to prevent the formation of dust. On the best roads the depth of the ballast below the bottom of the ties is 12 inches, and, as the spaces around the cross-ties are filled in level with their tops, its total depth is 16 or 17 inches. Gravel and cinders, often used on light roads, make a ballast cheaper than broken stone, but it is liable to become dusty and also to heave under the action of frost. Furnace slag, in localities where it can be had, is extensively used, and makes a very smooth riding track. But broken stone best answers the requirements of a perfect ballast. It should be uniform in size, angular, and each piece should be able to pass in any way through a 1½-inch ring. By its use an even and

solid track is secured, together with perfect drainage, thus insuring long life to the cross-ties; it does not heave in winter, can be worked in both wet and dry weather, and is free from dust. Trap and hard sandstone rocks make good ballast, and also some limestones. MANSFIELD MERRIMAN.

Ballenstedt, baal'len-stet: town in the duchy of Anhalt; S. E. part of Harz Mountains. Pop. (1890) 4,779. The castle was, until 1863, the residence of the Dukes of Anhalt-Bernburg.

Ballet, baal'lay' [Fr., dimin. of *bal*, dance]: a dramatic or theatrical exhibition of dancing and pantomime, with music; a species of dance usually forming an interlude in theatrical performances, but confined principally to operas. The ballet has some resemblance to the pantomimic sacrificial dances of the ancient Greeks, among whom were dancers who expressed actions and passions by rhythm applied to gesture. The ballet was introduced into France under the auspices of Catherine de' Médié about 1580. Noverre about 1770 made improvements in it, to which he gave an independent dramatic form. The Vestris family were celebrated as performers in ballets. In recent times the public favor is almost exclusively bestowed on female dancers. The ballet has degenerated in many respects of late years.

Ballia: a district of Benares division, Northwestern Provinces, British India. It is at the eastern extremity of these provinces, between the Ganges and Goggra. Area, 1,145 sq. miles. Pop. about 1,000,000.

Ballina': a market-town and seaport of Ireland, partly in Mayo and partly in Sligo counties; on the river Moy; 7 miles from its entrance into Killala Bay, and 18 miles N. N. E. of Castlebar (see map of Ireland, ref. 6-D). The part of the town on the east bank of the Moy is called Ardnaree. Ballina has manufactures of coarse linens and snuff; also an active trade in fish, provisions, etc. Pop. 6,000.

Balliol: See BALIOL.

Ballis'ta, or **Balis'ta** [Lat.]: a military engine used before the invention of gunpowder to propel large stones or other heavy missiles. It probably originated with the ancient Romans, who used it in the siege and defense of fortified places. The construction of the ballista is not well understood. It appears that the elastic force with which a twisted rope uncoils itself was commonly used as the propelling power, with which other forces were perhaps combined. For a vivid picture of the effects of the ballista, see Lucan's *Pharsalia*, lib. iii. l. 465 *et seq.*

Ballis'tic Galvanom'eter: a galvanometer which measures electrical quantity by means of its first oscillation, instead of measuring electric current by its permanent deflection. The term refers rather to the method of using a galvanometer than to the type of instrument employed, although the qualities sought for, viz., a long period of oscillation and an undamped movement of the needle, differ from those essential to the ordinary galvanometer. See ELECTRICITY and GALVANOMETER. E. L. NICHOLS.

Ballistic Pen'dulum: an instrument used to ascertain the velocity of projectiles and to prove the quality of gunpowder. In its simplest form it consists of a large block of wood suspended as a pendulum bob at that point in the path of the projectile for which the velocity is desired. When the angle through which the pendulum swings after impact with the shot, which lodges in the wooden bob, is known, together with the centers of suspension and oscillation of the mass, the velocity of the shot can be determined by calculation. The gun itself is also sometimes made a ballistic pendulum, being suspended, and its recoil observed. But these contrivances are both long since superseded by various electrical devices for determining the velocity of projectiles. E. L. NICHOLS.

Ballistics [from *ballista*, *q. v.*]: that branch of dynamics which treats of the circumstances of motion of projectiles from the instant of ignition of the powder charge to that at which the projectile comes to rest.

It is divided into "interior" and "exterior" ballistics.

Interior ballistics attempts to determine the intensity of the pressure of the powder gases in the bore of the gun, and the law of variation in this arising from differences in the quantity, composition, density, size of grain and density of loading of the powder, and the weight and frictional resistances of the projectile.

Also it attempts to determine the law of variation in the motion of the projectile and its velocity at any point of the

bore of the gun, under the varying pressure of the powder gas, the friction of the projectile, and the resistances of inertia arising from its acceleration in motion of translation and rotation.

Exterior ballistics deals with the circumstances of the motion of the projectile between the instants at which it leaves the muzzle of the gun and that at which it comes to rest. It seeks to determine the amount of and law of variation in the resistance of the atmosphere, and its effect in retarding projectiles of different weight and form, moving with different velocities; as well as in producing "drift" or lateral deviation in rifled projectiles; and from these elements to construct the actual trajectories described by projectiles fired from small arms and cannon of all kinds. The physical and mathematical discussion of this subject is very complicated. See GUNNERY and GUNPOWDER.

BOOKS OF REFERENCE.—Ingall's *Interior Ballistics*; Ingall's *Exterior Ballistics*; Noble and Abel's *Experiments on Fired Gunpowder*; Sarrau's *Researches on the Effect of Powder*. JAMES MERCUR.

Balloons: See AERONAUTICS.

Balloon-fish: a name of various fishes of the families *Tetraodontidæ*, *Diodontidæ*, and *Triodontidæ*. They are so named from the power which they possess of inflating their stomachs with air, and thus floating, belly upward, on the surface of the water for the purpose of evading pursuit. Many species are known, of which several are American. They are not used for food. Revised by D. S. JORDAN.

Ballot Reform [*ballot* is from Ital. *ballotta*, dimin. of *balla*, ball]: such changes in the voting system as will best secure the secrecy of the ballot, and prevent fraud at the polls and in the count. The earliest and simplest form of election in all parts of the world has doubtless been *viva voce*, or by a showing of hands, as is now common in ordinary public meetings upon matters of lesser importance. It soon becomes evident, however, everywhere, that many persons have not the moral courage to express their opinions independently in the presence of others holding hostile opinions. Consequently, as in ancient Greece, in the case of ostracism, and in modern times in nearly all civilized countries in elections, the method of voting by ballot has been introduced in order to secure secrecy, and thereby independence. The form of the ballot at times has been a ball, a shell, colored beans, etc., but the most common form has doubtless been by written or printed ticket.

In all of the elections in the U. S., and in many foreign countries, it has been the custom for the candidate, or his party managers, to provide printed slips of paper containing the names of the candidates to be presented to the voters. The voter then, after making his selection among these tickets, could fold his ballot and present it to the election officers, or himself place it in the ballot-box without revealing its purport. The importance of the interests at stake, however, and the consequent influence that was brought to bear upon the voters, led in very many cases to intimidation and fraud, so that of late years, especially among the English-speaking races, some method of reform has been found necessary.

METHODS OF FRAUD.—The expense involved in the printing of tickets by political parties and by candidates led to the practice of raising large sums of money, ostensibly for the purpose of paying these legitimate expenses. The money, however, in the hands of campaign committees was frequently used for the purpose of renting unnecessary rooms, of hiring voters at enormous pay, for erecting campaign poles for banners, etc., for paying voters for guarding these poles, and for other methods more or less indirect and of purchasing votes. Perhaps the most common form in the U. S. has been that of hiring *ticket-peddlers*, that is, men whose business it is to stand at the polls and provide voters with tickets of the various candidates. The work seems a legitimate one under the old method of voting, but it was easy to hire an unnecessarily large number of men to do this work, and thus secure their votes. Another form of fraud at times practiced was the voting of *tissue ballots*. The ballots were printed on light but stiff tissue paper, so that a large number of ballots might be folded inside of one printed upon ordinary paper without detection. If they were not folded too closely the shaking of the box or a twisting of the ballots as they were dropped into the box would separate them, so that it was impossible to tell whether they were properly cast or not. When, at the close of the polls, it was found that more ballots had been cast than there

were voters in the district, the drawing out of the surplus ballots at random would still leave the advantage very largely with the fraudulent voter. The fact that it was possible to put a ticket into a voter's hand and keep him in view until it was safely deposited in the ballot-box made possible also the *direct purchase* of votes. In many cases voters have been corrupted by the dozen; tickets have been placed in their hands which were to be held in such position that a watcher could see them, and the men then marched in file to the ballot-box under careful supervision until each ticket was deposited, when they could be taken to a place free from observation and paid the reward of their infamy. In densely populated cities, where the number of voters at any polling-place was large, and where, consequently, it was practically impossible for all the voters in any one precinct to be personally known by any one man, "*repeating*" has been common. A man might vote readily in his own home district in the morning, then pass from voting precinct to voting precinct in the same city, casting a vote in every place with little danger of detection. So, too, it was possible for political managers to bring into the voting district men from elsewhere, not legitimate voters, and have them cast votes on election day.

REFORM MEASURES.—To check these methods of fraud the following methods of reform have been introduced in various places, with a large degree of success.

1. *Registration.*—To guard against "*repeating*" and the "*importation*" of voters, no method has been found so efficient as that of a previous registration. Under this system each voter is required to register his name with the election officers at certain fixed times, varying from ten days to four weeks before the election. These registration lists, when completely made up, are then opened to the inspection of the public; and agents of the various candidates, or other citizens, looking them through carefully with ample leisure for investigation, have full opportunity of detecting and exposing any illegal registration. On election day these registration lists are in the hands of the election officers, and no person whose name does not appear upon the list is permitted to vote. In country districts, where voters have frequently to go long distances in order to register, and where also, on account of the more intimate acquaintance of the voters one with the other, "*repeating*" or "*importation*" of voters is less likely to be successful, the system of registration seems at times to work hardship. A modification of this system, introduced in Indiana in 1889, has many commendable features. In that State the law does not require repeated registration of citizens who reside continuously in the same county; but registration is required of every person who moves into any county within six months preceding an election, and also of every person who, having once been a citizen of that State, shall have voted in another State, or shall have been absent from the State for a period long enough to lose his domicile, unless upon leaving the State he has declared his intention of still holding his citizenship and of returning within a specified period. The registration also is required to be made at a period (fifty-nine days) longer than usual before an election. This modification of the system seems to guard against fraud as well as the other, and to work much less hardship in ordinary cases.

2. The most efficient safeguard that has yet been attempted against the other methods of fraud mentioned seems to be the *Australian ballot system*.

The essential features of this system are the arrangement and control of the polling-places, the inclosed polling-booth, and the official ballot.

a. While usage in different places varies somewhat, it is customary for no electioneering to be permitted within 50 feet of the polls, and for each voter to approach the *polling-place* through a chute 50 feet long, formed of ropes or a light railing. In the voting-room only the officers of election and from one to three voters are permitted at a time. In this way the voter is protected from the importunities of electioneering agents while preparing his ballot.

b. The *booths* are small stalls arranged in some part of the voting-room, so that the voter, while preparing his ballot in

the booth, shall be entirely screened from observation. Each booth is provided with a shelf or counter at the proper height, and with all of the materials necessary for marking or otherwise preparing the ballot.

c. The expenses of preparing, printing, and distributing the *official ballots* are all borne by the state or the local government, thus removing from political parties in good part the necessity for the raising of large sums of money to be used as campaign funds. The system at its best permits the use of no ballots except the official ones; and these, prepared and printed under the direction of election officers, are given out only within the polling-place, one to each voter as needed. It is a crime in some States, punishable by fine and imprisonment, for any person to have an official ballot in his possession outside of the polling-place.

The original and perhaps the most common form of this ticket in the U. S. is that used in Massachusetts. There the names and addresses of all the candidates for each office are arranged in a column alphabetically, with a small blank space opposite each name. All the names for all the offices are thus grouped together upon one "*blanket ballot*."

In the United Kingdom and Canada, where usually very few officers are voted for at the same time, often only one, besides the name and residence of the candidate appears also his business. The voter designates the candidate for whom he wishes to vote by placing in the square opposite his name a small cross with a lead-pencil or a rubber stamp. In Missouri the names of those not voted for are to be erased, leaving untouched the name of the preferred candidate.

A second form of ballot that meets with more favor where party feeling is strong, and there is a large number of officers to be voted for at the same election, is that used in Indiana and other States. On this the names of all the candidates representing one political party are grouped together in one column, with the name of the political party which they represent at its head, and in the small square in line with that name the voting-mark is to be placed. Usually also at the head of the column will be placed some device, readily recognized by the illiterate voter, such as a domestic fowl, an eagle, or the like, as in the accompanying diagram. In order to prevent more effectively the use of any but official ballots, it is customary to place upon the back of the ballot some official designation, either a printed device or the name and number of the polling-district, or, more commonly, the written initials of the poll-clerks; and when voted the ballot must be so folded that, while the names of the candidates are all concealed, these initials or other devices shall be on the outside and visible to the inspector of elections.

In order to favor the illiterate voter still more, as well as to avoid the constitutional objections in the States providing for manhood suffrage, some of the States, notably New York, have provided that "*paster ballots*" may also be employed. These paster ballots may contain the names of any candidates for whom the voter may desire to cast his ballot, and may be prepared outside by any person and brought by the voter into the polling-place, and cast by pasting them upon



the face of the official ballot. It is claimed by many, with some justice, that without the use of the "*paster ballot*" many illiterate voters would be practically disfranchised. In most States, however, provision is made that any voter, by declaring his inability to read, or such physical disability that he can not prepare his ballot, may be accompanied to the booth by the election officers, who will give him needed assistance.

For the success of this system, as well as of a careful registration system, it is desirable that the election precincts be made small, so that the number of voters in each shall not be more than two or three hundred, in order that they may be readily known, and may all vote in one day without

undue haste. The accompanying diagram A will make clear the method of voting under the Australian election system.

The voter enters the chute E, E. Challengers, representing the leading political parties, standing outside of the polling-place by the window C, may challenge his vote if there is question as to his being a legal voter. A judge of election, from the inside, at the window, may administer the proper oath to test this question. Passing the challengers, he enters the door D, and receives from one of the poll-clerks at the table A his official ballot and whatever explanations he desires with reference to the

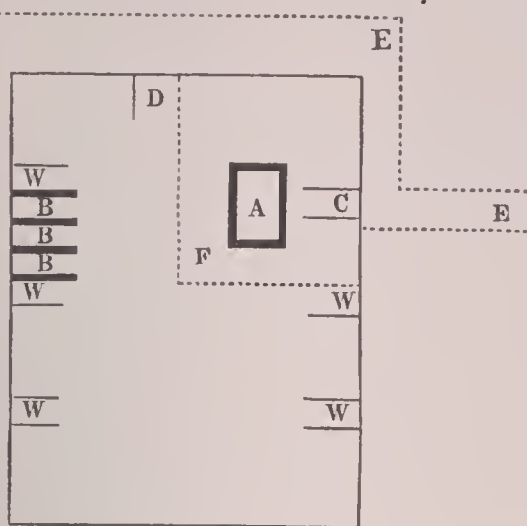


DIAGRAM A.—A. Table for election board. B, B, B. Booths where ballots are marked. C. Challenge window. D. Door. E, E. Chute through which the voter must enter. F. Railing separating the election board from the voters. W, W. Windows.

method of voting. Entering then one of the booths, he prepares his ballot, screened from observation, and, folding it so that no one of the names on the ballot can be seen, he goes out of the booth, hands the ballot to the inspector, who places it, in his presence, in the ballot-box. He then withdraws immediately from the room, and gives place to another voter.

The Myers American ballot-machine offers, probably, the most effective way of insuring absolute secrecy of the ballot, with the additional advantage (no slight one) of readiness of counting. This ballot-machine consists of a cabinet some 7 feet high and 5 feet in width and depth. It is simply a light iron frame covered with heavy sheet iron, divided by a steel partition into a voter's compartment, 4 feet by 5 feet in size, and a counter compartment, 1 foot by 5 feet, in which are lever mechanical counters. The voter enters his compartment, and a door is closed after him, leaving him entirely alone. In the compartment are vertical rows or columns, 6 inches apart, of "ballot-pushers," nickel-plated knobs standing out 3 inches from the partition. To the left of each column of knobs are the permanent ballots of each particular party, containing in large print the name of the candidates and the name of the office for which each is intended to be chosen, and nothing else but a large index hand pointing to the proper knob. These ballots are arranged in the most convenient manner, with the most important office at the top. A man votes for any candidate whom he prefers by pushing inward for 2 inches the knob opposite his name. This act counts one for this candidate upon the hidden dial in the counter compartment, and at the same time locks out all other push-knobs of the other candidates for the same office. By pushing in these ballot knobs, in a few seconds a man may vote either a straight or a split ticket without possibility of mistake, and his votes are at the same time counted upon the unseen dials. After voting he goes out through the exit door, the closing of which returns the knobs ready for the next voter.

As there are models of the keyboard of the machine placed in different situations about the polling-place, that may be studied before one enters the cabinet, an illiterate voter by counting the knobs, and even a blind voter by a sense of touch, may vote, it is claimed, with perfect accuracy without assistance. Immediately after the close of the election the counter compartment is unlocked by the inspectors of election, and they find the totals already recorded upon the dial opposite each candidate's name, so that within three minutes after the polls close the entire result is known, and there can be no error in the count. The machine is durable, cheap, may be used more rapidly than the present system, seems to be absolutely secret, and does its own counting. It has been tested in many places and seems to meet all the requirements for voting. The accompanying diagrams (B and C) show a section of the keyboard and of the concealed counter compartment. See VOTING MACHINES.

These ballot-reform laws already described have doubtless done much to prevent corruption of the voters, but none of

them have proved entirely efficient. For the man who lacks the moral courage to vote as he wills in the presence of others, or who is likely to be terrorized by an employer or other person to whom he is under obligations, the Australian

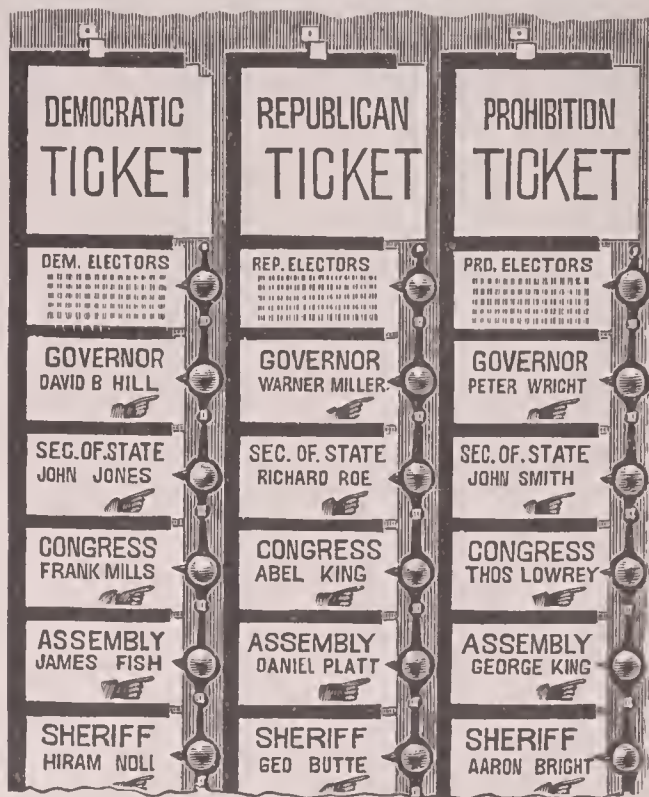


DIAGRAM B.

ballot or the Myers machine gives perfect security. But many voters who are willing to sell their votes, even though they can not be followed to the polls by the briber, have

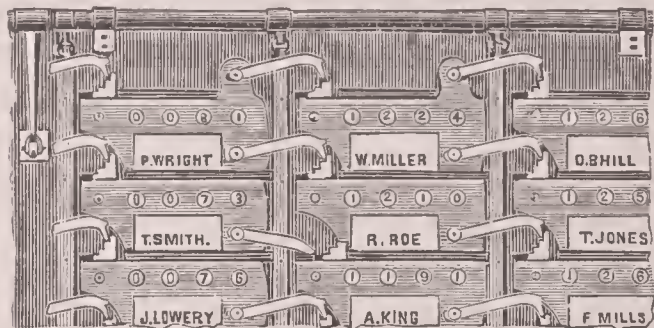


DIAGRAM C.

still honor enough left to cast their vote as they have agreed. So, too, at times, when election inspectors are not unwilling to tolerate corruption, the laws are in good part practically set aside by their lax enforcement by the election officers. Various devices to cheat the election officers have also been discovered in different places; but, on the whole, the Australian system has been very efficient, and has doubtless reduced vote-buying to a very great extent. The system is in use in all Australasia, where it was first used. Canada and all the States of the U. S. but fifteen have adopted some modification of the system, while in Europe Belgium, Italy, Greece, Norway, Great Britain, and Luxembourg have similar systems.

No ballot reform, however, is complete that deals only with the casting of the ballot. The method of making nominations (see PRIMARY ELECTIONS) must also be controlled, and efficient laws must be provided for inflicting severe penalties upon those violating election laws. The most efficient form of a Corrupt Practices Act is perhaps found in Great Britain.

Corrupt Practices Acts.—The first act for the prevention of corrupt practices in elections in the United Kingdom was passed in 1854, and this has since then been supplemented by others in 1858, 1863, 1882, and 1883. These acts give in the first place a very complete and thorough definition of bribery, both for the giver and the receiver, of treating, and of undue influence over voters. The law limits strictly the amount of money that may be expended at any election by any candidate, or by an agent in his behalf. It forbids the expenditure of money for many purposes that are common in other places; such as for the conveyance of electors to or from the polls by the hiring of horses or carriages, or pay-

ment of railway fares or otherwise, or for the use of committee-rooms or other buildings or premises beyond a certain fixed number, or for any entertainment (beyond a certain fixed amount for speakers and others), or for bands of music, torches, flags, badges, ribbons, etc., or for the employment of more than a designated number of agents and sub-agents for electioneering purposes. After the election an itemized statement of all the expenditures incurred on his account is to be made by the candidate and his agent under oath, and the further declaration that no expenses have been made contrary to the law or for purposes of bribery, direct or indirect. These reports must be public. "If it is found that a corrupt practice has been permitted with the knowledge and consent of the candidate, he is forever disqualified from holding office and is deprived of his franchise as an elector. If such corrupt practice is found to have occurred by the act of the agent, with or without the candidate's knowledge and consent, the candidate himself is disqualified from serving during the time for which he was elected, and can neither hold office nor act as an elector for seven years. Similar penalties are imposed on agents and sub-agents found guilty. These penalties are all in addition to penalties of fines and imprisonment for conviction on an indictment of bribery, undue influence, treating, illegal payments, or other corrupt practices."

Any unsuccessful candidate, if he has reason to believe that his successful opponent has employed corrupt practices of any kind, may by petition have a scrutiny, and, if he can prove his charge, may unseat his opponent and take the seat himself, unless it can be proved that he also has been guilty of corrupt practices, in which case a new election must be held. These acts in connection with the secret ballot have resulted in almost entirely suppressing corruption in elections in many parts of Great Britain and Canada, and have greatly decreased it wherever introduced. Similar acts, more or less complete, some covering only the expenses of the candidate, which may be evaded by giving a large sum to an irresponsible committee, others covering also the work of committees, have been passed in Massachusetts, New York, Minnesota, and other States. It is too soon yet to see the full effect here, but it will doubtless be good.

AUTHORITIES.—John H. Wigmore, *The Australian Ballot System* (Boston, 1889), and the statutes of the States mentioned above.

JEREMIAH W. JENKS.

Ballou, HOSEA: one of the fathers of the Universalist denomination in the U. S.; b. at Richmond, N. H., Apr. 30, 1771. His early education was acquired by his own efforts, though he had to contend with unusual obstacles. He began to preach when about twenty-one years of age, and labored in various places in New England. In 1807 he settled in Portsmouth, N. H., in 1815 in Salem, Mass., and in 1817 in Boston. In 1819 he became editor of the *Universalist Magazine*, and in 1831–32 was connected with the *Expositor*. He was a radical reformer of the Universalist theology, which, as shaped by Murray, the founder of Universalism in America, had been Calvinistic in its doctrines, with the exception that all were, as he thought, elect and consequently all saved. Ballou rejected Calvinism entirely, and the orthodox doctrines of the Trinity and Atonement by the vicarious sacrifice of Christ. He did this several years before it was done, at least openly, by the New England Unitarians. D. in Boston, June 7, 1852. Among his works are *Notes on the Parables* (1804), and an *Examination of the Doctrine of a Future Retribution* (1846); also, with a friend, a book of Universalist hymns, now very rare, remarkable for its lack of poetic merit. See his *Life*, by M. M. Ballou; another by T. Whittemore (1854), and one by O. F. Safford (1889). Revised by JOHN W. CHADWICK.

Ballou, HOSEA, D. D.: b. at Halifax, Vt., Oct. 18, 1796. He was a nephew of the foregoing. He entered the Universalist ministry in his youth, and preached at Stafford, Conn., and Roxbury and Medford, Mass. In 1822 became an editor of the *Universalist Magazine*, and was long connected with various journals of his denomination. He displayed much ability as editor of the *Universalist Quarterly*. He was (1854–61) the first president of Tufts College. He published *Ancient History of Universalism* (1829) and a hymn-book (1837). D. at Somerville, Mass., May 27, 1861.

Revised by JOHN W. CHADWICK.

Ballou, MATURIN MURRAY: journalist; son of Rev. Hosea Ballou; b. in Boston, Mass., Apr. 14, 1820; has edited *Ballou's Pictorial*, *The Flag of our Union*, *Ballou's Monthly*, and other periodicals; and has published a *History of Cuba*

(1854), *Biography of Hosea Ballou*, *Life-work of Hosea Ballou*, and a valuable compilation of quotations from a great number of writers. He became in 1872 one of the founders and the editor-in-chief of the *Boston Globe*. D. in Cairo, Egypt, Mar. 27, 1895. Author of *Due South; or, Cuba, Past and Present* (1885); *Due North* (1887), etc.

Ball's Bluff: Loudon co., Va.; on the right bank of the Potomac, about 33 miles N. W. of Washington. The bank here rises about 150 feet above the level of the river. It was the scene of a disastrous defeat of the U. S. forces under Col. E. D. Baker, Oct. 21, 1861. The hostile forces of the North and South had for several months confronted each other on opposite banks of the Potomac. On Oct. 19 and 20 reconnoissances were made in the direction of Dranesville and Leesburg by the Federal forces under Gen. McCall, without encountering any opposition. Gen. McClellan being anxious to ascertain the strength of the Confederates in these positions, on Oct. 20 (10:30 P. M.) instructions were sent to Gen. Stone at Poolesville, Md., directing him to keep a good lookout on Leesburg, to note the effect of this movement, and adding that "perhaps a slight demonstration on your (Stone's) part might have the effect to move them." Accordingly, Gen. Stone ordered the Fifteenth Massachusetts, Col. Devens, to be moved to Harrison's island in the Potomac, opposite the bluff, and about 100 yards distant from the Virginia shore; which was promptly effected in flatboats. At dark Devens sent a detachment of fifteen men under Capt. Philbrick to the Virginia shore to ascertain the whereabouts of the Confederates. After ascending the bluff they had proceeded but a short distance when they discovered what was supposed to be a camp, apparently but poorly guarded, which situation Philbrick reported to Col. Devens on his return. Devens forwarded this report to Gen. Stone, who immediately issued an order directing Col. Devens to land with five companies of his regiment and proceed to surprise the discovered camp at daybreak, and, after having accomplished this, to pursue as far as he deemed prudent, destroy the camp, and return to his position on the island, unless he saw a favorable position on the Virginia side which he could hold until re-enforced. At the same time Col. Lee (Twentieth Massachusetts) was ordered to occupy Harrison's island with his regiment, and to throw one company across to the heights on the Virginia shore to cover Col. Devens's return. These orders were carried into effect, and at daylight Devens advanced only to find the reported camp to be, in fact, no camp, the detachment of the night before having been deceived in the moonlight, and mistaken the openings between the trees for tents. Col. Devens, however, advanced to within a mile of Leesburg, where he halted and, concealing his force in the woods, reported to Gen. Stone that he had met with no opposition, and asked for further orders. About 7 A. M. a body of Confederates appeared, but retired when approached, and cavalry were also seen on the Leesburg road; whereupon Col. Devens fell back to the bluff without interference, and reported to Gen. Stone, who directed him to remain, and that he would be re-enforced. At this time his force of officers and men was about 650. The position he had taken up was surrounded on three sides by woods, and here about noon he was attacked and fell back to a more secure position; being again attacked, he retired still farther, to the edge of the bluff, where he was re-enforced by Col. Baker with his regiment of First California Volunteers, and who by seniority of rank took command. Col. Baker's instructions were discretionary whether to remain or withdraw, but on finding an attack already commenced he decided to remain. The force at his command amounted to about 1,900 men; the Confederate force in the woods was reported at 1,700, not including, however, a regiment of Mississippi volunteers so stationed as to prevent succor to Col. Baker from Edwards's Ferry. Col. Baker had no more than disposed his men in line when he received a vigorous attack on his right, extending soon to his left and center. For two hours a desperate conflict was maintained, the Federals from their exposed position suffering by far the heaviest loss. Col. Baker, who displayed the greatest bravery, was killed about five o'clock, and the command devolved upon Col. Cogswell (New York Tammany Regiment). The severe fire to which the Federal troops had been subjected, and the fearful loss they had sustained, caused them to waver, and the only hope that appeared to be left was to endeavor to join Gen. Stone, who was known to have a strong force at Edwards's Ferry, about 2 miles away; but this

movement was met by a body of fresh Mississippi infantry, and under their attack the disheartened and reduced troops were routed, and, flying in great disorder down the bluff, were subjected to a galling fire from all directions. The boats to which they fled were upset or sunk by the Confederates' fire, and the few that escaped either swam out into the stream or concealed themselves along the banks of the river, reaching the Federal lines under cover of the darkness. In the meantime, Gen. Stone had ordered an advance across Edwards's Ferry, but his troops arrived on the field too late to furnish any material assistance. The Federal loss in killed, drowned, and wounded exceeded, probably, 1,000 men; Gen. Evans, in command of the Confederate forces, reported his loss at 155. Much blame was attached to Col. Baker for recklessness, and Gen. Stone was subsequently arrested and confined in Fort La Fayette in New York harbor, but was afterward discharged, and at a later period again given a command.

Ballston Spa, sometimes called simply **Ballston**: a village on Del. and H. Canal Co. R. R., capital of Saratoga co., N. Y. (for location of county, see map of New York, ref. 4-J); 6 miles S. W. of Saratoga Springs. Here are mineral springs, which rise from the lower part of the Hudson river (Silurian) shales, and rank among the best acidulous chalybeate springs in the U. S. The village has several manufactories, including axe and scythe works, immense pulp and paper mills, and one of the largest tanneries in the world; five churches, and graded school-system with high school. Pop. (1870) 2,970; (1880) 3,011; (1890) 3,527; (1900) 3,923.

EDITOR "DAILY NEWS."

Bally: See **BALI**.

Bally [from Gael. *baile*, Manx, *balley*, town]: a prefix signifying "town," entering into the composition of the names of a great number of places in Ireland and Scotland.

Ballyme'na: a market-town of Ireland; in the county of Antrim; on the river Braid, 2 miles above its junction with the Maine and 33 miles by rail N. N. W. of Belfast (see map of Ireland, ref. 4-I). It has large public schools, a cotton-spinning mill, and extensive bleaching-grounds, and is one of the greatest linen and flax markets in Ireland. Pop. 9,000.

Ballyshan'non: a seaport-town of Ireland; in the county of Donegal; on the river Erne at its entrance into Donegal Bay; 120 miles N. W. of Dublin (see map of Ireland, ref. 4-F). A bridge of fourteen arches here crosses the Erne. It has six churches and chapels. Here is a valuable salmon-fishery in the Erne. Pop. 3,000.

Balm (*Melis'sa officinalis*): a perennial herbaceous plant of the family *Labiatae*; a native of the south of Europe; is cultivated in American gardens, and prized for its lemon-scented leaves. The leaves, which are ovate and crenate, and the stem are occasionally used in medicine as a gentle aromatic, stimulant, and tonic. Its properties depend on an essential oil called oil of balm. An infusion of balm is an excellent beverage in febrile diseases.

Balmaceda, baäl-maä-thay'da, JOSÉ MANUEL: president of Chili; b. in Santiago, 1840; committed suicide in the Argentine legation house there, Sept. 19, 1891. Educated for the priesthood; founded Reform Club (1868); deputy and senator in Chilian Congress; minister to Buenos Ayres; Minister of Interior (1882); president (1886) for five years. In 1890 he began intrigues to place one of his creatures in office as his successor; appointed an unpopular cabinet, prorogued Congress, and set on foot fictitious revolts in Valparaiso, which broke out in June. A junta was formed in Congress and the navy, which denounced Balmaceda, seized the best-armed vessels and the nitrate provinces, and marched south, beating the presidential forces as they advanced, until they appeared before Santiago, Aug. 27, 1891. The president fled, but returned to refuge with the Argentine minister. He was succeeded by Admiral Jorge Montt, provisionally at first, by election Nov. 6, 1891.

Balmés, JAYME LUCIO: a Spanish Catholic priest; b. at Vich, in Catalonia, Aug. 28, 1810. He was a remarkably precocious scholar. He wrote in reply to Guizot an able work entitled *Protestantism Compared with Catholicism in its Relations to European Civilization* (3 vols., 1848), which was translated into English, French, Italian, and German. Among his other works is *Filosofia Fundamental*, which was translated into English by H. F. Brownson (New York, 1857). D. at Vich, July 9, 1848. See Antonio Soler, *Biografía de D. J. Balmés* (1850); Garcia de los Santos, *Vida*

de Balmés (1848); A. de Blanche-Raffin, *J. Balmés, sa Vie et ses Ouvrages* (1849).

Balm of Gilead: either of several quite distinct plants. In Great Britain it is a small shrub (*Cedronella triphylla*) of the mint family, and native of Canary islands. In the U. S. it is a species of poplar (*Populus balsamifera*, var. *candicans*). In Arabia the balm of gilead is *Commiphora opobalsamum*, var. *gileadensis*, a small tree of the family *Burseraceae*.

CHARLES E. BESSEY.

Balmor'al Castle: the autumnal residence of Queen Victoria; is in a beautiful valley in Aberdeenshire, Scotland, on the river Dee, 48 miles W. S. W. of Aberdeen. It commands a magnificent prospect, and comprises 40,000 acres of beautiful grounds. Prince Albert purchased this estate in 1852 for £32,000, and erected a granite castle in the Scottish baronial style. It consists of two blocks of buildings united by wings, and a massive tower 35 feet square, rising to the height of 80 feet, and surmounted by a turret 20 feet high.

Balnav'es, HENRY, of Halhill: an eminent Scottish reformer and writer; b. at Kirkcaldy in Fifeshire about 1520. He studied law, and became Secretary of State in 1540. In 1546 he, with other Protestants, took refuge in the castle of St. Andrews, and was declared a traitor. The castle was captured by the French, who took him, with Knox, to Rouen as prisoners. While in prison he wrote a *Confession of Faith*. He returned to Scotland in 1556. D. in Edinburgh, 1579.

Balsam (*Impatiens balsamina*) [Lat. *bal'samum*, from Gr. *βάλσαμον*; of Semitic origin]: a well-known herbaceous annual belonging to the geranium family, and closely related to the touch-me-not. It is a native of India, and has been cultivated in European gardens for 300 years. It has developed many varieties.

CHARLES E. BESSEY.

Balsam, Canada: the thick, terebinthine sap of *Abies balsamea*, which collects in blisters beneath the epidermis of the trunks of young trees. These blisters are punctured, and the balsam gathered as an article of commerce. It is used in medicines, for varnishes, for mounting microscopic objects, etc. *Abies grandis* of the west coast of North America furnishes a similar fluid.

Balsam Fir: See **ABIES**.

Balta, baal'ta: a well-built town of Russian Poland; in Podolia; on the Kodema river; 132 miles E. S. E. of Kamieniec (see map of Russia, ref. 9-C). It has over twenty factories of candles, soap, etc., and has an extensive trade in cattle, horses, hides, wool, and grain. Pop. (1888) 32,983.

Balti, baal'tée, **Baltistan**, baäl-tée-staan', or **Little Tibet**: the upper end of the Indus valley, subject to Kashmir; having Chinese Tartary on the N., Afghanistan on the W., and Kashmir on the S., between lat. 34° 30' and 36° N., and lon. 74° 40' and 76° 30' E. The inhabitants are Shiite Mohammedans of Tibetan origin. The climate has greater extremes than that of Kashmir; the soil produces grains and fruits in abundance. Chief town, Iskardi. Area, 19,000 sq. miles.

Baltic, or **Baltic Sea** (in Germ. *Ostsee*; New Lat. *Mare Balticum* and *Sinus Codanus*): an inland sea or gulf of Northern Europe; situated between Russia, Sweden, Germany, and Denmark, and connecting with the German Ocean and the Cattegat by the Sound and the Great and Little Belts. It is 830 miles long. Its greatest width is 420 miles, and the area 154,570 sq. miles. On account of the small proportion of salt it contains (not over 2 per cent.), the Baltic freezes much more easily and early than the ocean. It is not affected by the tide. The numerous sandbanks and islands, and the violent storms with sudden changes of wind, render the navigation of the Baltic dangerous. It receives several large rivers—namely, the Oder, Vistula, Niemen, Düna, Narva, Neva, Torneå, Dal, etc. No sea has in proportion to its size so great an influx of fresh water. The chief ports are St. Petersburg, Riga, Dantzic, Stralsund, Königsberg, Stockholm, and Copenhagen. A remarkable phenomenon connected with this sea is the slow and gradual rising of its shore in Sweden. A ship-canal connecting the Baltic Sea and the North Sea through the river Elbe was begun in 1891; opened for traffic June 20, 1895. It begins at Holtenau on Kiel Bay and reaches the Elbe 15 miles from the mouth of the latter. It is 61.31 miles long and needs no locks.

By some the word "Baltic" is derived from Lith. *baltas*, white, *balti*, be white; by others from the same source as

Lat. *balticus*, Eng. *belt*. According to an ancient tradition which has come down to us through Pliny, Baltia was the name of a great island situated at a distance of three days' sail from the coast of Scythia. This term is not found either in German or in any of the Scandinavian languages; the Baltic is there invariably called the "East Sea." It is an aid to the understanding of ancient geography to know that both terms were used in early days.

Baltic Languages: See LITHUANIAN, LETTISH, and OLD PRUSSIAN.

Baltimore: the chief city of Maryland; an important railroad and commercial center (for location, see map of Maryland, ref. 2-F); is in 39° 17' N. lat. and 0° 26' E. lon. (76° 37' 30" W. from Greenwich), at head of tide-water and navigation on Patapsco river, about 14 miles from Chesapeake Bay, and nearly 200 from the ocean by ship-channel. The Patapsco to this point is a broad estuary; above, a small and swift stream, furnishing water-power to many mills and manufactories. The harbor is spacious and secure, and its original depth of about 20 feet has been increased to the requirements of the ocean steamships by extensive dredging prosecuted at the expense of the U. S., the State, and the city governments. The city covers about 20,000 acres of land, and the surface of its site was originally very hilly.

The first steps for "erecting a town" on the Patapsco, to be called Baltimore Town, were taken by a legislative act in 1729, and it was laid out in half-acre lots in 1730. In 1752 it contained 25 houses and 200 persons; in 1765 the number had increased to 50 houses. After this the growth was more rapid, and in 1775 there were 564 houses and 5,934 persons. In Dec., 1776, the Continental Congress transferred its sittings from Philadelphia to Baltimore, and met here for about two months. In 1797 it was incorporated as a city. Pop. (1790) 13,503; (1870) 267,354; (1880) 332,313; (1890) 434,439; (1900) 508,957.

The city is laid out, for the most part, at right angles, the streets having generally a width of about 60 feet, and the buildings are mostly built of red brick, made from immense clay-beds adjacent to the city. White marble, of excellent quality, is procured from inexhaustible quarries about 10 miles N. of the city; granite from quarries about 15 miles W. Ship-building has always been one of the leading industries of the city, and the repairs of ships are greatly facilitated by an excellent dry-dock capable of receiving the largest ships that can enter the harbor.

Manufactures.—The principal industries are clothing, tobacco, foundries and machine-shops, meat packing, breweries, and distilleries. There are forty establishments for packing oysters and fruits. This is a very important industry, and gives employment to 8,990 hands, consumes from 7,000,000 to 8,000,000 bushels of oysters, gathered from the Chesapeake Bay, in a year, and during the season—Sept. 1 to Apr. 1—often sends inland, packed raw, or cooked and hermetically sealed, from 40 to 60 car loads a day. These industries find their outlet both by land and water communication. There are lines of steamships to Liverpool, Bremen, Boston, Providence, Wilmington (N. C.), Charleston, Savannah, Havana, New Orleans, etc., and steamboat lines to Norfolk, Richmond, Fredericksburg, Washington, and all points on the Chesapeake Bay and its many estuaries. A ship-canal across the State of Delaware gives the city a direct outlet for trade with Philadelphia. The city is a terminus of the Maryland and Pennsylvania R. R. which runs to York, of the Western Md. R. R. which runs to Cherry Run, and of the Annapolis and Baltimore Short Line R. R. The Baltimore and Ohio R. R. passes through the center of the city in the long Belt Line Tunnel. Indeed, it is noteworthy that the most important roads pass through the city in tunnels, thus avoiding grade crossings. The Baltimore and Ohio R. R. main line to Frederick (66 miles) was the first railroad operated in the U. S. The Baltimore and Potomac R. R. (to Washington) passes by a tunnel 7,400 feet in length under the northwest part of the city; and the Northern Central R. R. (to Harrisburg) reaches tide-water by a similar tunnel 3,500 feet long, under the northeast section. Besides floating elevators for the transfer of grain, reaching the market by water, the railroads have at their termini six substantial elevators, with a storage capacity of 5,000,000 bushels, and others are projected.

Its sobriquet "Monumental City" was derived from the Washington Monument and Battle Monument, erected by the gratitude and patriotism of its citizens. The former, located at Mt. Vernon Place, North Charles Street, is a

Doric shaft of white marble 180 feet high, surmounted by a statue of Washington 16 feet high, erected 1816–30. Access to the top is had by 220 winding stairs within the column. Battle Monument, commemorating the defeat of the British at the battle of North Point, near Baltimore, on Sept. 12, 1814, is in Monument Square, North Calvert Street. It is also of white marble, 52½ feet high. Wilkey Monument on Broadway, of white marble, 52 feet high, was erected to Thomas Wilkey, a citizen of Baltimore, who died in 1861, and was the founder of Odd Fellowship in America. There is also in Greenmount Cemetery a monument and statue to John McDonogh, who bequeathed to the city a large sum (amounting now to about \$1,000,000) to establish the McDonogh Institute, an industrial institution for the education of poor boys, about 15 miles N. W. of the city. A monument in Harlem Park to James L. Ridgely, secretary of the Sovereign Grand Lodge of Odd Fellows, was unveiled Sept. 22, 1885. In the grounds of the Samuel Ready School for girls is a brick obelisk erected as a monument to Christopher Columbus by the Chevalier d'Anmour in 1792, and believed to be the first such monument in the world. Greenmount and London Park are two beautiful cemeteries, and there are several other minor ones. The city has about 480 churches and 22 Jewish synagogues. The oldest church in the city is St. Paul's (Episcopal). This church antedates the founding of the city, the parish having been erected in the end of the seventeenth century. The first Presbyterian church was established in 1761; the first Roman Catholic, in 1770; the first Wesleyan Methodist, in 1773; the first Baptist, in 1780; the first Friends' meeting about 1680, long before the town was laid out. The Reformed and Lutheran churches were first established about 1750. Several of the churches are imposing and beautiful structures. Among the most noticeable are the cathedral, St. Alphonsus, Corpus Christi (Jenkins Memorial), and St. Ignatius (Roman Catholic); Grace, St. Peter's, and Christ (Episcopal); the Mount Vernon, Madison Avenue, and First (Methodist); Westminster, Brown Memorial, and First (Presbyterian); Eutaw Place (Baptist); and the Unitarian. The finest synagogues are those of the Baltimore Hebrew Congregation (the oldest Jewish organization in the city), Oheb Shalom, Chizook Emunah, and Har Sinai (Reformed).

The water-supply of the city until 1881 was taken from Jones's Falls, about 7 miles above the city, and was of good quality and ordinarily abundant. In that year a further supply was brought, at an expense of \$4,000,000, from the Gunpowder river by natural flow through a tunnel of 12 feet interior diameter, 7 miles in length, with capacity for daily delivery of 170,000,000 gal. The reservoirs upon the two systems have a storage capacity of 2,241,000,000 gal.; the average daily flow of the streams that supply them is 165,000,000 gal., and the aqueducts leading from the storage reservoirs have a capacity for delivering in the city 200,000,000 gal. a day. This is distributed everywhere in abundance, and there are about 1,000 fire-plugs for use in case of fire. The fire department is well organized, directed by a police and fire-alarm telegraph, and notably efficient. It has 23 steam fire-engines and 9 hook-and-ladder companies.

Numerous public squares add to the beauty and healthfulness of the city. Patterson Park, in the southeast section of the city, contains 200 acres. Druid Hill Park, in the northwest section, contains 704 acres of ground, with fine forests, lakes, and lawns, and about 20 miles of good carriage-drives. In this park are fine statues in marble of Christopher Columbus erected by the Italian residents in 1892 and in bronze of William Wallace given by W. W. Spence. Clifton Park, the former residence of Johns Hopkins, in the northeastern part of the city, and Carroll Park, with the residence of Charles Carroll, barrister, in the southwest, are also beautiful pleasure grounds.

Public Buildings.—First among the public buildings should be named the city-hall, built of white marble, occupying an entire square, and costing \$3,000,000. The new court-house occupies another square, and is a white marble building erected at a cost of \$2,000,000. A third square is occupied by the fine Federal building, erected about 1885, for the post-office and U. S. courts. A new custom house was begun in 1901. The Maryland Institute is of brick, is 355 feet long, and is occupied by a successful school of art. It was formerly the scene of a number of national political conventions. The Odd Fellows' Hall, of brick, the Masonic Temple, of white marble, the jail and the new Penitentiary, of granite, are all remarkable structures. Outside of the city limits, but a part of its institutions, should be noted

INDEX.

Railroad Depots.

- Annapolis & Balt. Short Line Camden Station, E 4
- Balt. & Eastern Shore, Camden St., E 4
- Balt. & Ohio, Camden Station E 4
- Balt. & Ohio, Locust Point, G 5
- Balt. & Potomac, Union Depot, E 2
- Balt. & Potomac, Calvert Dep., E 3
- Maryland Cen., North Ave. Dep., E 1
- Northern Central, Union Depot, E 2
- Northern Central, Calvert St. Depot, E 3
- Phila., Wilm. & Balt., Union Depot, E 2
- Phila., Wilm. & Balt., President St. Dep., F 4
- Phila., Wilm. & Balt., Bay View Western Maryland, Hillen St. Sta., F 3
- Western Maryland, Union Depot, E 2
- Western Maryland, Pennsylvania Ave. Sta., C 2
- Western Maryland, Fulton Station, C 2

Hotels.

- 1. Albion, E 3
- 2. Altamont, D 2
- 3. Brook's, E 4
- 4. Carrolton, E 4
- 5. Eutaw, D 3
- 6. Guy's, E 3
- 7. Howard, E 3
- 8. Lechler, E 4
- 9. Malby, E 4
- 10. Mansion, E 4
- 11. Mt. Vernon, E 3
- 12. Pepper's, E 3
- 13. Rennert, E 3
- 14. St. James, E 3

Theatres, Etc.

- 16. Academy of Music, E 3
- 17. Base Ball Grounds, E 1
- 18. Concordia Op. H. & Society H., D 4
- 19. Ford's Grand Op. H., E 3
- 20. Forepaugh's Theatre, E 3
- 21. Front St. Theatre, F 3
- 22. Holiday St. Theatre, E 3
- 23. Monumental Theatre, F 4
- 24. Theatre Comique, F 4

Public Buildings, Etc.

- 25. Athenaeum Building, E 3
- 26. Chamber of Commerce, E 4
- 27. City Hall, E 3
- 28. Custom House, E 4
- 29. Enoch Pratt Free Library, E 3

- 30. House of Refuge, A 4
- 31. Jail, E 3
- 32. Marine Observatory, E 5
- 33. Maryland Institute, G 4
- 34. Masonic Temple, E 3
- 35. Penitentiary, F 3
- 36. Post Office & U.S. Court House, E 3
- 37. Odd Fellows' Hall, E 3
- 38. Y. M. C. Ass'n, E 3
- 39. Y. W. C. Ass'n, E 3

Colleges, Hospitals Etc.

- 40. Academy of the Visitation, E 3
- 41. Aged Men's Home, C 3
- 42. Baltimore Orphan Asylum, C 8
- 43. Carmelite Convent, F 2
- 44. City College, E 3
- 45. City Hospital, E 3
- 46. Col. of Physicians and Surgeons, E 3
- 47. Eye, Ear and Throat Hospital, D 3
- 48. German Orph. Asy., F 3
- 49. Hebrew Hospital, C 3
- 50. Holy Cross Academy, E 5
- 51. Home for the Aged, C 3
- 52. House of the Good Shepherd, F 2
- 53. Johns Hopkins Hospital, G 3
- 54. Johns Hopkins University, D 3
- 55. Loyola College, E 3
- 56. Maryland General Hospital, E 3
- 57. Newton Academy, C 4
- 58. Notre Dame Institute, F 3
- 59. Peabody Institute, E 3
- 60. State Normal School, C 3
- 61. St. Mary's Female Orph. Asy., E 2
- 62. St. Paul's Orph. Asy., D 2
- 64. Univ. of Maryland, D 4
- 64. Union Orph. Asy., C 3
- 65. Woman's College, E 1

Churches.

BAPTIST.

- 66. Eutaw Place, D 2
- 67. First, C 3
- 68. Fuller Memorial, C 2
- 69. High Street, F 3
- 70. Second, G 4

LUTHERAN.

- 71. First (English), D 3
- 72. Second, D 4
- 73. St. Paul, D 2

METH. EPISCOPAL.

- 74. Eutaw Street, D 3
- 75. First, E 1
- 76. Grace, G 3
- 77. Harford Avenue, F 2
- 78. Mt. Vernon Place, E 3

PRESBYTERIAN

- 79. Aisquith, F 3
- 80. Brown Memorial, D 2
- 81. First, E 3
- 82. Franklin Street, E 3
- 83. Westminster, D 4

PROT. EPISCOPAL.

- 84. Christ, E 2
- 85. Emmanuel, E 3
- 86. Grace, E 3
- 87. St. Peter's, D 2
- 88. Trinity, G 4

ROMAN CATHOLIC.

- 89. Cathedral, E 3
- 90. St. Alphonsus, E 3
- 91. St. Francis Xavier, E 3
- 92. St. Ignatius, E 3
- 93. St. James, F 2
- 94. St. Martins, C 3
- 95. St. Michael's, G 4
- 96. St. Patrick's, G 4
- 97. St. Peter's, D 4

OTHER CHURCHES.

- 98. Eden St. Synagogue, (Jewish), F 4
- 99. First Congregational, D 4
- 100. First Reformed, D 2
- 101. First Unitarian, E 3
- 102. Friends Orthodox, E 3



IORE



OXFORD

HOMESTEAD

Clifton Lake

BALTIMORE CEMETERY

Green Mount Cemetery

Holy Cross Cemetery

St. Alphonsus Cem.

St. Patrick's Cemetery

PATTERSON PARK

Basin

City Dock

Wharves

Point Dock

Wharves

Wharves

Wharves

Wharves

Wharves

Wharves

Wharves

Wharves

PATAPSCO R.

Fort McHenry

Northern Central Railway Company Steamship Pier

Third St.

Elliot

Toone

O'Donnell

Lancaster

Canton Square

Alice Anna

Bank

Gough

E. Pratt

E. Lombard

St. Patrick's Cemetery

Old N. E. Cem.

Patomac

Patuxent

N. Chesapeake

N. Palapasco

N. Luzerne

N. Cannon

N. Burke

N. Chester

N. Choptank

N. Washington

N. Annapolis

N. Howard

N. Calverton

N. York

N. E. Baltimore

1

2

3

4

5

6

7

8

9

10

11

12

13

14

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16

17

18

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100

Bay View Asylum (city almshouse), 714 feet in length; the House of Refuge, maintaining about 400 juvenile delinquents; Spring Grove Asylum, a State institution for the insane, of granite, with capacity for 600 patients. The Maryland Institution for the Blind possesses two beautiful white marble buildings, and instructs the blind children of Maryland and the District of Columbia. The Sheppard and Enoch Pratt Hospital for the insane, near the city, was founded by a bequest of about \$1,000,000 from Moses Sheppard and further endowed by Enoch Pratt with about \$1,750,000. The Peabody Institute of Baltimore was the recipient of over \$1,000,000 from the late George Peabody. It has, in its fine white marble building by the side of the Washington Monument, a free library of 135,000 books and pamphlets, an art-gallery, music conservatory, rooms for lectures, concerts, etc. The Johns Hopkins Hospital has no superior in its appointments in this country—probably none anywhere. In Mar., 1873, Johns Hopkins, a merchant of the city, placed in the hands of trustees selected by him 13 acres of land in the eastern part of the city, with directions to establish thereon a free hospital for the "indigent sick of the city and its environs, without regard to sex, age, or color." He left it half of his estate, giving it an endowment of over \$3,000,000. The buildings were erected from the income of the endowment, and the hospital was opened in 1889.

Education, etc.—Johns Hopkins also established the university bearing his name, over which Daniel C. Gilman, LL.D., was president from its opening until 1901. It was opened in 1876, and offered especial opportunities for graduate students from the first. By its system of fellowship it has always given great encouragement to original work. A college department, largely patronized by students from Maryland, has been carried on from the first, and a medical department, operated in connection with the Johns Hopkins Hospital, was opened in 1893. From 1898 to 1902 the university received an annual appropriation from the State. The Johns Hopkins was the first institution in the U. S. to establish a university press to publish the results of the work of its professors and students. The university has in all departments 120 instructors and about 600 students. Its buildings and equipments are valued at over \$1,000,000, and its productive funds at \$3,000,000. There are 90,000 volumes and 60,000 pamphlets in its library. Its medical school received an endowment from Miss Mary Garrett of nearly \$400,000 on condition that its courses of instruction should be open to women. The general education of the city is provided for in 125 graded public schools. Loyola College, a Catholic institution under the supervision of the Jesuits, and the seminary of St. Sulpice (St. Mary's College), a Catholic theological institution, are both in a flourishing condition. The University of Maryland (established in 1812) has prosperous departments of medicine, law, and dentistry. The Baltimore Dental College (established in 1839) is the oldest institution of the sort in the world. Other professional schools are the College of Physicians and Surgeons, Baltimore Medical College, Woman's Medical College, Southern Homœopathic College, Maryland Medical School, Maryland College of Pharmacy, and Baltimore Law School. The Baltimore University conducts departments of medicine and law. The Woman's College of Baltimore, established in 1884, is one of the most important institutions of the kind in the U. S. It has some 500 students, and is well equipped. It is under the control of the Methodist Episcopal Church. The city has 20 national banks, 25 State and savings banks, and 12 trust companies, 9 daily and 43 weekly newspapers, and 22 monthly and semi-monthly magazines.

In 1882 Enoch Pratt, a successful merchant of the city, offered the city a free circulating library for the use of the citizens, which the city accepted and named the "Enoch Pratt Free Library." It has a central building on Mulberry Street and seven branches in the different quarters of the city. The endowment consisted of these buildings and the sum of \$833,333.33, given the city in return for the creation by the city of a perpetual annuity of \$50,000 payable to trustees originally selected by the donor and having the right of coöptation. The Central Library contains 130,000 volumes, and the branches from 5,000 to 15,000 each. The total collection is some 210,000 volumes. Other libraries of the city are Mercantile Library Association, about 60,000; Maryland Institute, 20,000; Baltimore Bar Association, about 12,000; Odd Fellows', about 25,000; Maryland Historical Society, about 30,000; Loyola College, 22,000; Maryland Diocesan Library (Whittingham Memorial), about

25,000; Library of the State Medical and Chirurgical Faculty, about 13,000. Revised by BERNARD C. STEINER.

Baltimore, Lord: a title of the Calvert family in the Irish peerage; created in 1625 by James I., who marked his confidence in Sir George Calvert by making him, though a Roman Catholic, Baron of Baltimore (Ireland). Calvert was born at Kipling, Yorkshire, England, in 1582. He graduated at Oxford; held several important public trusts; was knighted in 1617; became principal Secretary of State in 1619; member of Parliament 1620-21; and first Lord Baltimore 1625. By grant of James I. he became proprietary of Avalon in Newfoundland, endeavored to plant a colony there, and went thither himself in 1625. Owing chiefly to the unfavorable soil and climate, the colony was a failure. He then (1628) visited Virginia, met an ungracious reception, and returned to England. He seems then to have petitioned Charles I. for a charter for founding a new colony, and to have met with favor; but before the charter was issued he died in London, Apr. 15, 1632. The charter which he had secured was re-issued in June, 1632, to his son Cecil, who became the second Lord Baltimore, and real founder of the colony of Maryland. The territory granted by the charter included the whole of the present State of Maryland. Cecil never visited it, but sent out an expedition in Nov., 1633, under the charge of his brother, Leonard Calvert, as governor. The Calverts have been much praised for their liberal and tolerant spirit, and their wise and equitable legislation in the colony. The successive Lords Baltimore were Charles (the third), Benedict-Leonard (fourth), Charles (fifth), and Frederick (sixth). Frederick died in 1771, leaving no legitimate children, and with him the title Lord Baltimore became extinct. See Fuller's *Worthies of England*; Bancroft's and Hildreth's *Histories of the United States*; J. P. Kennedy, *Character of George Calvert: Proceedings of Maryland Historical Society*; Sparks's *American Biography*, vol. ix. S. S.

Baltimore Oriole, also called **Golden Robin**: a well-known and conspicuously beautiful bird (*Icterus galbula*) of the New-World family *Icteridae*. This family, closely allied in structure and habits with the weaving-birds (*Ploceidae*) of Africa and Asia, displays an equally wonderful skill in the construction of its nest, which is a pendulous, cylindrical pouch suspended from the extremity of a hanging branch. Both are also distinguished by the brilliant contrast in the colors of their plumage. Black and yellow, the two colors of the coat-of-arms of Lord Baltimore, suggested the name of this species, which is the best known of the group. In the summer months the Baltimore oriole is found from Florida to New Brunswick on the coast, westward, as far as the great plains, from the valley of the Saskatchewan on the N. to Louisiana and Texas. It is a winter resident of the West Indies and Central America as far S. as Panama. As a vocalist it is a bird of rare power, combining beauty and variety in its notes. The eggs are from four to six in number; they hatch in 14 days. The oriole feeds chiefly on insects, many of them highly injurious to vegetation, and is thus of immense service to the farmer, destroying the worst pests of the orchard. The parents feed their young chiefly with caterpillars, which they swallow and disgorge for this purpose. Besides the Baltimore oriole there are four other orioles common in the U. S.—Bullock's oriole of the Pacific coast, the orchard oriole of the Eastern States, and the hooded and Scott's orioles of Texas and Arizona.

Baluchi, bã-loo'chěe, or **Balūcī**, bã-loo'chěe (also **Beloochee**, **Biluchi**): the language spoken in BALUCHISTAN (*q. v.*), a branch of the Iranian division of languages, which closely resembles modern Persian. Two dialectic groups are distinctly recognized: first, the northeastern or North Baluchi; second, the southwestern, the Makrānī or South Baluchi. The dialectic division is made by the interposed wedge of the Brāhūī tribes, a people of Dravidian stock and speech. The separation thus made is so marked that Southern Baluchi speech is sometimes almost unintelligible in the north. The South Baluchi dialect is more ancient in its character; the North Baluchi is marked especially by the use of spirants and aspirates.

Baluchi, like modern Persian, may be regarded as an analytic language. The noun-inflection consists chiefly in adding *a* to form the oblique case in the singular, and *ān*, or, in the oblique cases *āna*, in the plural. The verb is comparatively meager in forms, and somewhat irregular.

Baluchi hardly possessed a written literature until recent

times, when the Persian script began to be used in recording it. There exists quite a rich store of popular songs and stories, on legendary, historical, religious, heroic, and amatory subjects. A number of these have already been collected, and some of them bear the name of Jām Durrak, a celebrated Baluchi poet of the eighteenth century. Riddles seem to have been an especially popular style of composition among the Baluchis.

Consult Picree's *Mekranee Beloochee Dialect* (*Journ. Bombay Branch Roy. As. Society*, Bombay, 1876); Dames's *Northern Balochi Language, Grammar, Vocabulary, Specimens* (*Journ. Roy. As. Society of Bengal*, Calcutta, 1881); and especially the contributions of Wilhelm Geiger, *Dialektspaltung in Balūči, Etymologie des Balūči, Lautlehre des Balūči* (Bayer. Akademie der Wiss., 1889-91, *seq.*). See also IRANIAN LANGUAGES. A. V. WILLIAMS JACKSON.

Baluchistan, baā-loo-ehis-taan', or **Beluchistan**, be-loo-ehis-taan' (from *Baluchi*, one of the races occupying the country): a maritime country of Asia; with Afghanistan on the N., British India on the E., the Arabian Sea on the S., and Persia on the W. It is an irregular rectangle in form, with a projection at the northeast angle which extends to lat. 32° N. The seacoast runs E. and W. for about 600 miles, but has no good harbor. Area about 130,000 sq. miles.

Topography.—The surface is rugged and elevated, generally barren, and deficient in water. The Herbie or Hala Mountains run N. and S., separating the country from India, and there are several parallel ranges in Eastern Baluchistan. The northeastern extension is very mountainous. The coast is bordered by a lower range at some distance inland, with parallel ranges farther in the interior. The northwestern quarter is a dry, elevated plateau, with many independent drainage basins, and includes a part of the great Sarhadd plateau of Persia, and a part of the periodically dry and overflowed territory, the most of which lies in Afghanistan and Persia. The drainage of the country is for the most part into this area, but a few short streams find their way into the gulf.

Inhabitants.—The total population is (1901) 810,811. There are two distinct races occupying the country, the Baluch or Baluchi and the Brahūi. They are clearly distinguished from each other in language and appearance, and each is divided into an infinity of tribes. The Baluchis have a language allied to Persia, are handsome, active, tall, strong, with long visages and raised features, pastoral, predatory, and hospitable, warlike, but lazy. Their chief articles of food are milk and flesh, the latter, by preference, only half cooked. They keep many slaves, and usually the men have several wives. The Brahūis have a language strongly resembling the Hindu dialect spoken in the Punjab, are short and thick, with round faces and flat features. They are the dominant race, though the Baluchis were the earlier occupants of the country.

Productions.—The climate is various, but usually dry, and the soil generally unfertile, though there are regions where the most of the crops of India can be produced. The chief pursuit is that of camel-raising; the other domestic animals are the horse, mule, ass, buffalo, black cattle, sheep, goats, fowls, and pigeons. Especial attention is given to the culture of dates in Mekran, in the southwest. A great variety of ores have been found. Iron and lead are mined near Nal, 150 miles S. of Khelat. Coal has been found in several places. At Khost, on the Sind-Pishin Railway, it has been successfully worked for some years.

History.—The power of the Brahūi Khans of Khelat was founded toward the end of the seventeenth century. The previous dynasty was a Hindu one. Nasir Khan II. of the Brahūi dynasty was recognized by the British in 1841, and in 1854 a treaty was made with him, under the terms of which he received an annual subsidy of \$17,000. He was succeeded in 1857 by his brother Khudadad, who is the present khan. With him a fresh treaty was made in 1876, and the subsidy paid him was doubled. He turned over the district of Quetta to the British, for which he receives an annual quit-rent of \$8,000, besides \$10,000 per annum in lieu of his right to levy duty on merchandise in the Bolan Pass—making \$50,000 paid to him by the British annually. In 1888-89 the district of Khethran, between Quetta and India, was brought under British control, and the territory has since been extended.

Government.—Baluchistan, as it now (1893) stands, may be divided into three parts: (1) The districts to the northeast, for the most part formerly included in Afghanistan, now

under British rule, and forming British Baluchistan. (2) The districts of Quetta and Bolan, now administered by British officials on the khan's behalf. (3) The greater part of Baluchistan, composed of a confederation of chiefs under the suzerainty of the Khan of Khelat, and in a general way under British protection. The capital of this part of Baluchistan is Khelat. The British administrative center is Quetta. From Quetta, which is strongly fortified, a railway runs through the Kwaja Amran range toward CANDAHAR (*q. v.*).

LITERATURE.—Hughes, *The Country of Baluchistan* (1877); Floyer, *Unexplored Baluchistan* (1882); MacGregor, *Wanderings in Baluchistan* (1882); Oliver, *Across the Border, or Pathan and Biloch* (1891). MARK W. HARRINGTON.

Baluze, baā'lüz', ÉTIENNE: a French historian; b. at Tulle, Dec. 24, 1630; became in 1668 Professor of Canon Law in Paris, and in 1707 director of the Royal College under Louis XIV. Among his works are *Lives of the Popes of Avignon* (Paris, 1693), and *History of the House of Auvergne* (1708, 2 vols.), in which he endeavored to show that the House of Bouillon was descended from the ancient Dukes of Guienne, and therefore owed no allegiance to the King of France. The king suppressed this work, exiled the author, and confiscated his estates, but he was recalled in 1713. He published forty-five works, among which were *Capitularia Regum Francorum* (1677, 2 vols.); *Conciliarum Nova Collectio* (1685), etc. D. in Paris, July 28, 1718.

Balzac, baāl'zaak', HONORÉ, de: the most famous French novelist of the nineteenth century; b. at Tours, May 20, 1799; of plebeian origin, notwithstanding the *de* which he placed before his name. Coming early to Paris, he lived on to the age of nearly thirty with his head full of ambitions, but without achieving a success. In 1829 he published his *Dernier Chouan* (written, however, in 1827), the first of his novels to show real power. In 1829 (dated 1830) appeared his *Physiologie du mariage*, witty, acute, often gross—and his fortune was almost made. In 1831 it was quite made by his *Peau de Chagrin*, full of wise and just things, mingled with much that was the opposite. From this time till his death Balzac produced enormously—the list of his books from 1827-48 including ninety-seven titles. He early began to elaborate a new theory of novel-writing—that it should consist in giving documents from the life of the society in which the writer lives; and his enormous production purported to be the carrying into practice of this theory. In it he has been followed also by later novelists; and has thus become perhaps the most important influence upon the imaginative literature of the end of the nineteenth century. His total work he called the *Comédie humaine*, in contrast to the Dantesque *Divina Commedia*. Furthermore, he divided his stories into lesser groups—*Contes philosophiques*, *Scènes de la vie privée*, *Scènes de la vie de province*, *Contes drolatiques*, etc. Of single novels, besides those named above, the most famous are perhaps *Eugénie Grandet* (1833); *Seraphita* (1834); *Le Père Goriot* (1834); *La Recherche de l'absolu* (1834); *Le Lys dans la Vallée* (1835); *César Birotteau* (1837); *Béatrix* (1844); *Modeste Mignon* (1844). In conclusion, it may be said that most of the prevailing French theories about novel-writing—so-called "realism," "naturalism," etc.—go back to Balzac. His novels have been translated into English by Miss K. P. Wormley, and an edition by various translators has been edited by Prof. Geo. Saintsbury. D. in Paris, Aug. 18, 1850.

See George Sand, *Notice biographique de H. de Balzac* (1853); Vieohte de Spoelbergh de Lovenjoul, *Histoire des Œuvres de H. de Balzac* (1886); A. Cerfbeer et J. Christophe, *Répertoire de la Comédie humaine de H. de Balzac* (1887); M. Barrière, *L'Œuvre de H. de Balzac* (1890); E. E. Saltus, *Balzac*, with full bibliography of his works (Boston, 1888).

A. R. MARSH.

Balzac, JEAN LOUIS GUEZ, de, Seigneur: French writer; b. at Angoulême in 1597. He was patronized by Cardinal Richelieu, and was admitted into the French Academy in 1634. He did for French prose what Malherbe did for verse, i. e. purified it from the pedantries of the sixteenth century and the obscurities of a still earlier time. Almost all the great writers of the age of Louis XIV. show his influence. As Sainte-Beuve said: "He gave the French tongue a stiff course in rhetoric." Personally he was vain, uncertain, and vacillating. His youth was spent in dissipations, his age in devotions; but he had observed much, and reflected deeply upon the course of human life, and his works contain so much of human experience that they must long remain famous. His reputation mainly rests upon his *Letters*, the

first collection of which, after they had passed through many private hands, appeared in 1624. Besides these, he published several works avowedly written for the public at large—as his *Prince* (1631); *Socrate Chrétien* (1652); *Entretiens* (1657); *Aristippe* (1658). His collected works appeared 1665, 2 t. fol., and 1854. Many separate editions of his *Letters* have appeared, e. g. by P. T. de Larroque, Paris, 1874. D. at Angoulême, Feb. 15, 1654. Revised by A. R. MARSH.

Bambar'ra: a large district in the Western Sudan, on both sides of the Upper Niger or Joliba, which flows in a N. E. direction through the middle of this state. Its boundaries are uncertain, but it lies entirely in the area claimed by the French. The soil is well watered and fertile. The rainy season lasts from June to November. Two crops of maize, cotton, and yams are raised annually. The baobab, butter-tree, and date-palm are found here. The wild animals are lions, elephants, leopards, panthers, etc. The population is composed mostly of Mandingoes. Area about 20,000 sq. miles.

Bam'berg: a city of Bavaria, in Upper Franconia; is beautifully situated on the river Regnitz, 30 miles N. of Nuremberg and 3 miles from the river Main (see map of German Empire, ref. 6-E). It is connected by railway with Nuremberg and other towns. It is well built, and has spacious, well-lighted streets, which are lined with handsome houses. Among the remarkable public buildings are the magnificent cathedral (Domkirche) in the Byzantine style, founded in 1004 by the Emperor Henry II.; the old palace of the bishops of Bamberg; and the Jesuit church of St. Martin's. Bamberg contains a theater, a lyceum, a museum of natural history, and a royal library of 135,000 volumes. Here are manufactures of porcelain, jewelry, musical instruments, gloves, etc.; also numerous breweries, which produce beer of superior quality. It has numerous literary and charitable institutions. Pop. (1895) 38,949.

Bam'boo' (Fr. *bambou*): the common name of the arborescent grasses of the genus *Bambusa*, numbering forty-six species; natives of the tropical and warm parts of Asia and America, and grow to a large size. Some of the species are a foot in diameter and 120 feet in height. The bamboo is a plant of great utility and importance. It has a jointed and hollow stem, which is very hard and light, and is externally coated with silex. It has been called the national plant of China, the natives of which make from it a great variety of articles, furniture, weapons, etc. It is sometimes used for building houses and bridges and for water-pipes. The smaller stems are converted into walking-sticks, and are employed in wickerwork and the seats of chairs. Some species of *Bambusa* secrete a silicious, phosphorescent substance called tabasheer, to which remarkable properties have been attributed. See TABASHEER.

Revised by CHARLES E. BESSEY.

Bam'borough (or **Bambrongh**) **Castle**: one of the oldest castles in Great Britain; is on the coast of Northumberland, 16 miles S. E. of Berwick. It stands on a basaltic rock 150 feet high, and accessible only on the southeast side. It was founded in 1070. Connected with this castle is an extensive public library, a dispensary, life-boats to save the crews of shipwrecked vessels, and other charitable institutions. Near the castle is a village of the same name.

Bambuk, baām-book': a district in the French Senegal Territory, West Africa; on the Upper Senegal river, between it and its tributary, the Faleme. The surface is hilly, and the soil of the valleys fertile. It is inhabited by Mandingoes, who are said to be very ferocious. The baobab and other trees here attain an enormous size. Bambuk has long been celebrated for its rich gold mines. Pop. about 800,000.

Bamian, baā-mcē-aan': a valley and pass of Afghanistan; on the route from Cabul to Turkestan, and between the central and western ranges of the Hindu Kush Mountains; is at an elevation of 8,496 feet, and is important as the only known pass over the Hindu Kush Mountains that is practicable for artillery. The valley is covered with ruins of the city of Gulgula, which was destroyed by Jengis Khan about 1220. Bamian was one of the chief centers of the Būddhist worship, and presents numerous caves with gigantic idols cut out of the rock. One of these is 160 feet high.

Bamo: same as BHAMO.

Bamp'ton Lec'tures: so called after the name of their founder, the Rev. John Bampton (1689-1751), of Trinity College, Oxford, Canon of Salisbury, who in 1751 left his "lands

and estates" to the University of Oxford for "the endowment of eight divinity lecture sermons," to be preached annually at "St. Mary's in Oxford." The subjects specified were: (1) "To confirm and establish the Christian faith, and to confute all heretics and schismatics; (2) upon the divine authority of the Holy Scriptures; (3) upon the authority of the writings of the primitive Fathers as to the faith and practice of the primitive Church; (4) upon the divinity of our Lord and Saviour Jesus Christ; (5) upon the divinity of the Holy Ghost; (6) upon the articles of the Christian faith as comprehended in the Apostles' and Nicene creeds." When the lectures commenced, in 1780, the income of the estate was £120 a year. Ever since then (except in the years 1834, 1835, and 1841) these lectures have been delivered. Some of the more noted of the earlier lecturers were Dr. White, in 1784, on *Christianity and Mohammedanism*; Dr. Nott, in 1802, on *Religious Enthusiasm*; Bishop Heber, in 1815; and Archbishop Whately, in 1822. Mansel, in 1858, on *The Limits of Religious Thought*, opened a new era in the history of the lectures. Since then we have had, among others, George Rawlinson in 1859, Farrar in 1863, Bernard in 1864, Mozly in 1865, Liddon in 1866, Irons in 1870, Jackson in 1875, Row in 1877, Wace in 1879, Hatch in 1880, John Wordsworth in 1881, Temple in 1884. Hurst's *Bibliotheca Theologica*, rev. ed., gives a complete list down to 1892.

Ban [a Teutonic word signifying proclamation, edict, prohibition, the verb of which, *bannan*, exists in O. Eng., but which actually came into Eng. viâ Fr. Cf. root of Gr. *φάναι*, Lat. *fari*, assert]: a word which occurs in many modern languages, signifying an edict; a public order or prohibition; an interdiction; a notice of marriage; a curse or excommunication. In the former German empire to put a prince under the ban of the empire was to divest him of his dignities, and pronounce on him a sentence of outlawry.

Ban and Arrière Ban: military terms used in France under the feudal system. When the feudal barons were summoned to the service of the king in time of war, they were called the *ban*. Their tenants or inferior vassals formed the second levy, or *arrière ban*. The *ban* and *arrière ban* constituted the entire military force of France in feudal times.

Ban, or Ba'nus [Pers. *bān*, lord]: the title formerly given to military governors of certain districts, called *banats*, in the eastern part of Hungary. The ban was appointed by the king, with the consent of the Diet, and had formerly very extensive powers. In political, judicial, and military affairs his authority was supreme. In time of war he commanded the troops of his banat. The most important banats were those of Dalmatia, Croatia, Slavonia, Bosnia, and Makovia (or Machow), but their boundaries often changed, and they were at length united into the double banat of Dalmatia and Croatia.

Ban, baan, MATIJA: Servian poet and writer; b. at Ragusa in Dalmatia, Dec. 18, 1818. He went to Constantinople in 1839, and was married there to a Greek lady in 1840. He studied at Greek and French colleges, and learned many languages and literatures. In 1845 he went to Belgrade in Servia, and settled there. From 1845 to 1849 he was tutor of the daughters of the Prince Regent of Servia. In 1848 he took vehement part in the revolution that broke out in Servia, as elsewhere in Europe, striving to unite Croats, Servians, and Dalmatians against the Hungarians. During these years he wrote the most famous of his tragedies—*Mejrima, or the Liberation of Bosnia* (1851). After the revolution he taught foreign literatures in the lyceum and the college in Belgrade. In 1860 he became Minister of Foreign Affairs for Servia; in 1868 he was given a national pension; in 1885 there was a magnificent celebration of the fiftieth year of his literary career.

Among his works may be mentioned: Dramas, *Miljenko*, *Dobriča*, *Dabroslavili*, *Jean Hus*, *Maroječa Kaboga*; poems, *Raslisne pezmé* (1853). He has written also many books and articles upon various aspects of the Eastern question. See Siméon Pjerotic, *Sulla vita e sulle opere di Mattia Ban* (Zara, 1881). A. R. MARSH.

Bana'na (*Mu'sa sapien'tium*): a tropical fruit-tree (and fruit) of great importance in both hemispheres. It is an herbaceous plant with a strong rhizome, from which sprouts or suckers arise and propagate the species, for the fruit is nearly always seedless. The plant grows to a height of 10 to 20 feet, bearing enormous entire ascending leaves, and clusters containing from 50 to 150 fruits. A year or two after

a banana-plant becomes established it begins to flower, the fruit maturing in from 90 to 120 days thereafter. After the fruit is ripe, the plant dies to the ground and the younger shoots take its place. Two or three suckers are allowed to grow from a plant, the others being destroyed or transplanted. The suckers are transplanted when 2 or 3 feet high, and are set deep, as low as 2 feet in many cases. It is thought that the transplanted plants do not produce so well as the suckers which are undisturbed. Bananas are planted in rows about 8 feet apart, and the plants in adjoining rows alternate at a distance apart of about 9 or 10 feet. This method affords shade to the ground, while it does not keep the sun from the plants. The banana is now grown in Southern Florida with success. The varieties are numerous and various. Bananas are constantly gaining in popularity in this country as a common article of food. This is due in part to the better transportation facilities of recent years between the tropics and northern markets. The first bananas brought to this country are said to have come from Cuba in 1804, and the first full cargo (1,500 bunches) arrived in 1830. The annual importation is now (1893) not far from 10,000,000 bunches. See PLANTAIN. L. H. BAILEY.

Bananal, bã-naã-naal' [said to be from *banana*]: an island of Brazil; in the river Araguay, and in the province of Goyaz. Its length from N. to S. is 290 miles, and its width about 35 miles. The soil is fertile and covered with a dense forest. There is a large lake near the middle of the island.

Banana-quit': one of a group of very small birds of the honey-creeper family (*Cærebidæ*), found in tropical America. One species (*Certhiola bahamensis*) is found in Florida.

Banat: district or territory under a BAN (*q. v.*); especially the name of a territory of Hungary (distinctively pronounced bã-naat'), embracing the counties of Temesvár, Torontál, and Krasso; principal town, Temesvár; originally a part of Hungary; belonged to the Turks 1652-1716; became united with Hungary 1779.

Ban'bury: small town of Oxfordshire: 78 miles N. W. of London (see map of England, ref. 11-H); returned a member to Parliament until 1885. Pop. (1891) 12,767; famous in Ben Jonson's day and at present for its cakes and ale.

Banc: in law, a term used in the phrases trial in banc, sitting in banc, meaning a trial or sitting at which the full number of judges are present, as distinguished from a trial or sitting *nisi prius* presided over by a single judge. See NISI PRIUS. F. STURGES ALLEN.

Banca, baang'kaã, or **Bangka**: an island in the Malay Archipelago; belonging to Holland; about 10 miles E. of Sumatra, from which it is separated by the Strait of Banca (see map of East Indies, ref. 7-C). It is about 100 miles long, and has an area of 4,977 sq. miles. The surface is hilly, the soil mostly dry and stony, and the island to a great extent covered with forests. It is celebrated for its tin mines, which are very productive, about 4,700 tons having been produced in a single year. Copper, iron, and lead are also found here. Pop. (1890) 79,648.

Ban'co: the standard money in which a bank keeps its accounts, as distinguished from current money. The term is chiefly applied to the money in which the Hamburg bank keeps its accounts, which is not coined money. The Hamburg mark banco (= 1s. 5½d. sterling) is to the current mark (= 1s. 2½d. sterling) as 20 to 17.

Ban'croft, AARON, D. D.: Unitarian minister; b. at Reading, Mass., Nov. 10, 1755. He graduated at Harvard in 1778, and became in 1785 pastor at Worcester, where he remained upward of fifty years. Among his works, beside a great number of sermons, is a life of George Washington (1807), which was very popular. He was the father of George Bancroft, the historian. D. at Worcester, Mass., Aug. 19, 1839.

Bancroft, EDWARD, M. D., F. R. S.: b. at Westfield, Mass., Jan. 9, 1744; ran away from his native country in his youth; practiced medicine in Guiana, and resided long in England. He was a friend of Dr. Franklin, and professed to labor in behalf of America, but is believed to have been a spy of the British Government. He published several political works, a *Natural History of Guiana* (London, 1769), and *Researches Concerning the Philosophy of Permanent Colors* (2 vols., 1794-1813). D. in London, Sept. 8, 1820.

Bancroft, GEORGE, Ph. D., LL. D., L. H. D., D. C. L.: historian; a son of Aaron, noticed above; b. at Worcester, Mass., Oct. 3, 1800; graduated at Harvard College in 1817, and entered in 1818 the University of Göttingen, where he

studied history and philology under Heeren, Bunsen, and others. In 1820 he took the degree of Doctor of Philosophy at Göttingen. Having returned home in 1822, he published a volume of poems (1823) and a translation of Heeren's *Reflections on the Politics of Ancient Greece* (1824). In 1834 he produced the first volume of his *History of the United States*. He was appointed Secretary of the Navy by President Polk in Mar., 1845, in which year he founded the U. S. Naval Academy; resigned office in 1846, and was sent as minister plenipotentiary to England in the same year. He returned home in 1849, retired from the public service, and for several years resided in Washington, D. C. Appointed minister to the court of Berlin in 1867, he negotiated a treaty by which Germans emigrating to the U. S. are released from their allegiance to the Government of their native country. In 1871-74 he was minister plenipotentiary to the German empire, and rendered important services in settling the San Juan boundary question. His capital work is a *History of the United States*. The tenth volume, to the end of the Revolutionary war, appeared in 1874. The eleventh and twelfth volumes, giving the history of the Constitution, appeared in 1882. In the same year he began to issue his final revised edition of the whole work. This edition (last volume published in 1885) is completed in 6 vols. 8vo. The work is the most elaborate and carefully prepared history of the Colonial and Revolutionary periods yet published. It is the result of fifty years of labor on all available European and American sources. The style is stately and somewhat discursive. D. in Washington, D. C., Jan. 17, 1891. Revised by C. K. ADAMS.

Bancroft, HUBERT HOWE: historical writer; b. at Granville, O., May 5, 1832; first went to California in 1852; established a book-store in San Francisco 1856, which developed into one of the largest book-stores and publishing-houses in the country; began (1859) collecting books in Europe and America concerning the Pacific coast, and gradually formed the Bancroft library (50,000 vols.), which occupies a substantial building erected by Mr. Bancroft on Valencia Street; resolved about 1871 to devote himself to the writing of the history of the Pacific slope. On account of the magnitude of the task he organized a large staff of literary assistants. His published works in thirty-nine volumes are: *Native Races of the Pacific States* (5 vols., 1875-76); histories of *Central America* (3 vols., 1882-83); *Mexico* (6 vols., 1883-85); *North Mexican States* (2 vols., 1887); *California* (7 vols., 1886-90); *Oregon* (2 vols., 1886-87); *Northwest Coast* (2 vols., 1884); *British Columbia*; *Alaska*; *Utah*; *Nevada and Colorado*; *New Mexico*; *Popular Tribunals*; *California Pastoral*; *California inter Pocula*; *Essays and Miscellany*; *Literary Industries*. The last named contains an interesting account of his methods of work. His avowed purpose was less to write history than to make accessible to students the vast accumulations of documents and information which he had gathered. C. H. THURBER.

Bancroft, RICHARD: Archbishop of Canterbury; b. at Farnworth, Sept., 1544; educated at Cambridge; chaplain to Archbishop Whitgift; consecrated Bishop of London 1597; attended Queen Elizabeth during her last illness; became Archbishop of Canterbury 1604; Chancellor of the University of Oxford 1608; bitterly opposed the Puritans; proclaimed the divine origin and prerogative of bishops; enforced conformity with a high hand; deprived forty-nine ministers of their livings for disobedience; was "chief overseer" of the commission which produced the King James version of the Bible. He was a resolute ruler and an eloquent preacher, and the High Church party of the Anglican Church dates from him. D. in London, Nov. 2, 1610.

Banda, baan'daã: a district and city of the Allahabad division, Northwestern Provinces, British India. It lies between the parallels 25° and 26° N., and meridians 80° and 82° E.; on the Jamna river. Area, 3,061 sq. miles. Pop. 700,000, nearly all of whom are Hindus. The surface is variegated and somewhat rocky, the Vindhya Hills forming the boundary on the S. E. The most important crop is cotton, and the district is so well known for this that its product is distinguished in commerce as Banda cotton. Millet, wheat, corn, barley, and rice are also raised extensively. Iron and building-stone are the only mineral products. Coarse cotton-cloth, sackcloth, and stone handles for knives are manufactured. The climate is cold in winter, but very hot in summer. Hot winds are a not unusual cause of death to natives exposed to them. The annual rainfall is about 50 inches. A branch of the East Indian Railway passes through the

district. Banda city (lat. 25° 28' N., lon. 80° 23' E.) (see map of N. India, ref. 6-F), on the river Ken, has a population of 29,000. The other towns are small. M. W. H.

Bandages [from Fr. *bandage*, a bandage, deriv. of *bande*, Eng. *band*; of Teutonic origin]: the bands used by surgeons to bind wounds or injured parts, or to retain dressings. The most common form of bandage is made of strips of muslin, linen, or the like, of varying width, and rolled longitudinally into a cylinder. The bandage is applied to a limb in a spiral manner, each turn overlapping one-third of the last, and where the limb is conical the bandage is folded back or *reversed* so as to exercise pressure equably. Pressure must be carefully regulated lest the circulation be obstructed, and, as has frequently happened, gangrene result. Special forms of bandages are used for different parts of the body. A large handkerchief may sometimes be used with advantage. Sometimes bandages are made to become immovable by first being soaked in starch or plaster-of-Paris. One of the most useful of bandages for emergencies is the "Spanish windlass," to check serious bleeding from any part of either extremity. It is merely a strip of muslin or a pocket handkerchief passed around the upper part of the limb, tied in a knot, and then twisted firmly by a stick or bayonet passed under it, so as to press with sufficient force to arrest the arterial circulation. It must not be left on many hours, but its temporary application has often saved life. In like manner, free bleeding from a wound of the scalp may be controlled by a compress and bandage tightly applied around the head. Revised by WILLIAM PEPPER.

Bandai-San, *bān'-dī-sān'*: a volcano of Japan; about 140 miles N. of Tokio. The summit includes several peaks, of which the highest rises 6,035 feet above the ocean and about 4,000 feet above the adjacent plain. On the morning of July 15, 1888, a tremendous explosion of steam occurred by which a side of the mountain was blown out, producing a crater more than a mile wide, with precipitous walls on three sides. The rock was broken into fragments and partly reduced to dust, and the *débris* rushed down the slope and over the adjacent plain, covering a district 27 sq. miles in area, burying a number of villages and killing 461 persons. The volume of the ejected material was about two-sevenths of a cubic mile. The eruption is described by S. Sekiya and Y. Kikuchi in vol. xiii. of the *Transactions of the Seismological Society of Japan*. G. K. GILBERT.

Ban'da Isles: a group of islands, about 50 miles S. of Ceram, forming part of the Molucca Archipelago; belonging to the Dutch (see map of East Indies, ref. 8-I); discovered in 1511 by a Portuguese, Antonio Abreis. Portugal took possession of the islands in 1524, and in 1599 they passed under the dominion of the Dutch, and as a Dutch province they now form the presidency of Banda, with an area of 7,150 sq. miles and a population of 111,000, of whom 6,000 are in Neira, the seat of government. They are lofty and volcanic; one of them, named Gunong Api, rises 7,880 feet above the sea, and is an active volcano. In the larger islands nutmegs and mace are grown exclusively. The name is sometimes, but improperly, applied to all the islands N. of the Banda Sea.

Banda'na, or **Bandan'na**: a silk or cotton handkerchief of East Indian origin, though now extensively manufactured in Great Britain. The cloth is dyed Turkey-red, and then the pattern is made by discharging the color with bleaching-liquor in a hydraulic press. The patterns of the real bandana are spots and diamond prints.

Banda (*baan'dān*) **Oriental**, i. e. the Eastern Shore, a name often employed for URUGUAY (*q. v.*).

Bandel, *bān'del*, JOSEPH ERNST, von: b. at Anspach, May 17, 1800; received his artistic education at the academy of Munich; studied for several years in Rome, and settled in 1827 at Munich. In 1834 he moved to Hanover. His principal work is the Hermann monument in the Teutoburger-Wald, near Detmold. It was begun in 1838, but not finished until nearly forty years later, and consists of a figure representing Hermann, 90 feet high, of copper, and raised on a foundation of granite 93½ feet high. In 1846 the foundation was ready to receive the statue, but the reaction which in 1850 set in and swept through the whole of Germany made it impossible to carry out a plan like that of the Hermann monument. In 1862 an association was formed in Hanover for the purpose, but only an insignificant sum was raised; in 1869 the King of Prussia gave 2,000 thalers; but after the Franco-German war the Hermann monument became a na-

tional affair and was soon completed. D. at Neudegg, near Donauwörth, Sept. 25, 1876.

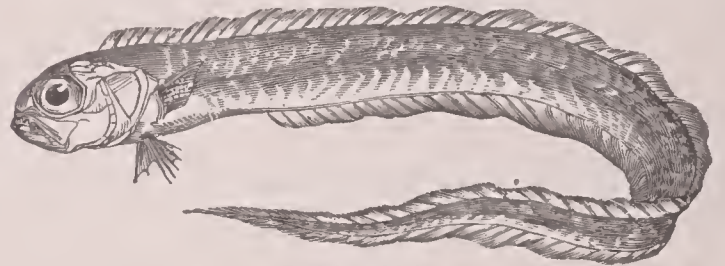
Ban-de-la-Roche: See OBERLIN, JEAN FRÉDÉRIC.

Bandelkhand: another spelling of BUNDELKHAND (*q. v.*).

Bandello, *bān-del'lō*, MATTEO: Italian story-writer; b. at Castelnuovo, Piedmont, in 1480; became a Dominican, and was teacher to Lucrezia Gonzaga. After the battle of Pavia he had to flee to France, and finally Henry II. made him Bishop of Agen (1550). He was living in 1561. His *Novelle* were famous over all Europe, and like the similar collection, the *Decameron*, served as a quarry for many succeeding writers, among them Shakspeare. There are 214 of these *Novelle* divided into four parts. The best edition is that of Sylvestri (Milan, 1813-14, 9 vols.). Some of them were translated by T. Roscoe in his *Italian Novelists* (vol. iii., London, 1825). Revised by A. R. MARSH.

Bandettini, *bān-det-tee'nē*, TERESA: Italian poet and improvisatrice; b. at Lucca, Aug. 12, 1755; d. Apr. 5, 1837. She began life as a *danseuse*, and only by chance discovered her talent for poetical improvisation. Her success in the latter field was extraordinary; and the *Amarilli Etrusca*, as she was called, received distinguished honors in many parts of Italy. Of her verse we have in permanent form: *La Morte di Adonide*, a poem in four chants; *Il Polidoro*, a tragedy; *La Rosmunda*, a drama; besides many shorter pieces. A. R. MARSH.

Bandfish: the *Cep'ola rubes'cens* or any allied fish having the body much elongated and compressed. The name



Red bandfish.

has also been given sometimes to other elongated and much compressed fishes. The red bandfish (*Cep'ola rubescens*) is about 15 inches long, and is found in the Mediterranean.

Ban'dicoot: a species of *Peramelidae*, a family of marsupial quadrupeds, natives of Australia and Tasmania, having a long head and a pointed muzzle. They devour grain in



Long-nosed bandicoot.

granaries and potatoes in the field. The *Perameles nasuta* is about 18 inches long. The name is popularly extended to several kindred genera of marsupials.

Bandiera, *bān-dē-ā'ra*, AILIO and EMILIO: two brothers and Italian patriots; born respectively in 1817 and 1819; were sons of a vice-admiral in the Austrian service. In the year 1842 they opened a correspondence with Mazzini, and formed a design to liberate Italy by a conspiracy. They failed, and escaped to Corfu about Mar., 1844, but hearing a false or exaggerated rumor of a revolt in Naples, they returned with a few friends and landed in Calabria in June. They were executed in the public square of Cosenza, July

25, 1844, their letters to Mazzini having been opened by the British postmaster-general, and the contents communicated to the Austrian Government.

Bandinelli, bān-deē-nel'lee, Baccio: sculptor and painter; b. 1493; d. at Florence, 1560. He was one of the more celebrated artists of the sixteenth century, but rather from the large amount of his generally skillful and popular work than by any lofty character or unusual excellence given to it. The *Hercules and Cacus* in the Loggia dei Lanzi at Florence, the tombs of the Popes Clement VII. and Leo X. in the Church of Santa Maria sopra Minerva at Rome, and the *Archangel Michael* on the top of the Castle of St. Angelo, also at Rome, are perhaps his best-known works.

RUSSELL STURGIS.

Bandini, bān-dec'nēe, ANGIOLO MARIA (1726-1803): classical philologist and librarian of the Laurentiana in Florence; made famous by his *Catalogue of the Laurentiana*, a monumental work of erudition and accuracy.

Bandit'ti [from Ital. *bandito*, proclaimed, outlawed, deriv. of *bandire* = Med. Lat. *banni're*, from Teutonic *ban*; cf. Eng. *ban*]: bands of robbers in the mountainous parts of Italy and Greece, who fall upon travelers and hold them captive for a ransom. In former times there existed in the larger towns of Italy organized associations of bandits, whose stilettoes were ready for hire to accomplish any deadly scheme. They were called euphemistically *bravi* ("brave men"), and were not exterminated until the modern improvements in police organization. Hired assassination (*homicidium conductum, assassinatus*) was a worse crime than ordinary murder, and punished by the wheel.

Band of Hope: See LOYAL TEMPERANCE LEGION.

Ban'don, or **Bandonbridge**: a town of Ireland; on the river Bandon; 20 miles S. W. of Cork (see map of Ireland, ref. 14-E). It is situated on both sides of the river, which enters the harbor of Kinsale. Bandon was formerly a prosperous manufacturing town, but its prosperity has considerably declined. Pop. 6,000.

Banér, bā-nār', written also **Bannier**, or **Bannér**, JOHAN: a famous Swedish general; b. at Djursholm, near Stockholm, June 23, 1596. He commanded the right wing under Gustavus Adolphus at the battle of Leipzig in Sept., 1631. His conduct in this action was highly applauded. On the death of Gustavus Adolphus (Nov., 1632) he became the commander-in-chief of the Swedish army. He gained a brilliant victory near Wittstock, Oct. 4, 1636, and again defeated the imperial army near Chemnitz, Apr. 14, 1639, after which he overran a large part of Germany. D. at Halberstadt, June 20, 1641. Schiller represents him as great in adversity, and formidable even after defeat. See Schiller, *History of the Thirty Years War*; Carl Manderfeldt, *Éloge de J. Banér*, Copenhagen, 1787.

Banff, bāmf: an ancient seaport-town of Scotland; capital of Banffshire; at the mouth of the river Deveron; on Moray Frith; about 40 miles N. N. W. of Aberdeen (see map of Scotland, ref. 6-I). A bridge over the river connects it with Macduff. Here is Duff House, the seat of the Earl of Fife, with a park 14 miles in circumference. Banff has manufactures of leather, soap, iron castings, linen, sails, and cordage, and has important fisheries of salmon, cod, and herring, which, with agricultural products, are exported from this town by sea. Banff has a lighthouse in lat. 57° 40' N., lon. 2° 31' W. The harbor is shallow and poor. The town has numerous and excellent schools and charitable institutions. The river is liable to floods, which have sometimes been destructive. Pop. 8,000.

Banff'shire: a county of Scotland; bounded N. by Moray Frith, E. and S. by Aberdeenshire, and W. by Elgin and Inverness-shire, and partly by the river Spey, a very rapid stream. Area, 614 sq. miles. The surface is greatly diversified by mountains and valleys. Among its highest peaks is Cairngorm, 4,090 feet high. Granite, slate, old red sandstone, limestone, and serpentine occur here. The soil of the valleys is fertile. The breeding of cattle is the chief occupation of the farmers. Capital, Banff. Pop. (1881) 62,736; (1891) 64,167; (1901) 61,439.

Bang, bāng, ANTON CHRISTIAN: a Norwegian author of a series of valuable works on church history; b. Sept. 18, 1840. His chief works are: *Hans Nielsen Hauge og hans Samtid* (2d ed. 1875); *Kirken og Romerstolen indtil Constantin den Store* (1879); *Julian den Frafaldne* (1881); and

Udsigt over den norske Kirkes Historie efter Reformationen (1883). In recent years he has written some valuable pamphlets on Norse mythology.

R. B. ANDERSON.

Bang, HERMAN; Danish novelist and poet; b. on the island of Alsen, Apr. 20, 1857. His masterpiece is perhaps *Ved Veien* (By the Roadside). Of his other works the following may be mentioned: *Haabløse Slægter* (Hopeless Generations); *Fædra*; *Excentriske Noveller* (Eccentric Tales); *Stuk*; *Digte* (Poems); *Under Aaget* (Under the Yoke); *Ti Aar* (Ten Years)—all published since 1879.

G. L. KITTREDGE.

Bangalore, bāng-ga-lōr': a strongly fortified town of India; the capital of Mysore; on a high table-land; 71 miles N. E. of Seringapatam; lat. 12° 58' N., lon. 77° 38' E. (see map of S. India, ref. 6-E). It is the chief British military station in Mysore, and is much frequented by Europeans, attracted by the salubrity of the air. The temperature seldom exceeds 90° F. Here are important manufactures of cotton and silk. It was taken by storm by Lord Cornwallis in 1791. Pop. (1891) 179,670.

Bang-ka, baang'ka, or **Mang-ka**, maang'ka, the largest city of Northern Formosa (*q. v.*), on the Tamsui river, and about 13 miles from its mouth. A railway connects it with KILUNG (*q. v.*). Near Bang-ka is Twa-tu-tia, the great center of the tea-trade of Formosa, and the capital of the province of Taiwan (i. e. Formosa) from 1885 to 1896. Pop. variously estimated from 50,000 to 100,000.

Bang'kok', or **Bankok**: a large commercial city; capital of Siam; situated on the river Meinam, about 20 miles from its entrance into the Gulf of Siam; lat. 13° 38' N., lon. 100° 34' E. (see map of East Indies, ref. 3-B). It is mostly built of wood, but has some brick and stone houses. Many of the houses are built on movable bamboo rafts on the river. The Chinese constitute a large part of the population, which is estimated at 600,000 to 1,000,000. Bangkok contains a large royal palace and numerous Buddhist temples, which are decorated in a gorgeous style. The stationary dwelling-houses are raised on piles 6 or 8 feet from the ground, in order to protect them from inundations. The river is navigable for vessels of 250 tons from its mouth to Bangkok, which has an extensive trade. The chief articles of export are sugar, pepper, rice, ivory, cardamoms, hides, tin, etc. Iron mines and forests of teak occur in the vicinity. It is the seat of Roman Catholic and of American Baptist and Presbyterian missions. It has some native Christians of Portuguese descent. See Sir John Bowring's *Siam*.

Bau'gor: an episcopal city and seaport of North Wales; county of Caernarvon; on the S. E. shore of Menai Strait; 2½ miles from the Britannia bridge, and 9 miles N. E. of Caernarvon (see map of England, ref. 8-D). It is on the railway which connects Chester and Holyhead, and is situated in a narrow, romantic valley. The grandeur and beauty of the scenery render it a favorite place of summer resort. Six miles from Bangor are slate-quarries which employ about 2,000 men. This city is very ancient. The famous monastery of Bangor was founded by Comgall. The cathedral, originally founded in 525, has been twice destroyed (in 1071 and in 1402). Bangor has eight annual fairs, four of which are for cattle. They are visited by great throngs of buyers and sellers. The trade by sea is not important, the harbor not being accessible to large vessels. The diocese includes the island of Anglesea. Pop. (1891) 9,892.

Bangor: a city, port of entry, and important railroad and commercial center; capital of Penobscot co., Me. (for location, see map of Maine, ref. 6-E); on the right bank of the Penobscot river, about 60 miles from its mouth, and at the head of navigation. The Kenduskeag stream, navigable to the center of the city, runs directly through it, dividing the city into two nearly equal parts. The stream is spanned by a number of bridges, and on it are located several important manufacturing industries. The city is surrounded by an excellent agricultural country, which sends to Bangor large quantities of farming produce for export. There is a large business in insurance done here. Water is carried from the river by the Holly system to every portion of the city, supplying residences and stores, furnishing power for small industries, and an abundant supply for extinguishing fires. The dam, built at an expense of \$500,000, crosses the river at the water-works, and affords excellent power for manufacturing industries. Bangor has a fine granite custom-house, an elegant opera-house, and several first-class hotels. The streets are broad, well shaded, and lighted by elec-

tricity. There are 5 national, 2 savings, and several private banks.

Manufactures, etc.—The manufacturing industries of Bangor are diversified, including several large iron foundries, planing-mills, furniture, carriage, and trunk manufactories, and a number of boot and shoe manufactories. The city offers special inducements to manufacturers on account of the low cost of suitable locations and the cheapness of most of the necessaries of life. The most magnificent water-power in New England is located a few miles above the city, and here extensive woolen mills are situated. Several pulp-mills are located along the river above the city, and in time this section is certain to be one of the most important manufacturing localities in New England. The lumber business is the principal industry, the amount sawed here being 175,000,000 feet annually. The ice-business of Bangor is now under the management of the American Ice Company. About 425,000 tons are cut annually.

Commerce, etc.—There is considerable commerce, coastwise and foreign; the average yearly arrivals are about 2,000. The foreign exports amount to about \$150,000 annually, of which spool-wood, shooks, and lumber form the principal part. The city has railroad and steamboat communication with all points east, west, and south. The completion of the Canadian Pacific Railway, connecting with the Bangor and Piscataquis R. R. at Brownsville, adds greatly to the advantages of Bangor as a commercial center. Bangor is the distributing point for travel to the summer-resorts of Eastern Maine, among the principal of which are Bar Harbor, which is within two hours' ride of the city, and Mt. Kineo, Moosehead Lake. A new railroad, the Bangor and Aroostook, is now in operation from Bangor to Northern Aroostook, a distance of 200 miles. The Bangor and Piscataquis has been bought, and the Bangor and Katahdin Iron Works Railway leased, by this company—making their total mileage operated 360 miles.

Salmon-fishing.—In 1886 it was discovered that salmon could be taken with a fly in the river below the dam, and now salmon-fishing, at the famous salmon pool, is very popular. A fine club-house for sportsmen has been built.

Churches, Education, etc.—The city has 18 churches, and 2 daily papers with weekly editions. The city schools are among the best in the State, and the theological seminary has a high reputation. The fine public library has 48,500 volumes. It is mainly supported by the income of a fund, amounting to \$112,000, established by citizens of Bangor, the greater portion of which (\$100,000) was given by the late Samuel F. Hersey.

History.—The French erected a fort on the present site of Bangor in 1656, and named it Norombega. The place was settled in 1769, and was then called Kenduskeag. Its name was changed to Bangor by Rev. Seth Noble, in honor of a well-known psalm-tune of that name. In 1791 the village was incorporated as a town, and in 1834 it became a city. Its rapid growth since that time has been the result of its position, which combines the advantages of a noble and navigable tidal river with a large and constant water-power. It has in the upper waters of the Penobscot the means of very cheap transportation of logs from the magnificent forests of Northern Maine. These advantages made it for a long time the greatest lumber-market in the world, and even now but few places excel it in the amount and value of lumber sawed and shipped. Pop. (1870) 18,289; (1880) 16,856; (1890) 19,103; (1900) 21,850. Bangor, with its suburb, Brewer, with which it is connected by bridge and a steam-ferry, had in 1900 a population of 26,685 and a valuation of over \$16,000,000. EDITOR "DAILY COMMERCIAL."

Bangor: borough; Northampton co., Pa. (for location of county, see map of Pennsylvania, ref. 4-J); on N. J. Cent. and Bangor and Port. R. R's., 15 miles N. of Easton. It has slate-quarries and manufactories. Pop. (1880) 1,328; (1890) 2,509; (1900) 4,106.

Bangor Theological Seminary: chartered by the Legislature of Massachusetts in 1814; opened at Hampden in 1816, and removed to Bangor, Me., in 1819, where its first class graduated the next year. It is a Congregational institution, but its rooms and tuition are free to Christian young men. The regular course consists of three years' work. The library contains over 17,000 volumes, and the property of the institution is valued at \$275,000. In 1899 there were 23 students, and 20,600 volumes in the library.

Bangs, HEMAN: Methodist preacher; b. at Fairfield, Conn., Apr., 1790; joined the New York Annual Conference

in 1815. He labored effectively in the pulpits of his denomination in New York and Connecticut. He was one of the principal founders of the Wesleyan University at Middletown, Conn., and one of the most powerful preachers of Methodism. D. at New Haven, Conn., Nov. 2, 1869.

Bangs, NATHAN, D. D.: Methodist minister; b. at Stratford, Conn., May 2, 1778. He became editor of the *Christian Advocate and Journal* (1828), and president of the Wesleyan University at Middletown, Conn. (1841), but resigned the next year. He wrote, among other works, a *History of the Methodist Episcopal Church* (4 vols., New York, 1839-42). D. in New York city, May 3, 1862. See his *Life*, by Abel Stevens, New York, 1863.

Bangwe'lo, or Bem'ba: a large lake in South Africa; lat. 10° to 13° S., lon. 30° E.; about 150 miles long from N. to S., and half as broad; elevation above the sea about 4,000 feet. It was discovered by Livingstone in 1868. It is fed by several large streams, the principal being the Chambezi from the northeast. It is of very irregular outline and shallow. It empties at its southwestern extremity into the Luapula, and this, probably, through Lake Moero, into the Congo river. M. W. H.

Baniäluka, bã-nëe-ää-loo'ka: a fortified town of Bosnia; on the river Verbas, 94 miles N. W. of Bosna-Serai (see map of Austria-Hungary, ref. 9-F). It has numerous mosques, many bazaars, a manufactory of gunpowder, hot springs, and Roman antiquities. Pop. (1885) 11,357.

Ba'nim, JOHN: Irish novelist; b. at Kilkenny, Apr. 3, 1798; excelled in the delineation of the life and character of the Irish peasantry. He published, with his brother, in 1825 *Tales of the O'Hara Family*, which was very popular. Among his other works are *The Battle of the Boyne* (1828); *The Denounced* (1830); *The Smuggler* (1831); and *The Mayor of Wind-gap*. D. at Wind-gap, near Kilkenny, Aug. 1, 1842. He has been called the "Scott of Ireland," but is deficient in humor, which is not to be wondered at, seeing he was a lifelong invalid. He wrote several successful plays, the most notable being *Damon and Pythias*, played at Covent Garden Theatre by Macready and Kemble in 1822. See his *Life*, by P. J. Murray (London, 1857). A new edition of the *O'Hara Tales* appeared in 1865.

Ban'ister, HENRY CHARLES: See the Appendix.

Banister, JOHN: b. in England; came from the West Indies to Virginia, and settled in the neighborhood of Jamestown, devoting himself to botanical investigations. He contributed in 1680 a catalogue of Virginia plants to Ray's *History of Plants*. He published, among other works, *Observations on the Natural Productions of Jamaica*, *The Insects of Virginia*, and *Curiosities in Virginia*. The genus *Banisteria* was named in his honor. He was killed in Virginia, in 1692, in one of his botanical excursions, by a fall.

Banister, JOHN: son of preceding; b. in Virginia; was educated in England, and studied law there. He was colonel in the Virginia line; was prominent in the patriotic conventions of the Revolution; member of the Virginia Assembly; delegate from Virginia to the Continental Congress in 1778-79, and signed the Articles of Confederation. He was lieutenant-colonel of cavalry in 1781. D. in 1787.

Baniwas: a tribe of South American Indians living on the Amazon and the Rio Negro. A vocabulary of their language is given by Alfred Wallace in *A Narrative of Travels on the Amazon and the Rio Negro* (1853, pp. 521-441).

Baniya: See BANYAN.

Banjarmassin, bãan-jar-maas'sin, or Benjar-Massen (i. e. the river of plenty): a town on the river Banjar, 15 miles from its mouth, on the south coast of Borneo (see map of East Indies, ref. 7-F). Owing to the inundations of the river, the town is mostly built on piles. It has a considerable trade in gold-dust, precious stones, birds' nests, wax, resin, rubber, rattan, pepper, and steel of native manufacture and excellent quality. Many of the inhabitants are Chinese, and most of the trade is with China. The name is also given to the former sultanate, which comprises about 6,000 sq. miles, with 300,000 inhabitants, mostly Mohammedans. It has been tributary to the Dutch since 1787, and was annexed by them in 1857. Pop. of town, 30,000.

Bank [viâ Fr. *banque* and Ital. *banca*, loan from Teutonic; cf. O. H. Germ. *banch*, Eng. *bench*. The special connection of signification with money is an Italian development]: a credit institution or a dealer in credits. This credit is of various kinds. A SAVINGS-BANK (q. v.) receives

deposits, and loans them to investors for long terms, chiefly on real-estate mortgages. A loan and trust company advances money on pledges of stocks, bonds, or other securities. A banker deals chiefly with commercial papers, secured not by real estate or stocks, but by the business transactions of his customers. Some bankers make a specialty of foreign exchange business; but the great majority of the loans are made on ordinary commercial paper; i. e. on accepted bills. If A sells B a hundred dollars' worth of goods, B may not and generally will not pay for it in cash, but in an acceptance, which is virtually a promise to pay 30, 60, or 90 days afterward. But a business man wants the cash to use immediately. He therefore takes this bill to his bank, and has it discounted. The bank considers that a hundred dollars two months hence is worth ninety-nine dollars to-day, and offers that amount for it. If the bank (or broker) pays in specie, it has to charge an extra rate of interest to make a profit on the transaction. But it may make a profit at the ordinary rate of interest, either by paying in its own notes as a bank of issue or by simply crediting its customers with the ninety-nine dollars, and allowing him to draw checks on this credit from time to time, as he may have occasion—acting as a *bank of deposit*. The more advanced the commerce of a country, the more important does the last-named function become. Large payments are universally made by check; metallic money and its representative, the circulating note, are together only the small change of trade, employed in the settlement of balances and in the smaller purchases and payments. The operations of the New York Clearing-house are a good illustration of the small amount of money required in the transaction of business, the balances paid in money being only about 4 per cent. of the amount of the settlements.

The earliest banking institution in Europe was the Bank of Venice, founded A. D. 1171. It was based upon a forced loan of the republic. Funds deposited in it could not be withdrawn, but were transferable on the books at the pleasure of the owner—in this respect not unlike the perpetual annuities of the British debt. These inscriptions of credit were usually at a premium over current coins, which were worn and clipped and were of various countries and values. Except in so far as the transfers of credit on the books were concerned, the bank was only a fiscal agent of the government. It continued in operation until 1797, when it was overthrown by the Revolutionary army of France.

The Bank of Genoa went into operation in 1407. For centuries it was one of the principal banks of Europe. It was the first to issue circulating notes, which were negotiated or passed only by indorsement, not made payable to bearer. It is not known whether or not they were issued in small denominations. They were probably made for considerable amounts, and employed only, or chiefly, in large transactions. This was a large step in advance of the earlier system of deposit transfers, which was also employed by this bank. In 1800, when its circulating notes were at a large premium, it was pillaged by the French army, and thenceforth ceased to perform the functions of a bank.

The Bank of Amsterdam, established in the year 1607, was the earliest considerable institution of the kind which looked to the promotion of commerce. Its predecessors of Venice and Genoa were chiefly devoted to the management of state finances. It was plundered by the French army in 1794, when it was found that, with the reputation of fifty millions of dollars in its vaults, it had nothing, its capital having been loaned to the States-General, the East India Company, and to the city of Amsterdam. In this condition of its affairs it had done an immense business during the preceding fifty years.

The Bank of Hamburg, established in 1619, was a bank of deposit and circulation based upon fine silver bars. The deposits were confined to silver. This institution, like nearly all those of the time, had, as a principal object, the protection of the people from worn, sweated, clipped, and plugged coins, and from coins of the German empire secretly reduced in standard value. The remedy was that previously adopted by the Bank of Amsterdam—to lock up the debased and depreciated coins, and circulate the credit granted for them.

The Bank of England was established in the year 1694. Nearly all the paper money of England and Wales is issued by this bank, £15,000,000 being based on securities, the rest upon actual deposits of coin, like U. S. gold certificates. During the period of the Napoleonic wars and immediately afterward (1797–1822) specie payments were suspended, but at present such a contingency is wholly out of the question.

Its charter has been frequently renewed, and, although considered as perpetual, is subject to amendment.

Previous to the passage of the bank-charter act of 1844 any bank or private person could issue bank-notes, subject to the condition that they must be paid in coin on demand. By that act such issue, with but slight exceptions, was confined to the Bank of England. This was divided into two departments—the bank and the issue department. The bank department is as private as any bank corporation; the issue department is an office of the state. The bank receives from the state office 15 millions of pounds in currency, which amount is loaned or issued to the Government, on which the bank receives 3 per cent. interest. The bank, however, pays to the Government about £200,000 annually for this privilege, and the profit to the bank from this source, after deducting the expense of management, is estimated at only about £100,000 annually. The notes are a legal tender everywhere except in payments by the bank. Bank-notes in excess of 15 million pounds are furnished by the issue department upon the gold coin and bullion held by it, which amount is not included in the reserves and is not under the control of the bank. In 1847, 1857, and 1866 the act was suspended, and the bank issued notes without holding gold; but the amount issued has only once exceeded the amount allowed by the bank charter, and then the excess was but £800,000.

The bank rate of interest since 1865 has varied from 10 to 2 per cent. The average rate for 1866 was 7 per cent.; for 1875, 3½ per cent.; for 1880, 2.76 per cent. The rate was reduced in Mar., 1887, from 4 to 3½ per cent. Its usual dividends are 10 per cent. per annum. The total issues of the United Kingdom on Feb. 5, 1887, were: Bank of England, £23,682,138; 148 private and joint-stock banks, £2,652,765; Scotland, £5,686,201; Ireland, £6,132,129; total for the United Kingdom, £38,153,970.

There is a large number of joint-stock banks which are not banks of issue. The usual dividends of the London and Westminster, London and Joint Stock, London and County, and the Union, which are leading joint-stock banks, are 20 per cent. per annum, and their average deposits are about twelve times the amount of their capital. In 1887 11 joint-stock banks in England, with a capital of £11,305,000, had 426 branches. The total deposits of the joint-stock banks of the United Kingdom in 1891 amounted to £539,000,000.

The number of banks in the Dominion of Canada in 1890 was 39; capital, 59 millions of dollars; circulation, 32 millions; deposits, 136 millions.

The Bank of France was authorized in 1800. Since 1803 it has had the exclusive privilege in Paris, and since 1857 in France, of issuing notes payable on demand. The bank in Mar., 1876, had 74 branches in the departments, and 14 others were in course of organization. Its present charter extends to the year 1897. During the revolution of 1848 it was authorized to suspend specie payments and its notes were made a legal tender. The Bank of France is not a fiscal agent of the Government, as is that of England. It does not collect or disburse the revenues of the exchequer, but lends to it largely in its exigencies, while its credits, in the form of circulating notes and other acceptances, have borne the government safely through extraordinary needs. During the war with Prussia, which continued for ten months and terminated on May 10, 1871, it rendered unexampled service. According to the report of the Minister of Finance for 1873, the total expenditures arising out of the war to that date were 9,288 millions of francs, or (at 20 cents to the franc) about 1,857 millions of dollars—an amount equal to about two-thirds of the war-debt of the U. S. When the war began the circulation of the bank was 251 millions of dollars, and its specie 229 millions, or 90 per cent. of its circulation. In June, 1871, the capital of the bank was 36½ million dollars, its circulation 442 millions, and its specie 110 millions, or about 25 per cent. of its circulation. In Nov., 1873, the circulation reached its maximum, and was 614 millions, while its specie had increased to 146 millions, or 24 per cent. of its circulation. In Dec., 1874, the ratio of specie to circulation was 52 per cent., and in Sept., 1875, 70 per cent. Since that date the amount of the circulation has fluctuated, standing on Nov. 2, 1876, at 515 millions, and on Feb. 8, 1877, at 533 millions. The stock of specie has risen rapidly since Dec., 1874. On Mar. 30, 1876, the bank held 350 millions of specie (of which 250 millions was in gold), being 76½ per cent. of its circulation and 63 per cent. of its deposits and circulation. In 1877, Feb. 22, it held 446 millions of specie, being 84½ per cent. of its circulation, which

was 528 millions. The increase of the circulation from July, 1870, to Nov., 1873, was 351 millions, and the decrease in specie 83 millions. The decrease in circulation from Nov., 1873, to Sept., 1875, when it reached its lowest point, was 135 millions, and the increase in specie in the same period was 179 millions. In Aug., 1870, the bank was again authorized to suspend specie payments and its notes were made a legal tender, but it has since paid out a large amount of coin. In 1875 it paid out 126 millions in gold and 96 millions in silver, and yet its stock of coin increased over 67 millions. Since the declaration of war in 1870 the bank loaned to the Government about \$600,000,000, and since the suspension of specie payments in 1870 the notes of the bank have, except during a brief period, remained at par. It resumed specie payments Jan. 1, 1878. In 1890 its circulation was \$572,000,000; its metallic reserve, \$474,000,000—not quite half of its silver.

The first organized bank in the U. S. had its origin in the formation of a banking company without charter, which was proposed in a resolution passed June 17, 1780, by citizens of Philadelphia. The first action in the Congress of the U. S. looking to the establishment of a bank was taken June 21, 1780, in reference to this proposed association. In the spring of 1781, Robert Morris, then superintendent of finance, submitted to Congress a plan for the establishment of the Bank of North America at Philadelphia, which plan was approved, and on Dec. 31 following a perpetual charter was granted to that institution. The bank opened for business on Jan. 2, 1782, and on Apr. 1 following the Legislature of Pennsylvania granted to the company a perpetual charter, which, though repealed in 1785, was subsequently renewed from time to time to the date of its last charter, on Dec. 3, 1854. On Feb. 7, 1784, the State of Massachusetts incorporated the Massachusetts Bank. The Bank of New York was chartered on Mar. 21, 1791, although it had since 1784 been doing business under "articles of association" drawn by Alexander Hamilton, who was a member of its first board of directors. All of the above-named institutions are still in a prosperous condition, and all have been converted into national banks.

The plan of establishing a Bank of the U. S. originated with Alexander Hamilton, then Secretary of the Treasury, and was first embodied in his report to Congress on Dec. 13, 1790. The capital of the proposed bank was fixed at \$10,000,000, one-fourth of the private and corporate subscriptions to be paid in gold and silver, and three-fourths in U. S. stocks bearing 6 per cent. interest. Two millions, to be subscribed by the U. S., were to be paid in ten equal annual installments by loans from the bank, or, as Mr. Hamilton describes the operation, "by borrowing with one hand what is lent with the other." This plan was adopted without material alteration by Congress, and approved by Washington, Feb. 25, 1791. During the years 1796–1802 the Government disposed of its stock in the bank at a considerable profit, 2,200 shares having been sold in the last-mentioned year at a premium of 45 per cent.

On Jan. 20, 1815, in accordance with the recommendation of Secretary Dallas, a bill was passed reorganizing the bank, many prominent members of both houses who had previously voted against a renewal of the charter now voting in its favor. President Madison ten days later returned the bill with his objections, but on Apr. 10, 1816, he approved a bill of substantially the same import; and this was the second and last charter of the bank granted by the general Government. The plan proposed by Mr. Dallas was modeled upon the charter of the first U. S. bank, and the act of incorporation, as finally passed, did not differ materially from the plan proposed by him. The charter was limited to twenty years, expiring on Mar. 3, 1836. The capital was fixed at \$35,000,000, seven millions of which was to be subscribed by the Government, payable in coin or in stock of the U. S. bearing interest at 5 per cent., and redeemable at the pleasure of the Government.

During the following year the currency was greatly depreciated; very many failures of State banks, corporations, and individuals had occurred, and the country had not yet recovered from the exhausting effects of its late war. In this emergency the bank attempted, by the importation of more than seven millions of dollars from Europe, at a cost of half a million, to restore soundness to the currency; but it became itself embarrassed, largely through the mismanagement of the branch at Baltimore, and was in danger of absolute failure. Its losses were reported to exceed three millions of dollars; but the bank, as well as the business of the country, eventually recovered. The industries of the

people and the finances of the Government prospered from 1820 to 1835. In this interval the national debt was paid, and the stock of the bank rose in the market until it commanded a premium of 20 per cent.

Congress having refused to recharter the bank, a bill was introduced in the Legislature of Pennsylvania to charter a State bank, to be called the U. S. Bank, which bill became a law just thirteen days before the expiration of the original charter. The circulating notes and the deposits of the Bank of the U. S. were eventually paid in full, and the accounts of the assignees were finally settled in 1856. The shares of the bank were quoted in 1837 at 125, in 1839 at 111, and in 1843, after its failure, at 1 $\frac{7}{8}$ per cent. The shareholders received no returns on their stock in the final settlement, the whole twenty-eight millions invested by them having been a total loss. The treasury records show that the Government realized a profit of \$6,093,167 upon its investment in the stock of the bank.

State banks were organized in most of the States of the Union under special charters obtained from their several Legislatures. Many of the States, chiefly Southern and Western, authorized banking corporations, with the State as part or sole stockholder. The amount of currency issued by them was frequently twice, and in many instances three times, the amount of their nominal capital. These charters were valuable, and the State Legislatures were besieged by applicants for such special privileges. In 1814 a bill was passed, by a two-thirds vote over the second veto of Gov. Snyder, of Pennsylvania, authorizing forty-one banks, with an aggregate capital of \$17,000,000, of which only one-fifth part was required to be paid in. Charters of banks authorized by the New England and the Southern States in some instances were disposed of to non-residents, who organized banks of circulation with little or no capital, and the citizens of other remote States suffered great loss from the worthlessness of such bank issues. The charters of these banks were in the interest of individuals, and generally of the friends of the dominant political party in the Legislature which granted them. In many instances they were corruptly obtained. Gov. Tompkins, of New York, in the year 1813, under authority of a clause in the constitution of 1777, prorogued the Legislature of that State, assigning as one of the reasons for such action that bank applicants had used or attempted to use corrupt means to secure a charter; and a clause was inserted in the constitution of 1821 which required the assent of two-thirds of the Legislature to the incorporation of a moneyed institution. In 1804 and in 1818 restraining acts were passed by the Legislature of that State, the latter of which provided that no person or association, unless authorized by law, should open an office for the purpose of receiving deposits, discounting promissory notes, or issuing circulation. This act was not repealed until the year 1837. Specie payments were generally suspended in 1814, in 1837, and in 1857, but many of the banks, particularly in the Western and Southern States, which were authorized to issue currency without security, and without such judicious restrictions as should always accompany legislation of this kind, were in a continual state of suspension. The rates of exchange between the Eastern, Southern, and Western States were oppressive, and the losses to the bill-holders from this cause were estimated to be not less than 5 per cent. annually upon the circulation, and to equal in 20 years the entire amount of circulation outstanding.

In 1813 a movement toward a reform in bank currency began in Massachusetts. This system was more fully developed in 1825, when five Boston banks undertook its management. Its exclusive control was finally assumed by the Suffolk Bank, which association compelled the redemption at par in Boston of the notes of the New England banks by a system of assorting and returning the notes to the place of issue; and its operations were continued down to the establishment of the national bank system.

In 1829 Mr. Van Buren, then Governor of New York, recommended a "safety-fund" system as affording greater security to the creditors and bill-holders of chartered banks; and during that year a bill which embodied his recommendation passed the Legislature and became a law. The system continued in operation for nine years, and its chief features were subsequently copied by Ohio and other States of the Union.

Suggestions regarding the expediency of requiring security to be given for bank issues were made by financial writers as early as 1815, and by Mr. Gallatin in 1831. The latter proposed that existing bank-notes be taxed out of ex-

istence, and suggested a system of currency which should be secured by stocks and real estate. The system of authorizing banks by special charter, with its attending evils, continued, however, in all the States down to the passage by the New York Legislature of the Free Bank act on Apr. 18, 1838. Under the provisions of this act any number of persons were authorized to form banking associations, upon the conditions and subject to the liabilities specified in the act. The law originally provided for the deposit of the stocks of the different States and bonds and mortgages as security for circulating notes. Previous to the year 1843 twenty-nine of these banks, with an aggregate circulation of \$1,233,374, had failed, and their securities were sufficient to pay but 74 per cent. of the circulation alone. Losses to bill-holders occurred only in the cases of those banks which had deposited State stocks other than those of New York. The law was so amended in 1849 as to require that at least one-half of the securities so deposited should consist of New York State stocks, and that not more than one-half should be in the stocks of the United States, the securities in all cases to be, or to be made, equal to a stock producing an interest of 6 per cent. per annum, and to be taken at a rate not above their par value, and at not more than their market value. The banks were under the supervision of a commissioner appointed under the Safety Fund act until the year 1843, in which year they were required to report to the State Comptroller; but in 1851 the present office of bank superintendent was established. In 1840 a law was passed requiring the banks of New York to redeem their notes at an agency of the bank, either in New York city, Albany, or Troy, at one-half of 1 per cent. discount. This discount was reduced in 1851 to one-fourth of 1 per cent. After the passage of this act two of the principal banks in the city of New York inaugurated a plan of redemption similar to the Suffolk system. The notes of such associations as kept a deposit with them were returned to the banks of issue, and the discount of one-fourth of 1 per cent. was divided between the redemption agent and the associations whose notes were redeemed. Those banks which did not provide the means for redemption were forced to close up their affairs.

Some of the States adopted banking laws based on the New York system, but most of them were careless in this matter, and "wildcat banking" was a prominent cause of the crisis of 1857. The just dissatisfaction of the public with State banks in general and the financial exigencies of the Government in the course of the war combined to pave the way for the establishment of a national banking system, modeled on the general lines of the New York act. Such a system was recommended by Secretary Chase in 1861 and 1862. An act to this effect was passed Feb. 25, 1863, but proved inoperative, and was superseded by the act of June 3, 1864, which forms the basis of the existing system.

It provided for the establishment of a national bank bureau in the Treasury Department, the chief officer of which is the comptroller of the currency. Under this act national banks may be organized by any number of persons, not less than five, the capital in any instance to be not less than \$100,000, except that in cities containing a population not exceeding 6,000 banks may be established with a capital of not less than \$50,000. The capital stock in cities having a population of 50,000 must not be less than \$200,000. Not less than one-third of the capital was required to be invested in U. S. bonds, upon which circulating notes may be issued equal in amount to 90 per cent. of the current market value, but not exceeding 90 per cent. of the par value of the bonds deposited; the notes are receivable at par in the U. S. in all payments to and from the Government, except for duties on imports, interest on the public debt, and in redemption of the national currency. On Mar. 3, 1865, an act was passed providing that every banking association should pay a tax of 10 per cent. on the notes of any person or State bank used for circulation and paid out by them; which act had the effect of taxing State-bank circulation out of existence.

The national bank act authorized the issue of \$300,000,000 of circulation, which amount was increased to \$354,000,000 by the act of May 12, 1870. The act of June 20, 1874, provided for the deposit by any association of lawful money with the treasurer in sums of not less than \$9,000, and the withdrawal of a proportionate amount of the bonds on deposit as security for its circulating notes. The act of Jan. 14, 1875, authorized the unlimited issue of circulating notes, subject to the restrictions of then existing law, but made it the duty of the Secretary of the Treasury to retire legal-

der notes to the extent of 80 per cent. of the additional national bank-notes issued, and to continue such retirement until the legal-tender notes should be reduced to \$300,000,000. The greatest amount of national bank circulation outstanding at any one time was on Oct. 13, 1882, when it reached \$363,407,474. Since that time it has steadily and of late years rapidly decreased, while the deposits have at the same time been increasing.

DATE.	Circulation.	Individual deposits.	DATE.	Circulation.	Individual deposits.
	Millions.	Millions.		Millions.	Millions.
Oct., 1880....	317·3	887·9	Oct., 1888...	155·4	1,350·7
" 1882....	315·0	1,134·9	" 1889....	128·5	1,522·0
" 1884....	289·8	993·0	" 1890....	123·0	1,594·2
" 1886....	228·8	1,189·5	" 1900....	283·9	2,508·2
" 1887....	167·3	1,274·7			

This difference is due, on the one hand, to the increased use of checks as a means of payment instead of notes; and on the other hand to the high price of U. S. bonds, which has reduced the net interest to about 2½ per cent., and made it very unprofitable to hold them as a reserve to secure circulation. So great has been the contraction of the bank-note currency from this latter cause that many efforts have been made to allow the banks to base their circulation on securities other than U. S. bonds, but these efforts have been thus far without effect.

The national banks in twenty-three of the larger cities are required to keep a reserve amounting to 25 per cent. of their deposits. In New York, Chicago, and St. Louis such reserves must be actually on hand; in the other cities, one-half of such reserve may be kept in the form of bank deposits in any of the cities above named. Outside of these larger cities the required reserve is only 15 per cent., and three-fifths of this reserve may be in the form of balances in the hands of banking associations in larger cities. The reserve has been habitually kept much higher than the legal requirement, in the neighborhood of 30 per cent.

The following table shows the resources and liabilities of the national banks, in millions of dollars, at different periods:

RESOURCES, ETC.	Oct., 1870.	Oct., 1880.	Oct., 1890.	Sept., 1900.
Number of banks.....	1,615	2,090	3,540	3,871
<i>Resources.</i>				
Loans.....	715·9	1,041·0	1,986·1	2,686·7
Bonds for circulation.....	340·9	357·8	140·0	294·8
Other U. S. bonds.....	37·7	43·6	30·7	113·8
Stocks, bonds, etc.....	23·6	48·9	115·5	367·2
Due from banks.....	109·4	213·5	336·2	736·3
Real estate, etc.....	27·5	48·0	76·8	107·2
Specie.....	18·5	109·3	195·9	373·3
Legal-tender notes.....	79·3	56·6	80·6	145·0
National bank-notes.....	12·5	18·2	18·5	25·4
Clearing-house exchanges..	79·1	121·1	106·8	124·5
U. S. certif. of deposit.....	....	7·7	6·2	2·0
Due from U. S. Treasury...	....	17·1	6·9	1·6
Other resources.....	66·3	23·0	41·3	68·5
Totals.....	1,510·7	2,105·8	3,141·5	5,048·1
<i>Liabilities.</i>				
Capital stock.....	430·4	457·6	650·4	630·2
Surplus fund.....	94·1	120·5	213·6	261·8
Undivided profits.....	38·6	46·1	97·0	127·5
Circulation outstanding....	293·9	317·3	123·0	283·9
Due to depositors.....	515·2	887·9	1,594·2	2,506·2
Due to banks.....	130·1	267·9	426·4	1,096·5
Other liabilities.....	8·4	8·5	36·9	139·6
Totals.....	1,510·7	2,105·8	3,141·5	5,048·1

Statistics (partly unofficial) of State and private banks, savings-banks, and trust companies, were given as follows, by the comptroller of the currency, for the year 1900:

BANKS, ETC.	Number.	Capital.	Surplus.	Deposits.
		Millions.	Millions.	Millions.
State banks.....	4,369	237·0	91·3	1,266·7
Loan and trust companies..	290	126·9	112·6	1,028·2
Savings-banks (mutual)....	652	.....	175·7	2,134·4
" " (stock).....	350	19·8	9·1	255·2
Private banks.....	989	19·3	3·1	96·2
Totals.....	6,650	403·0	391·8	4,780·7
Add to this—				
National banks (1900).....	3,871	630·2	261·8	2,508·2
Grand totals.....	10,521	1,033·2	653·6	7,288·9

Fuller figures are given in the reports of the comptroller of the currency for successive years. See also CLEARING-HOUSE, CURRENCY, SAVINGS-BANKS.

Revised by A. T. HADLEY.

Bank Ban: ban of Hungary; flourished in the first half of the thirteenth century, and acquired a kind of romantic fame from the prompt revenge he took upon Queen Gertrude, the spouse of Andreas II., King of Hungary. The queen's brother, Eckart, seduced the wife of the ban, and the queen aided him in carrying out his evil design. But as soon as Bank discovered the queen's participation in the conspiracy he gathered a mob, stormed the palace, and killed the queen, though he knew that it would cost him his life. And so it did. When King Andreas II., who was absent on a campaign in Poland, returned, he immediately put Bank to death. The story has several times been made the subject of dramatic treatment. Katona's drama *Bank-bán* (Klausenburg, 1827) is considered one of the best dramas the Hungarian literature has produced; it was translated into German by Dux (1858), and the genuine pathos of the characters and the scenic strength of the story made a great impression.

Bankes, HENRY: b. in London, 1757; was educated at Westminster School and at Trinity College, Cambridge, and entered Parliament in 1780 for Corfe Castle, which place—the family borough—he continued to represent till 1826. He wrote *The Civil and Constitutional History of Rome from the Foundation to the Age of Augustus* (1818, 2 vols.). D. at Tregothnan, Cornwall, Dec. 17, 1834.

Bank'head, JOHN PINE: captain U. S. N.; son of Gen. James Bankhead, U. S. A.; b. in South Carolina, Aug. 3, 1821; entered the navy as a midshipman Aug. 6, 1838. He commanded the gunboat Pembina at the battle of Port Royal, Nov. 7, 1861, and during the subsequent operations on the coast of South Carolina; commanded the Monitor when she foundered off Hatteras on the night of Dec. 31, 1862, and displayed admirable coolness on that trying occasion. He was made captain in 1866. D. near Aden, Arabia, Apr. 27, 1869.

Bankrupt [orig. *banke rota*, from Ital. *banca rotta*, bank broken, but changed to *bankrupt* under influence of Lat. *ruptus*]: originally a merchant whose bench or counter had been broken by reason of inability to pay his debts. In its popular sense the word is now nearly synonymous with *insolvent*, and denotes any person unable to meet his liabilities. In England its legal signification is well defined. It embraces only traders, or persons whose business it is to buy and sell for gain, and the various statutes which have been enacted there since the reign of Henry VIII. in relation to bankrupts have been applicable to that class alone. By the English laws a bankrupt is a trader who has committed an act of bankruptcy, as defined by statute. A trader may have committed an act of bankruptcy, and have been formally adjudged a bankrupt, and yet be entirely solvent—that is, eventually able to pay his debts in full; and he may be wholly unable to pay his debts, and yet have committed no act of bankruptcy. A bankrupt was at first regarded as an offender against the law, and bankrupt laws were intended for the benefit of creditors. But at present they are founded on the interests of trade, and intended to be beneficial to both debtor and creditor. If the conduct of the bankrupt has been such as to entitle him to the consideration of the court, he is discharged forever from all debts owing by him at the time he became a bankrupt. The law is confined to traders, because they are regarded as possessing peculiar facilities for delaying and defrauding creditors; and, on the other hand, they are considered, generally speaking, the only class subject to heavy accidental losses, and to an inability to pay their debts without any fault on their part. The above statements must be qualified by the results of the statute 46 and 47 Vict., c. 52 of 1883, and 53 and 54 Vict., c. 71 of 1890. For other details, see *INSOLVENCY*.

In the U. S., Congress possesses the power, under the Constitution, to establish uniform laws on the subject of bankruptcies. Pursuant to this power, in the year 1800, Congress passed a bankrupt law, which by its own terms was limited to five years, but it was repealed in 1803. This law preserved the leading features of the English laws relating to bankruptcy. It could be enforced only on the application of creditors, and embraced only the mercantile class.

In the year 1841 the second bankrupt act was enacted by Congress. It could be taken advantage of by all persons whomsoever residing in the U. S. owing debts not con-

tracted in a fiduciary capacity, although it could be enforced at the instance of creditors only against merchants, bankers, brokers, factors, and underwriters. This extended exercise of the power over the subject of bankruptcy was violently opposed as unconstitutional, on the ground that Congress was confined to the well-recognized meaning of the term bankruptcies as understood in the English courts when the Constitution was formed. The law was repealed in Mar., 1843.

But by act approved Mar. 2, 1867, Congress passed a third bankrupt law, even more general in its scope than the preceding. Under it any person residing in the U. S. and owing debts to the amount of \$300 could, on his own application showing his inability to pay his debts in full, and his desire to surrender his property for the benefit of his creditors, take advantage of the act and be declared a bankrupt. So a debtor owing a specified amount could be forced to become a bankrupt upon the application of creditors if he has committed any of certain offenses or acts specified in the statute. The bankrupt, after the distribution of his property amounting to a fixed percentage of his debts, obtained a discharge from all his indebtedness existing at the time the petition was filed, except in certain instances specified in the act. This act has been in its turn repealed (chap. 160, laws of 1878).

The distinguishing feature of a bankrupt act is the summary seizure of all the debtor's property, and its division among his creditors in proportion to their claims. The race of diligence among creditors is entirely at an end, and all legal proceedings, except such as are in conformity to the statute, are stayed. It is against the policy of the bankrupt law to allow the debtor, in contemplation of bankruptcy, to give preference to one creditor over another. All such preferences are void, and an attempt to make them is of itself an act of bankruptcy.

The various States also possess the power to pass bankrupt laws, but no State bankrupt or insolvent law can impair the obligations of contracts. Hence they can not release a debtor from obligations incurred before the passage of such law, nor act upon the rights of citizens of other States. And when Congress sees fit to exercise the power over the subject of bankruptcies granted it by the Constitution, the State laws on the same subject are suspended. On the repeal of the Congressional law the State laws would revive. The power of Congress over the subject is plenary, and its law may affect existing debts as well as those which are contracted after its enactment.

The judicial business in bankruptcy is in the main transacted by the district court of the U. S., with officers called registers to conduct the administrative or non-contested business. The estate is managed by an assignee, who acts as a trustee, and is accountable to the court referred to. See *BANKRUPTCY*, in the Appendix.

Banks (named after Sir JOSEPH BANKS, *q. v.*): name of four single islands or groups: (1) An island off the coast of British Columbia, on the east side of Hecate Straits, in lat. 53° 30' N., lon. 130° 10' W.; 41 miles long by 5 to 10 broad; high, rocky, and wooded. (2) A large island in the Arctic Sea, north of British America, in about lon. 120° W. (3) A small island in Torres Straits, between New Guinea and Australia. (4) A group of islands in the South Seas, consisting of two larger and five smaller islands, the northern part of the New Hebrides cluster. M. W. H.

Banks, Mrs. ISABELLA VARLEY: See the Appendix.

Banks, Sir JOSEPH, LL. D., F. R. S.: naturalist; b. in London, Feb. 13, 1743. He was educated at Oxford. He sailed with Capt. Cook in his voyage round the world in 1768, returning in 1771 with rich collections of plants, animals, etc. In 1778 he was chosen president of the Royal Society, over which he presided forty-two years. He contributed memoirs to the *Philosophical Transactions* and other publications. D. June 19, 1820.

Banks, NATHANIEL PRENTISS, LL. D.: a statesman and general; b. at Waltham, Mass., Jan. 30, 1816. He learned the trade of a machinist, studied law, was elected to the Legislature as a Democrat in 1849, and was chosen Speaker of the House of Representatives of Massachusetts in 1851. Having been elected a member of the national Congress in 1852, he was separated from the Democratic party by his opposition to the extension of slavery, and in 1854 was returned to Congress by the Republicans and Knownothings. In Feb., 1856, after an exciting contest which occupied two months, he was chosen Speaker of the House on the one

hundred and thirty-third ballot. He was elected Governor of Massachusetts in Nov., 1857, for one year, and was re-elected in 1858 and 1859. In May, 1861, he was appointed a major-general of volunteers, and soon obtained the command of an army on the Potomac. Having gained some advantage at Winchester, in Mar., 1862, he pursued the enemy to Harrisonburg. On May 24 he was attacked by Stonewall Jackson, and retreated rapidly to the Potomac. In Dec., 1862, he succeeded Gen. Butler as commander of the department of the Gulf. About the end of May, 1863, he invested Port Hudson, which was taken with about 6,000 prisoners July 9. In the spring of 1864 he conducted an expedition up the Red river, in which Rear-Admiral Porter co-operated with the gunboats. He ascended above Grand Ecore. After several battles at Pleasant Hill (April 9) and other places, being pressed by superior numbers, he retreated toward New Orleans, and was relieved from the command in May, 1864. He was chosen M. C. by the Republicans of Massachusetts in 1864, 1866, 1868, and 1870. He served as chairman of the Committee of Foreign Relations in the Fortieth and Forty-first Congresses. He advocated the election of Horace Greeley as President, and was defeated for Congress in 1872, but was re-elected in 1874 and 1876. He was U. S. marshal at Boston, Mass., 1879-88; re-elected to Congress Nov. 6, 1888. D. in Waltham, Mass., Sept. 1, 1894.

Banks, THOMAS: the first great English sculptor; b. at Lambeth, Dec. 29, 1735. He gained the gold medal of the Royal Academy in 1770, and went to Rome in 1772. He remained for several years in Rome, and produced there *Caractacus Pleading before Claudius*, and an admirable statue of *Psyche and the Butterfly*, which was purchased by Catherine II. of Russia, at whose invitation he visited St. Petersburg in 1784. Among his masterpieces is the *Mourning Achilles*. He excelled in imaginative works. He became a member of the Royal Academy. D. in London, Feb. 2, 1805.

Banks, Savings: See SAVINGS-BANKS.

Bank Safes and Vaults: See SAFES, BURGLAR-PROOF.

Bank'sia: a genus of Australian shrubs and trees of the family *Proteaceae*, named in honor of Sir Joseph Banks; have hard, dry leaves, and an umbellate arrangement of branches bearing near the extremities oblong heads of numerous flowers, which secrete much honey. They are called honeysuckle trees, and abound in all parts of Australia. One species (*Banksia grandis*), found at Swan river, grows to a height of 50 feet.

Banks Land: island in western part of Arctic America; discovered by Parry 1819; separated by Banks Strait from Melville island on the N. W. and by Prince of Wales Strait from Prince Albert Land on the S. See map of North America, ref. 2-D.

Bankura: a district and town of Burdwan division, Bengal, British India; between the parallels 22° and 23° N. and the meridians 86° and 87° E.; N. W. from Calcutta, and between the Gangetic delta and the highlands. The fat paddy lands along the eastern margin gradually pass into the undulating forest tracts of the west. The district is noted for the fine colored silk cloths manufactured within it. The climate is fairly healthy. The winters are cool and bracing, but the summers are hot and oppressive. The rainfall is about 60 inches. The district suffered greatly from the famine of 1865-66. Area, 2,621 sq. miles. Pop., 1,000,000. Bankura city (see map of N. India, ref. 8-1) is the capital (lat. 23° 14' N., lon. 87° 7' E.); has a population of 19,000. Bishnupur is about as large. M. W. H.

Bann: either of two rivers in N. E. of Ireland—the Upper Bann, 25 miles long, flowing into, and the Lower Bann, 40 miles long, flowing out of, Lough Neagh. The Lower Bann has important salmon and eel fisheries.

Ban'natyne Club: a literary club deriving its name from George Bannatyne (1545-1608), who was born in Scotland. He compiled a collection of manuscripts called *Corpus Poeticum Scotorum*. This club was founded at Edinburgh in 1823 by Sir Walter Scott, its design being to promote the knowledge of Scottish history and antiquities, and to print rare works which tend to illustrate those subjects. The club originally consisted of thirty-one members, and gradually increased to one hundred, to which number it was finally limited.

Ban'neker, BENJAMIN: a Negro mathematician; b. at Ellicott's Mills, Md., Nov. 9, 1731. He was the author of an almanac (1792, *sqq.*), of which a copy was sent by Thomas

Jefferson to the secretary of the Academy of Sciences at Paris. Banneker assisted in laying out Washington city and running the boundary-lines of the District of Columbia. D. at Baltimore in Oct., 1806. See his *Life* by J. H. B. Latrobe (Phila., 1845), and by J. S. Norris (1854).

Ban'ner [O. Fr. *banere*, formed with Lat. suffix *-aria* from a Teutonic loan-word; cf. Goth. *bandwô*, emblem, of same root with Eng. *bind*]: a flag; that is to say, a piece of cloth attached to a spear or staff, and serving to denote the nationality of a company of soldiers, the character and purpose of a society, or the rank of a prince or chief. The modern use of the term for a flag which hangs from a cross-bar is not the original or proper meaning. In the Middle Ages the term denoted the square flag carried before a knight-banneret. In literature the term is used as synonymous with flag, but in a somewhat lofty or poetical sense.

Banner, MICHAEL: See the Appendix.

Ban'neret: See KNIGHT.

Ban'nister, HENRY, D. D.: b. at Conway, Mass., Oct. 5, 1812; graduated at the Wesleyan University, Conn. in 1836; studied at Anburn Theological Seminary; was teacher and principal of the Methodist Academy at Cazenovia 1838-56; and in 1856 was appointed Professor of Exegetical Theology in the Garrett Biblical Institute, which is now the Theological Department of the Northwestern University at Evanston, Ill. He was author of several able published sermons, addresses, and reviews scattered in various periodicals. He was also a highly esteemed professor, teacher, and lecturer. D. at Evanston, Ill., Apr. 15, 1883.

Ban'nockburn: a village of Scotland; in the county of Stirling, on the Bannock rivulet, 3 miles S. of Stirling (see map of Scotland, ref. 11-G). It was the scene of a famous and complete victory gained by Robert Bruce over the English army, led by the king, Edward II., on June 24, 1314. The English lost about 30,000 men. Here are important manufactures of woolens, especially tartans and carpets. Pop. about 2,600.

Banns (or Bans) of Marriage [for etymology see BAN]: a public notice of an intended marriage, given in a church or other place prescribed by law. The law of England requires that all banns of matrimony shall be published in an audible manner, according to the rubric prefixed to the marriage service in the Book of Common Prayer, after the second lesson at matins or evensong, upon three Sundays preceding the ceremony. This rubric is in the following terms: "I publish the banns of marriage between A, of —, and B, of —. If any of you know cause or just impediment why these persons should not be joined together in holy matrimony, ye are to declare it." The English law, however, dispenses with this preliminary publication if the parties obtain a license from the court of the bishop of the diocese or any of his surrogates, or from the Archbishop of Canterbury. A republication of the banns is necessary if the marriage is not solemnized within three months. The "bidding" of banns has fallen into disuse in the U. S., though it is still occasionally heard. The practice was first directed in the times of the Fathers, was enacted afterward by Odo, Bishop of Paris, about 1176, placed in the canon law in 1200 by the Synod of Westminster, and prescribed for the whole Latin Church by the Lateran Council in 1215. It is still required by the canon law of England and of the Roman Catholic Church. Revised by W. S. PERRY.

Bannu: See BANU.

Banswara, baän-swaa'ra (i. e. the forest country): a feudatory state in Rajputana, British India; lat. 23° 30' N., lon. 74° 30' E.; area, 1,500 sq. miles. Pop. 105,000, of whom 48,000 are Bhils, a brave and warlike hill tribe of India, not disposed to agriculture. The country is arid.

Bantam, baän-taam': an old town of Java, on the north coast, 44 miles W. of Batavia (see map of East Indies, ref. 8-C). It was formerly a large city and great entrepôt of trade, but on account of the unhealthy climate is at present almost deserted. In the fifteenth century it was the chief town of a powerful Mohammedan empire of the same name, which at one time even comprised the southern part of Sumatra and the west coast of Borneo. In 1683 the Sultan of Bantam became a vassal of the Netherlands, and in the beginning of the present century the Dutch took possession of the sultanate. The town is in lat. 6° 2' S., lon. 106° 50' E.

Bantam: a name applied to the numerous dwarf breeds of the domestic fowl, many of which are of very recent

origin. Originally given to a small breed supposed to have been brought from Bantam, Java. Bantam fowls are remarkable for their courage and for consequential fussiness.

Ban'teng (*Bibos sondaicus*): a species of ox (*Bovidae*); a native of Java and Borneo, which in color, shape, horns, and want of dewlap bears some resemblance to the gaur of India. It has short and sleek hair, slender limbs, and a sharp muzzle. Though extremely wild, it is often domesticated by the natives, and becomes a very serviceable animal.

Ban'tingism: a regimen for the reduction of corpulence; so called after a London undertaker named William Banting (1797–Mar. 16, 1878), who introduced it (1863) as the result of his own experience. The regimen was suggested to him by Mr. William Harvey. In several weeks he reduced his weight from 202 lb. to 156 lb., and with marked gain to his health. The regimen consists essentially in the avoidance of food containing fatty matter, and of materials which may make fat in the body, as starch and sugar. Lean meat predominates in this diet; vegetables are almost excluded; butter, milk, sugar, and malt liquors are prohibited. With active exercise this method is often successful in reducing excessive weight.

Bantry Bay: a deep inlet in the south of Ireland, in Cork County; is 25 miles long and from 3 to 5 miles wide. It is one of the finest harbors in Europe, affording safe and commodious anchorage for ships of all sizes. The coast of the bay is high and rocky, consisting of Devonian strata, and exhibits some of the finest scenery in the island. Near the entrance of this bay occurred a naval action between the English and French in 1689.

Ban'tu: See AFRICAN LANGUAGES.

Banu, *baa'noo*, or **Bannu**: a district of the Darajat division of the Punjab, British India; situated between the parallels 32° and 33° N. and the meridians 70° and 72° E. Area, 3,868 sq. miles. Pop. 333,000, 90 per cent. of whom are Mohammedans. The Indus flows through the district, but its course is very capricious and it has a tendency to move eastward. During inundations it is a vast body of water, many miles across. The principal crops are the ordinary cereals, millet, sugar-cane, cotton, and oil seeds. The principal towns are Trakhet, pop. 7,500, and Kalabagh, 6,500.

M. W. H.

Banville, *bañ'veel'*, THÉODORE FAULLAIN, de: French poet; b. at Moulins, Mar. 14, 1823; has obtained the admiration of a clique (*soi-disant* decadent) of French and other writers. In 1842 he published *Les Cariatides*, and *Les Stalactites* in 1846; but he first attracted general attention by his *Odes funambulesques* (1857). Afterward he published many verses and wrote several plays. His poetic works have been published together in 3 volumes (1878–79); also his plays (except the opera-ballet *Les Nations*), under the title *Comédies*. A volume of recollections, *Mes Souvenirs*, appeared in 1882. D. in Paris, Mar. 13, 1891.

A. R. MARSH.

Banx'ring: an insectivorous quadruped, of the genus *Tupaia*; native of Sumatra, India, Borneo, etc. It climbs trees with agility, like the lemur and squirrels, and has an elongated muzzle and a long bushy tail.



Tupaia, or banxring.

Ban'yan, **Banian**, or, in Bengalese form, **Baniya** [from Skr. *vaniy*, a merchant]: a Hindu shop-keeper or merchant; especially one of the wholesale dealers and importers of Bombay, Surat, Cambay, etc., who carry on a trade with the interior of Asia by caravans and with Africa by ships. They usually belong to the caste called Vaisayas, and strictly abstain from animal food.

Banyan, or **Banian** [so called because frequently used as market-places by the banyans or merchants]: an East



Banyan-tree.

Indian tree (*Ficus indica*), remarkable for its mode of propagation by means of aerial roots, which, on descending to the ground and penetrating it, become stems or trunks. These roots at first hang like loose cords, but after they take hold they are gradually tightened, till they become almost as firm as a rod of iron. In this manner a single tree spreads over a large extent of ground, and endures for many centuries. One of these trees has been described as having 350 large stems, and occupying so large a space that many thousand persons might stand under its shade. It is a species of fig, and produces a fruit about as large as a cherry, and of a rich scarlet color. An abundance of gum-lac is procured from this tree, the bark of which is esteemed as a tonic by Hindu physicians. The above illustration may serve to give one an idea of a vigorous and comparatively young banyan-tree. In very old trees many of the stems often become almost or quite as large as the original trunk. Its wood is light, porous, and of little value.

Banz, baans: the name of one of the finest Benedictine abbeys known in history; situated in Bavaria in the midst of a beautiful landscape. The monks of this abbey were noted for their learning and humane spirit. It was founded in 1058. The convent was abolished in 1802, and is now the summer residence of the princes of Bavaria. Here is a museum which is especially rich in petrifications.

Ba'obab: See ADANSONIA.

Baour-Lormian, *baä'oör' lör'mi-ään'*, PIERRE MARIE FRANÇOIS LOUIS: French poet of the first empire; b. at Toulouse, Mar. 24, 1770; translator of Tasso (1795) and Ossian (1801), and author of many tragedies in the severely classic style, which were greatly admired in their time; but before his death he saw himself one of the most despised of poets, the butt of numberless epigrams, and the especial detestation of the Romanticists. He had been made a member of the French Academy (1815), however, and when he died this body, still a stronghold of the classicists, manifested their respect for him by unusual signs. Nisard, whose own classical sympathies were in the main with him, pronounced the funeral oration. D. in Paris, Dec. 10, 1854.

Revised by A. R. MARSH.

Baph'omet: a mysterious symbol of the Knight Templars, was a small human figure cut out of stone, having two heads, male and female. It was environed with serpents and astrological attributes, and marked with inscriptions, mostly in Arabic. The word is supposed to be a corruption of Mohammed or Mahomet (called by the Portuguese, Bafoma), to whose religion the Templars were suspected of leaning. Others derive it from Βαφή Μήτρεως, the "bath of wisdom," a reputed name of the Gnostic baptism, often called in old writings "baphometric baptism." Some explain it as a cabalistic term formed by writing backward, *tem. o. h. p. ab*, i. e. *templi omnium hominum pacis abbas*. Quite a number of baphomets are preserved in European archaeological collections.

Baptism [from Gr. βαπτισμός, subst. to βαπτίζω, baptize]: a sacrament and initiatory rite of the Christian Church. By whatever other ceremonies one may be advanced to the privileges of full membership, it has been universally held in Christendom, except among sects repudiating sacraments altogether, that a baptized person was by that rite incorporated into the Church which Christ and the apostles founded, or into the mystical "body of Christ." The authority for this rite rests upon the New Testament. (See Matt. xxviii. 18-20; Mark xvi. 16; Acts ii. 38, x. 44; Rom. vi. 4; Col. ii. 12, etc.) From these and similar texts a doctrine of baptism has been developed, as a common Christian heritage, although it has been variously modified by differing religious bodies.

It has been customary to find the antecedents of baptism in the rites with which it was alleged that the Jews received proselytes into their number, and also in the rite practiced by John the Baptist; but both of these subjects are very obscure. It is thought by some that the Jewish baptism of proselytes came into use after the final dispersion of the nation, and in imitation of Christian practice. As for John's rite, it is not known what formula he used, nor into what body he regarded it as an initiation, if any at all, nor what the inward benefits were which he attached to the ceremony, except that it was a symbol of repentance. For all purpose of argument or use, baptism must stand upon New Testament texts and the usages of the Christian Church.

Rites.—The practice of the early Christians as given in the New Testament was very simple. There is no evidence that Christ ever baptized, but he seems to have adopted the rite of his forerunner and to have lifted it into a higher significance. It was no longer a symbol merely of repentance, but also of a new life, a *palingenesis* wrought by the Holy Ghost, an assurance of forgiveness, and a badge of entrance into the "Kingdom of God." It is clear that the apostles (Acts ii. 38-41; viii. 16) and the evangelists (Acts viii. 37, 38; xix. 3-5) baptized, and in these two passages there is an intimation of the verbal formula at first used. Soon, however, it began to be held that the two outward essentials of baptism were the use of water and of the words of Christ as given in Matt. xxviii. 19. It is probable that the primitive rite was ordinarily performed by immersion, which became a trine immersion in respect to the three persons of the Trinity, but later the trine immersion ceased, as affording ground for questioning the unity of the Godhead. The Council of Ravenna, 1311, legalized the baptism of sprinkling, by leaving to the officiating minister the choice of the two modes of applying water; but the practice of "clinical" or bedside baptism had long been in use, and had spread from the sick-room to the churches. This practice received an impulse from the desire of catechumens to postpone their baptism, as was the case with Constantine, until the end of life drew nigh, that the recipient might receive the spiritual benefits involved at the latest moment, and when the danger was least of forfeiting baptismal grace by subsequent misconduct. By reason of this postponement Christians now and then died unbaptized, but if they departed this life as martyrs they were held to have received the "baptism of blood." St. Augustine speaks also of a "baptism of tears" as possible for the deeply penitent. Baptism of the dead was a rite received often by proxy, but was regarded as heretical. Lay baptism was long recognized as valid in the early and mediæval Church, as it still is by the Roman Catholics, although with the development of high views of the clerical function this practice was discouraged. In emergencies nurses and midwives and even unbaptized laymen, if their intent was right, could administer the sacrament. Among Protestants, however, lay baptism is scarcely recognized at all.

The early Church developed elaborate ceremonies in connection with baptism. Candidates for the rite were termed catechumens, and received by laying on of hands to a long course of instruction. At first they were not allowed to witness the mysteries (hence the term "mass" or *missa* for the Eucharist, which was celebrated after the dismissal of the general congregation). They were permitted to attend church, worship as witnesses at first, and then to take part in the responses and genuflections. From these the *electi* were taken, and baptism was administered at the great church festivals, especially Whitsunday. The catechumen was received; given a Christian name; turning to the west he renounced the "devil and all his works"; then he was exorcised, the priest laying his hands on him, breathing in

his face, and commanding the evil spirit to come out of him. The ceremony of opening the candidate's ears and nose followed, indicating that he was to receive the Word and Holy Spirit. He was then anointed with oil; sometimes an anointing followed the baptism itself. Then came an instruction, which ended with the rehearsal of the Lord's Prayer and Apostle's Creed by the catechumens. Often a whole day was passed in these preliminaries. In baptism the water was first consecrated. The rite was performed at the entrance of the church, and quite commonly after it the baptized received a white garment in token of his cleansing from sin. These garments were often laid up in the churches as witnesses, lest the baptized forget their vows.

Water is still variously applied: in immersion the person is submerged backward in the water; in pouring or affusion, water is poured from a vessel or a shell over the head; in aspersion or sprinkling the water is dropped from the hand upon the head. In primitive immersions the catechumen was submerged face downward. In the Church of England infant immersion, or dipping, was practiced until after the Reformation. In the Greek churches a form of immersion is still observed. In these two and in the Anglican communions the application of water is followed by the minister's making a sign of the cross upon the forehead of the baptized.

The practice of infant baptism gave rise to SPONSORS (*q. v.*), or god-parents, who promised in the child's behalf faith and obedience, and on their own the child's Christian nurture.

Divergencies of views concerning baptism have arisen, extending from the *ex opere operato* theory found in St. Augustine, and the High-Church expansion of his views, to the Quaker contention that the inward witness of the Holy Ghost suffices without other ceremony. They arise over the mode of applying water and over the qualifications for it, from the baptism of infants to that of adults only, and then on a profession of repentance and faith. These characteristic views will be found stated in this work in the article BAPTISTS (*q. v.*) and under the titles of the various Christian denominations. S. M. J.

Baptism from the Roman Catholic standpoint "is the sacrament of regeneration by water in the word." (*Catechism of the Council of Trent.*) 1. The matter of baptism is natural water poured on the head of the person to be baptized. But baptism by immersion or by sprinkling would be equally valid.

2. The form of words to be pronounced by the minister in the very act of pouring on the water is: "I baptize thee in the name of the Father, and of the Son, and of the Holy Ghost."

3. The ordinary minister of baptism is the priest; but any man or woman, heretic, Jew, or pagan can validly baptize, provided he applies properly the matter and form, and has the intention to do what Christ ordains.

4. The effects of baptism are in general regeneration, and in particular the infusion of sanctifying grace, the gifts of the Holy Ghost, faith, hope, and charity, etc., and the remission of all sin, original and actual, and of all penalties due to sin, both temporal and eternal. Baptism also imprints an indelible character, and makes the recipient a member of the Church of Christ.

5. Unless already validly baptized, any human being (even infants and idiots) is a *subject* capable of receiving baptism. Adults should have the proper dispositions.

6. Baptism is *necessary* to salvation. But in case of necessity the baptism of desire, or of blood, can, in the case of adults, supply the place of baptism by water.

JOHN J. KEANE.

Baptistery [from Gr. βαπτιστήριον, bathing-place, baptistry]: the building or chamber set apart for the administration of the sacrament of baptism. These buildings are either octagonal, polygonal, or circular. They are usually placed at the west end of the church or at the entrance, baptism symbolizing the entrance into the Church of Christ. They began to be erected probably in the time of Constantine. The baptistry of the Lateran in Rome (about 62 feet in diameter) is said to have been built by him. The baptistry of Florence, among the most celebrated, is an octagonal structure about 100 feet in diameter, standing in close proximity to the cathedral. It is built of black and white marble. The most remarkable features of this baptistry are the magnificent bronze doors, adorned with bas-reliefs by Ghiberti and others. In the center of each of these build-

ings erected for baptismal purposes is a font, which is often of considerable proportions—that at Ravenna being about 9 feet square, and that of the Lateran, at Rome, 37 inches or more in depth.

Baptists: a body of evangelical Christians numbering about 5,000,000 of communicants, who insist that believers are the only proper subjects, and that immersion is the only proper mode of baptism. They insist also on the Bible as the sole and sufficient rule of faith and practice, on the independence of the local church, the separation of the Church from the state, and the widest liberty of conscience. In America the large majority adhere to strict communion at the Lord's table. There are several divisions among them, but the largest division is Calvinistic in its type of doctrine. They are most numerous in Great Britain and North America, but are also represented in many other countries.

So far as present researches go, the name "*Baptist*," as applied to this body of Christian people, first appears in literature in the year 1644 in a volume entitled *The Anabaptists' Groundwork for Reformation*, page 23. Prior to that date they were without a name, and commonly designated themselves as "those who are unjustly called Anabaptists." (See ANABAPTISTS.) The new name gave offense: it was charged that "they arrogate to themselves the title of Baptists, as if none were baptized but themselves." Much speculation has been bestowed to determine why this more aggressive attitude should have been assumed about the year 1644. Some have fancied that the new title was claimed and maintained because of the change in the form of administering baptism, which is alleged to have occurred about the year 1641, when immersion was restored in the place of sprinkling and pouring. If these had been retained it would have been as impossible for them to shake off the name Anabaptist as it was in the case of the Anabaptists of Germany. After the restoration of immersion, it was easy to insist that those who practiced it were alone "baptized people," emphasis being laid not only upon the subjects as formerly, but also upon the mode of baptism. This latter emphasis was clearly indicated by the name Baptist.

In the year 1609 or 1610 a body of English Anabaptists was organized in Holland, which subsequently developed into the Arminian Anabaptist movement in England. After 1641, when believers' immersion was restored in England, this body of Arminian Anabaptists became known as General Baptists. No traces of believers' immersion have yet been discovered in England between 1509 and 1641. The Puritan movement was in progress: Ainsworth, Johnson, Clifton, and their adherents were already settled in Amsterdam, where they found refuge from their English persecutors. Possibly in 1606 John Smyth made his way to Amsterdam from Lincolnshire for the same purpose, with another party composed of about forty adults. Arrived in Amsterdam, Mr. Smyth shortly fell in with the Mennonites, and fell out with Ainsworth and the friends with whom he had hitherto co-operated. The Mennonites, who opposed infant baptism, persuaded Smyth that he had never been baptized. All of Smyth's company apparently joined him in this conviction, and decided to have themselves rebaptized. Smyth took the lead, and, after performing the ceremony in his own case, proceeded to baptize the others. The mode of this baptism, it is believed, was by sprinkling, since that had now become the general mode in England, and the Brownists do not appear to have used any other. Certainly there was no other mode among the Mennonites, and sprinkling had by this time become almost universal in every section of Holland and Germany.

Instead of welcoming this change the Mennonites criticised the action of Smyth and his people, asserting that they had no right to baptize themselves, for the reason that they had no succession in respect to baptism or the ordination of elders. Smyth was impressed by that reasoning, and shortly became assured that his new position was untenable. According to de Hoop Scheffer, it was in the year 1609 that he applied to be admitted to the Mennonite Church in Amsterdam, where he fancied was true succession both as regards ordinances and officers. Thirty-one of his followers united with him in that request. They were not immediately admitted, but remained on the threshold till the year 1615 before they were finally received. Smyth had passed away meanwhile, in 1612.

Four persons of the party of Smyth were unwilling to join him in seeking admission to the Mennonite Church, as-

serting that succession is a mark of the beast, and intimating that the Mennonites could not demonstrate their own succession. Their names were Thomas Helwys, William Piggott, Thomas Seamer and John Murton. Their protest was uttered on Mar. 12, 1609. Some time afterward, possibly before the close of the year, they concluded to organize themselves into a church, a step in which they may have been joined by their wives or other members of their families. De Hoop Scheffer suggests that as many as ten persons participated in founding this English Anabaptist Church. In the year 1611 appeared their earliest confession of faith, entitled *A Declaration of Faith of English People Remaining at Amsterdam, in Holland*. They shortly returned to England, and established their church at Newgate, in London. In the year 1626 there were five of these English Anabaptist churches in England, which comprised about 150 communicants. By the year 1644 the number of churches had increased to something over forty.

Though the company of Helwys and Morton had refused to enter the Mennonite communion, they had not escaped the influence of the Mennonites. They lost in Holland the assured faith which they had carried thither in the doctrines of the Calvinistic system, and became Arminians. The denomination which they founded later became known as General Baptists, owing to the fact that they believed in a general atonement. They also surrendered the Brownist ecclesiastical constitution, and borrowed from the Mennonites the constitution with elders and deacons which has now become almost universal among Baptists. They stoutly refused to accept the Mennonite opinion regarding oaths and the magistracy, but were disposed to favor the idea that it of churches is sinful for a Christian man to bear arms.

The other branch which, after 1641, became known as English *Particular Baptists*, had a different history. At the outset, all Brownists who could conveniently escape took refuge from persecution in Holland. By the year 1616, however, it was considered possible for them to remain at home, and in that year the oldest Independent church on English soil was established at London under Mr. Henry Jacob. In the course of time it was perceived that a portion of the members of Mr. Jacob's church denied the truth of the parish churches, while others conceded that point. This led to a peaceful separation, the seceding party organizing a new church on Sept. 12, 1633. A large portion of this seceding party also scrupled the baptism which they had received in infancy, and these submitted to adult baptism, apparently by sprinkling. Having had no kind of connection with Holland or the Mennonites, their Calvinism remained intact. Their church constitution was likewise at the beginning unaffected by the Mennonite scheme; they were in favor of the four grades of officers—pastors, teachers, elders, and deacons—which at that period prevailed among the Independents. In fact, so intimate and fraternal were the subsequent relations between the Particular or Calvinistic Baptists and the Independents, that the custom was shortly established of organizing mixed churches, composed in part of Independents and in part of Baptists, with a pastor selected indifferently from either denomination. The church over which Mr. Bunyan presided was of that sort, and there were many others. The lines between the two denominations are now more strictly drawn, but there are still numbers of these mixed churches in England. The Particular Baptists, having received no education in Mennonite views, did not, as the General Baptists are known to have done, feel any scruples touching the lawfulness of military service. That a Christian might become a magistrate, or incur the responsibilities of a judicial oath, was also never questioned among them.

Soon after the organization of this first Calvinistic Anabaptist Church a discussion was raised concerning the proper mode of administering baptism, and the conviction was at length established that immersion was the only scriptural mode. Much embarrassment resulted when they began to consult as to the wisest course of procedure. Mr. Spillsbury, the pastor, and most of the members, held the opinion that, since the circumstances were extraordinary, it was admissible for any minister to administer immersion even though he had not himself received the rite, arguing that neither John the Baptist nor the twelve apostles had been baptized before they commenced to baptize others. That position was approved by the larger number, and those who were accounted most judicious. Others were discontented, and insisted upon obtaining succession. Some of these were members of Mr. Spillsbury's flock, but it is supposed

that the majority still belonged to the Independent Church from which Spillsbury's church had separated. No succession could be obtained in England; they were aware of the existence of the Arminian Anabaptists, but as these were still in the practice of sprinkling they could afford no relief. Mr. Richard Blunt, who took an active part in favor of succession, was master of the Dutch language, and well acquainted with the condition of affairs in Holland. He cited attention to the Collegiants, who in the year 1620 had established the practice of immersion at Rhynsburg, and proposed to send thither and obtain succession from them. He was deputed to go abroad for that purpose, and, arriving at Rhynsburg, was courteously received by Mr. John Batten, successor of the brothers Van der Codde in the pastoral office there. In due time Batten consented to immerse him, and returning to England he administered the rite to the rest of his company. Thus the people now known as Particular Baptists became divided into two separate tendencies; the followers of Spillsbury laid no stress upon succession, his opponents regarded it as indispensable. The same division prevails at the present time.

If the Rhynsburgers introduced immersion only in the year 1620, it might be claimed that their succession was a mere myth, and that Blunt did not obtain what he went so far to seek. That question has been investigated in a special treatise by de Hoop Scheffer, entitled *Overzicht der Geschiedenis van den Doop bij Onderdompeling* (Amsterdam, 1882), in which he suggests that immersion had been brought out of Poland to Rhynsburg by Joannes Geesteranus. From the Polish Anabaptists it might also be traced back to Switzerland and the Reformation. Hence the friends of succession are not so hardly bested as might at first appear. Their case is stronger than some are aware of who oppose their claims.

As soon as they perceived this change, the English Arminian Anabaptists almost immediately accepted it, and so became English General Baptists. Mr. Edward Barber has the honor to have written the initial treatise in the long controversy in favor of the immersion of believers, entitled *A Treatise of Baptism or Dipping* (1641). The Particular Baptists, who had now increased to seven congregations, published their earliest confession of faith in 1644, and took pains to provide for immersion. This confession was to a degree dependent upon the confession of the Brownist churches, which had been issued in various editions in Holland. The confession of 1644 retains the Independent form of church constitution, providing for pastors, teachers, elders, and deacons; but when the edition of 1646 was issued they adopted the scheme derived by the General Baptists from the Mennonites. As already intimated, that scheme has become prevalent; but some of the older churches, as that of Mr. Spurgeon, still retain some features of the Independent scheme.

First Period of English Baptist History (1644-1750).—Having described above the beginnings of Baptist history in England, at least in so far as any organized churches are concerned, it is now in order to give a brief account of their early progress. Almost immediately after the two parties, General and Particular Baptists, had established themselves in the doctrines and usages which they were destined to maintain, the upheavals of the Revolution began to be observed. This movement was of special advantage to the Baptists, who flourished amazingly as long as it continued. Freedom of speech, freedom of the press, and freedom of many other kinds were enjoyed and improved. The Particular Baptists, however, reaped the highest benefits. They stood nearest to the Independents, who became the victorious party. Mr. Kiffin, their most prominent preacher and leader, was a person of wealth, energy, and experience in affairs, whose influence was felt in many quarters. When the Protector was distributing favors, a due share would go to his firm friends and allies of the Particular Baptists. A portion of their ministers were granted positions in the established church; others accompanied the army in the character of chaplains. Thousands of their adherents were in the ranks, and some few attained to prominence in official station. Indeed, when Richard Cromwell displayed his incompetency to succeed his father, it was for a season apprehended that the Baptists might come to the helm of state.

The General Baptists, on the contrary, were handicapped by the principle of opposition to the bearing of arms by Christian men which they had inherited from the Mennonites. That principle, however, was not universally accepted

by the General Baptists, since Gen. Desborough, one of their leaders, attained to prominence and influence in the army. It is also possible that not a few members of his communion may have served in the ranks. Yet the fact remains that the great body of the General Baptists abstained as far as possible from taking part in the triumphs of the military. This attitude toward Cromwell and the cause of the people condemned them to insignificance. During these convulsions was established the marked sympathy between the General Baptists and the Quakers that has been so frequently a matter of observation and remark. Both these parties alike were composed of men of peace, and they would naturally comfort and encourage each other by denouncing the men of the sword. It is suspected that this close contact with the Quakers might have been injurious to the General Baptists, who were commonly more enthusiastic and less safely poised than the Particular Baptists.

The numbers of the Particular Baptists at the Restoration in 1660 can not be definitely ascertained, but it is estimated that there may have been something like 100,000 of them; the General Baptists claimed "more than 20,000." Following the return of the king there was a season of repression and decay. The Particular Baptists are believed to have experienced the heaviest losses, due in part to the fact that multitudes had become attached to them during the Commonwealth period in the expectation that they would one day attain to supreme control in the government. When that hope was thwarted, there was no further incentive to profess their creed, and the floating element retired from their churches. The General Baptists issued a confession of faith in March, 1660, composed of twenty-five articles, in which that denomination as a whole committed themselves to the practice of immersion. After the overthrow of the Stuarts the Particular Baptists held a general assembly at London in Sept., 1689, in which they set forth a new confession for that party. It was based on the Westminster Confession. There were more than 100 churches in the General Assembly of 1689, and it is likely that they represented nearly all the Particular Baptists then in England. It is believed that 15,000 would be a fair estimate of the entire number of communicants. One of the leading items of the platform upon which this assembly stood is given in the following words: "That in those things wherein one church differs from another church in their principles or practices, in point of communion, that we can not, shall not impose upon any particular church therein, but leave every church to their own liberty to walk together as they have received from the Lord." This provision was indispensable for the accommodation of the mixed churches, as well as for the accommodation of such as did not receive a mixed membership and yet granted open communion at the Lord's table. Mr. Bunyan, as the leader of the mixed church contingent, was also the leader of the open communion party. Mr. Kiffin seems to have opposed mixed churches, and was the leader of the strict communion party. These two leaders had recently engaged in a controversy that was still unsettled, and the assembly found it impossible to take any decided position, either in its platform of organization or in the confession of faith which it indorsed. This open communion, however, was hardly intended to apply to any others than members of the Independent body; it did not embrace the General Baptists, who, having no mixed churches, were in their turn strict communionists at the Lord's table.

There was still further decay among the Baptists of England from 1689 to 1750. The seeds of Socinianism, which the General Baptists had brought over with them from Holland, came to ripeness during this period, and the denomination was almost desolated. The Particular Baptists drifted into Hyper-Calvinism; a portion of them likewise were infected by the Socinian leaven. A pretty reliable census of the Particular Baptists in 1750 showed 10,000 communicants. It is likely that the General Baptists did not then number more than 5,000.

Second Period of English Baptist History (1750-1897).—The denomination was at a low ebb at the beginning of this period, but the influences of the Great Awakening were already beginning to be felt among them. The ascendancy of Dr. Gill and of men yet more extreme was still acknowledged, but their views were beginning to be called in question. Finally Andrew Fuller appeared upon the scene with a modified and evangelical form of Calvinism which in the course of time broke the sway of Gill and the Hyper-Calvinists, bringing Baptists into cordial sympathy with the re-

vived religious life of the times. In 1792 was formed the Baptist Missionary Society, and the next year Carey and Thomas were sent as missionaries to India. During the long period of decay it is suspected that the strict communion element had gained some ground among Particular Baptists; but Robert Hall in 1815 took up the cause of Bunyan and secured the triumph of open communion. After that period the strict communion party retired from the fellowship of their brethren and maintained a separate existence. Much attention has been given to the interests of education, and there are several flourishing institutions of learning. Mr. Spurgeon and Robert Hall have been the most prominent ministers. The General Baptists took little part in the revival of religion. At length, however, Mr. Dan Taylor, of Yorkshire, who had been for some years connected with the Methodists, becoming persuaded that immersion was the proper mode of baptism, was immersed by a General Baptist minister in 1763. He continued in alliance with the General Baptists till 1770, but a deal of friction was occasioned by their Socinian tendencies. Finding it impossible longer to endure their heretical sentiments, he withdrew in 1770, and formed a new denomination called the General Baptists of the New Connection, who were somewhat decidedly Methodist in their doctrine and usages. The original denomination continued to exist, but it is believed that they are now nearly extinct. The General Baptists of the New Connection, on the contrary, are in a flourishing condition, numbering at present 203 churches, 134 pastors and missionaries, and 27,256 members. They are open communion in their practice. The Baptists of England, according to the latest statistics, embrace 360,112 communicants. They have been laborious and successful in the cause of missions in India, Ceylon, Burma, and the West Indies.

BAPTISTS OF AMERICA.—In 1636 Roger Williams, who had been banished from the colony of Massachusetts Bay, established a community at Providence, and set up a church. He preached with zeal and regularity until Mar., 1639, when it was decided to make a new departure. Williams, having become convinced of the error of infant baptism, concluded to obtain rebaptism. Eleven others joined him in this step. Ezekiel Holliman baptized Williams, and then Williams baptized the rest of the company, and so they became an Anabaptist church. The ceremony was most likely performed by sprinkling; the immersion of believers had not yet been restored in England; and there is no reason which renders it probable that Williams was in that regard in advance of the people with whom he now allied himself. John Clarke, who had likewise been driven from Massachusetts Bay, arrived at Newport in 1638. Like Williams, he was a zealous preacher and kept regular worship among his fellow-colonists. When Williams caused himself to be rebaptized in 1639, it is likely that Clarke and his people approved the change. In 1640 Gov. Winthrop announces that Clarke and divers of his associates had become Anabaptists. Possibly they were rebaptized by Williams or some of the men from Providence.

Restoration of Believers' Immersion.—In 1644 Williams returned from England with a charter for the colony. It is possible that Mr. Mark Lucar came over with him. Lucar had been a member of the church organized in England on Sept. 12, 1633. In the year 1641, when Mr. Blunt returned from Holland, Mr. Lucar is mentioned as one of the persons who received immersion. Upon his arrival in America he would be swift to advertise the brethren touching the change that had been enacted in England. His representations appear to have met with decided favor; for in the year 1644 the church in Newport was reorganized, with him as one of the most important members. This is believed to signify that they then received immersion at the hands of Lucar, and became for the first time a regular Baptist church in the sense now accepted. Probably the immersion of the Providence men followed in a short while. Mr. Lucar, who is understood to be the founder of believers' immersion in America, brought with him the ideas of succession that were so much valued in England, and many American Baptists have become committed to them. The relations between the Independents and the Baptists in America were very different from those that prevailed in England; by consequence there has never been anything like mixed churches here, and the tendency toward open communion has been very slight.

First Period of American Baptist History (1644-1750).—The earliest churches of Providence and Newport were both of the Particular Baptist persuasion, but the General Bap-

tists shortly appeared upon the scene. In 1652 a General Baptist church was formed at Providence by Chad Brown, Gregory Dexter, and William Wickenden, and in 1656 a similar church was established at Newport, making two rival and more or less hostile Baptist churches in each place. Throughout the period before us the General Baptists were in the ascendant. About the year 1718 the first church in Providence, of which Williams was the founder, became extinct, and the General Baptist church of the Browns triumphed over it. After that casualty only three Particular Baptist churches remained in New England, while the General Baptist churches were quite numerous, having a large and aggressive Yearly Meeting. In the Middle Colonies the forces seem to have been more evenly divided, there being many General Baptists in the Philadelphia Association, and also many Particular Baptists. The two parties appear to have watched each other narrowly and to have manoeuvred for the advantage, which in the end remained with the Particular Baptists. Philadelphia Association is suspected to have begun its history in the character of a Yearly Meeting, but in the year 1707 the other element rallied and gave it the title of Association, a Particular Baptist designation. Nevertheless, some of the churches appear to have been honeycombed by Arminian sentiments, so that it was impossible for the body to adopt a Calvinistic confession of faith before the year 1742. In the Southern Colonies the General Baptists prevailed almost exclusively, there being only a single Particular Baptist church. The Arminians, however, combined against this church in Charleston, S. C., and had well-nigh destroyed it before deliverance came. In North Carolina the General Baptist Yearly Meeting was perhaps the most prosperous, though not the most powerful, body of Baptist people then in existence.

Second Period of American Baptists (1750-1897).—The Particular Baptists were on the point of defeat in 1750; if succor had not been bestowed it is more than likely that the General Baptists would have controlled the destinies of the Baptists of America. But at an early stage of its progress the Great Awakening in America fell under Calvinistic auspices. Jonathan Edwards and George Whitefield took the lead, and, without intending to accomplish such a result, rescued the falling fortunes of the Particular interest. In 1742, shortly after Mr. Whitefield appeared upon the scene, the Philadelphia Association adopted the Philadelphia Confession of Faith, which was the banner of the Particular party in England, and prepared herself for action. In a few years this association acquired the hegemony of American Baptists, and has ever since maintained that dignity. It sent representatives to Maryland and Northern Virginia, where they speedily captured the Arminian churches that existed in that region. It also dispatched agents, men of admirable gifts and zeal, to North Carolina, where in 1755 they captured nearly the whole of the flourishing Yearly Meeting that had been cultivated with so much care by Rev. Paul Palmer. A few of Palmer's followers resisted, and still stand to their colors in that portion of the country, whence they sent forth colonies to the Cumberland country, which have grown to be a somewhat numerous people in Kentucky and Indiana. A Philadelphia minister went to Charleston in 1749, and, taking charge of the first church, soon succeeded in driving away the General Baptist opponent. In 1751 it was given to the exertions of Oliver Hart to lay the foundations of Charleston Association on the Philadelphia model and with the Philadelphia creed. The men of Philadelphia even ventured as far as Nova Scotia to preach the Word. Two of its most gifted young ministers also had the temerity to invade the General Baptist stronghold in New England, and to carry a college to Rhode Island, which at first scarcely anybody was prepared to receive. James Manning and Hezekiah Smith, however, persevered in their task, and at last earned for themselves a welcome. It is amazing the amount of work that was accomplished in the interest of Philadelphia within a period of twenty years. In 1751 Charleston Association was established. In 1765 Kehukee Association was built on the ruins of the General Baptist interest in North Carolina; in 1766 Kettocton was founded by a like process on the borders of Maryland and Virginia; in 1767 Manning and Smith, assisted by John Gano, Abel Griffith, and Noah Hammond, who had made a special journey from Philadelphia for the purpose, established Warren Association in Rhode Island. By this means the entire country was occupied by the Philadelphia Association and its allies. The General Baptists were driven back at every point; their cause was now lost. Their Yearly Meet-

ing in New England has perpetuated itself in a feeble way to the present time, reporting in 1896 only 10 churches and 741 members. They still retain the ancient designation of *Six-principle Baptists*.

The Gibraltar of the General Baptists, however, still held out; the church in Providence had not yet been directly assailed. In 1770 the labor of taking this stronghold was begun. Manning succeeded to admiration; in due time Samuel Winsor retired to Johnston with the original church, and the present First Baptist church of Providence was founded in 1771. Long years of patient education were required before the last vestiges of the old Arminian leaven could be eliminated; it was not until the year 1782 that Manning could induce the new church to attach itself to Warren Association; the Second church of Newport declined to take that step until the year 1801.

Separate Baptists.—Through the influence of Whitefield and Edwards Calvinism gained the victory among American Baptists, and Arminianism was defeated. While the conflict between these parties was going forward a dangerous rival to the Calvinistic interest appeared upon the scene. As a direct result of Whitefield's preaching, a new denomination of Christians had arisen in New England called Separates, from the circumstance that they had separated from the churches of the Standing Order. About the year 1750 numbers of these Separates became convinced of the correctness of Baptist principles, and had themselves immersed. By that means churches of Separate Baptists were constituted in many sections of the country. More than half the Baptists of New England are supposed to be of Separate Baptist extraction. Manning and Smith succeeded in conciliating Isaac Backus, the leader of the Separate Baptists in New England, at an early date, and their forces were thus united with those of Philadelphia. Owing to the intimacy of that union there has not been much friction between the two tendencies in the New England States. A handful of these Separate Baptists, under the lead of Shubael Stearns and Daniel Marshall, got abroad in North Carolina in 1755 and started a movement of gigantic proportions. In the year 1758 they established the first Separate Baptist Association at Sandy Creek, in North Carolina. Before the advent of the American Revolution they had captured nearly the whole of North Carolina, South Carolina, and Georgia for their party. They had also invaded Virginia and occupied nearly the whole of that State; the battle for religious liberty in Virginia was fought and won almost exclusively by Separate Baptists. It is estimated that about seven-tenths of the Baptist people of the Southern States are of Separate Baptist extraction. The power of the Separate Baptists was so marked in the South that the friends of Philadelphia were driven to assume a special designation, and so they called themselves Regular Baptists. But at length, after the Separate Baptists had achieved the triumph of religious liberty in Virginia, it became plain that they could not be despised, even though they might not be quite Regular. Both parties were Calvinistic, but the Separates were Calvinists of the Whitefield and not of the Philadelphia type. Nevertheless, a union was proposed by the friends of Philadelphia in Virginia, and it was happily accomplished in the year 1787. By that means the party who of late seemed destined to become formidable rivals of Philadelphia were brought into close alliance. Thenceforward the Baptists of the Southern States were known as United Baptists, a designation that is still often heard. A small faction of Separate Baptists declined to enter this union, and these have maintained an independent existence, mainly in Kentucky and Indiana, down to the present time. They embrace about seven thousand communicants.

Free-will Baptists.—Since the Separate Baptists had no creed like the Regular Baptists, there were many shades and grades of Calvinism among them, and in some instances they veered round toward Arminianism. A community of Separate Baptists existed in New Hampshire who were so moderate in their Calvinism as to be almost Arminians. Benjamin Randall, who perhaps in some way had come under the influence of the Arminian Baptists of New England, succeeded in organizing these into a party, after the year 1780, who repudiated Calvinism. They have been quite successful in divers directions. In the year 1900 they reported 1,684 churches and 97,242 communicants. It is important to remember that they are of Separate and not of General Baptist extraction.

Primitive Baptists.—For a number of years after 1787

the United Baptists advanced with much harmony and success. But at length, in the year 1812, through the agency of Adoniram Judson and Luther Rice, the denomination was committed to the enterprise of promoting missionary work in foreign lands. From the outset persons were found who objected to that course, and the disaffection continued to spread until about the year 1835, when a schism was begun in which the opponents of missions withdrew and founded another denomination which they called Primitive Baptists, but which is more commonly known by the name of Anti-Mission Baptists. They have been in a declining condition, and at present an active discussion is in progress among them which seems likely to result in a fresh schism. One of the parties, which advocates missions, Sunday-schools, and other agencies, is known as the party of Means; the Anti-Means party stand upon the platform which the denomination originally assumed. The Primitive Baptists in 1900 reported 3,530 churches, and 126,000 communicants.

Seventh-day Baptists.—These are distinguished by the fact that they keep the seventh day of the week as the Sabbath. Their first church in America arose in 1671 by means of a schism from Mr. Clarke's church in Newport, R. I. They have taken little part in the historical development of American Baptists. For the year 1900 they reported 114 churches and 9,161 communicants. Rev. A. H. Lewis, D. D., of Plainfield, N. J., is the leading figure among them.

Great progress has been made by the Baptists of America during the nineteenth century. In the year 1700 there were 6 Calvinistic Baptist churches, 6 Arminian Baptist churches, and in the limits of Philadelphia Association 4 that are supposed to have been doubtful. In addition to these there were 1 church of Seventh-day Baptists, 1 of so-called Rogerenc Baptists, and 2 Indian churches. Reckoning all these as Baptists, there were 20 churches in the year 1700, with perhaps as many as 800 members. In 1784 there were 471 churches, 424 ministers, and 35,101 members. In 1900 there are reported in the U. S. 43,427 Baptist churches and 4,181,686 communicants. In Canada and Mexico there are 1,176 churches and 141,631 communicants. The press is represented in every State and Territory, and is prosperous and powerful. Their missionaries are found in nearly all heathen countries, and also in many regions where the Roman Catholic religion is predominant.

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Baptist Young People's Union: See the Appendix.

Bar: a long and narrow piece of wood, metal, or other solid substance, generally round, quadrangular, and other uniform section. BAR, in hydrography, is an accumulation of mud or sand in any navigable channel by which navigation is obstructed, but more particularly a similar formation almost universally found across and exterior to the mouths of rivers and harbors, rendering entrance difficult except to vessels of light draught. In music, the word BAR denotes a straight line drawn across the staff to divide the music into small portions of equal duration, and also comprises the musical notes written or played between such lines. BAR, in heraldry, is one of the important charges known as ordinaries. The bar is formed by two horizontal lines passing over the shield; it differs from the fess in size, the bar occupying only one-fifth of the shield. BAR SINISTER is a term misused for "baton sinister" to denote illegitimacy. In law BAR denotes: 1. A partition or railing intended to inclose that part of the court-room in which prisoners are arraigned or sentenced, and in which the members of the legal profession usually sit; hence this space itself. In Great Britain there are admitted within the bar only solicitors, queen's counsel, and some others having precedence, all others, including the great body of barristers (called *utter* or *outer barristers*), being obliged to stand behind it. Hence the word often collectively signifies lawyers, or persons admitted to practice in the courts; and in some cases it refers to or implies the presence of the court itself. A trial at bar is a trial before a full bench of judges, as distinguished from a *nisi prius* trial—that is, a trial before a single judge. Trials at bar in civil causes were abolished in Great Britain by the Judicature Act of 1875. 2. A complete defense to an action in law. A plea in bar is a plea which, if true, completely defeats the plaintiff's action. Revised by F. STURGES ALLEN.

Bar: a town of Russia; government of Podolia. In 1768 the Confederation of Bar was formed here by the nobility of Poland, to counteract the influence of Russia on King Stanislas Augustus. Bar was taken by the Russians in the same year, and the confederates were compelled to go to Wallachia. Here they declared the king dethroned, had him carried off from Warsaw in 1771, and were only suppressed by Russia after four years' hard fighting. Eleven fairs are held here every year (see map of Russia, ref. 9-B). Pop. 13,000.

Bär, K. E., von: naturalist. See BAER.

Bar'aba': a vast steppe of West Siberia, lying between the rivers Ob and Irtysh on the W., and the Altai Mountains on the S. E. Area about 55,000 sq. miles. It is very level, covered by recent deposits, fertile, with large forests separated by marshes and salt-lakes. It was colonized by the Russians in 1730. Pop. about 250,000; only 4,000 aborigines, the rest Russians.

Bara Banki, baa'ra-baan'keē: a district of Lucknow division, Oudh, British India; between parallels 26° and 28° N. lat., and meridians 81° and 82° E. lon. Area, 1,768 sq. miles. It is a level plain interspersed with marshes. The Gogra river forms the northern boundary. This is navigable, and a railway passes through the district. The population is about 1,000,000; about 85 per cent. Hindus. The largest town is Rudauli, with 12,000 inhabitants.

Bar'aboo: city; on C. and N. W. R. R., capital of Sauk co., Wis. (for location of county, see map of Wisconsin, ref. 6-D); situated in Baraboo valley, on the Baraboo river; is noted for its beauty of situation and magnificent scenery, and is 3 miles from the famous Devil's Lake. It is in the center of a prolific fruit-growing district, has excellent water-power, paved streets, a fine city hall, 4 large and handsome school-houses, 3 magnificent iron bridges, water-works, electric lights, and gas-works. Pop. (1880) 3,266; (1890) 4,605; (1900) 5,751.

EDITOR OF "REPUBLIC."

Barab'ra, or Berab'era: a name applied by the Egyptians to the inhabitants of a small district in Upper Nubia. They are not the same as the Berbers, the latter having derived their name from the Arabians. They trade with the

Egyptians in cattle, which they pasture among the mountains beyond the Atbara and near the Red Sea. They are Mohammedans.

Baracoa, baa-ra-kō'a: a seaport on the northeast coast of Cuba (see map of West Indies, ref. 4-F). See BARACOA in the Appendix.

Barada, baa-rah'da: a river of Syria; probably the Abana of the Old Testament. Its remotest, though not its largest, source is a lake, some 300 yards by 50, in the plain of Zebdany (8 miles by 3), 3,349 feet above the level of the sea, in the heart of Anti-Lebanon. The stream flows south-eastward, passing the ruins of the ancient city of Abila, breaking through three ridges of the mountain, and reaching Damascus (23 miles from its source) after a descent of 1,149 feet. Then it flows on eastward some 17 or 18 miles farther, emptying itself into two marshy lakes, each about 20 miles in circumference. In going through the city and gardens of Damascus it is parted into at least seven streams, which afterward reunite. See Porter's *Damascus*.

Bar'adla Cave: a celebrated cave near AGTELEK (*q. v.*).

Baraga, baa-rah'ga, FRIEDRIC, D. D.: a Roman Catholic missionary; b. at Treffen, in Carniola, Austria, June 29, 1797. He was ordained 1823, came to America in 1830, devoted himself to missionary labor among the Indians of the Lake Superior region, and was made Bishop of Sault St. Marie 1857, of Sault St. Marie and Marquette 1865. He published numerous works in the Ojibway (or Chippewa) dialect; a *Grammar of the Otchipwe Language* (1851); and a *Dictionary of the Otchipwe Language* (1853). D. at Marquette, Mich., Jan. 19, 1868.

Baraguey d'Hilliers, baa'ra-gā' dčēl'yā, ACHILLE, Count: a French general; b. in Paris, Sept. 6, 1795. Having served with distinction in Algeria, he obtained the rank of general of division in 1843. In the autumn of 1849 he became commander of the army that occupied Rome. He returned to France in 1850, and in the Crimean war commanded a corps which co-operated with the British fleet in the Baltic. He was made a marshal of France in 1854. D. at Amélie-les-Bains, France, June 6, 1878.

Baraguey d'Hilliers, LOUIS: a French general; the father of the preceding; was born in Paris, Aug. 13, 1764. He served in the Italian campaigns of 1796-97, soon after which he became a general of division. He commanded the dragoons of the grand army in Austria in 1805, and was appointed Governor of Venice in 1808. In the Russian campaign of 1812 he was taken prisoner, with all his division. D. in Berlin, Jan. 13, 1812.

Baranoff, baa-rah'nōf, ALEXANDER ANDREYEVITCH: first Governor of Russia in America; b. 1746; established a colony on Bering Strait 1796; took possession of Baranoff island 1799. D. at sea, near Java, Apr. 28, 1819.

Barante, baa'raant', PIERRE AIMABLE PROSPER BRUGIÈRE, de: a French statesman and historian; b. at Riom, June 10, 1782. He came of a literary stock, his father and his great-grandfather having distinguished themselves as writers. He was appointed collector-in-chief of customs in 1818, and became a peer of France in 1819. His chief works are a *History of the Dukes of Burgundy* (13 vols., 1826), and a *History of the National Convention* (6 vols., 1853). D. at Puy-de-Dôme, Nov. 21, 1866. See sketches by Guizot in *Revue des deux Mondes* (July, 1867), and E. de Mirecourt (Paris, 1867).

Baran'ya: one of the most populous counties of Hungary; bounded N. by Tolna, E. by Bacs, S. by Slavonia, W. by Somogy; area, 1,966 sq. miles. It is partly mountainous, but is very fertile. The Danube forms part of the western boundary. Capital, Fünfkirchen. Pop. (1890) 321,435.

Barataria Bay: Louisiana; an inlet of the Gulf of Mexico, lying between the Mississippi and the Bayou la Fourche; about 12 miles long from N. to S., and 5 or 6 miles broad, communicating with bayous and lakes of the interior. Its shores are marshes little elevated above the tides, which extend to the cypress swamps. Grande Terre island, a ridge of sand which lies across the mouth, was the headquarters of the brothers Lafitte, the so-called "pirates." (See LAFFITE.) The entrance to the bay was fortified by the U. S. in 1840-50 by the construction of Fort Livingston on the west end of Grande Terre island. The bar has 7 feet of water. Barataria lighthouse, on Grande Terre island, is in lat. 29° 16' 47" N., lon. 89° 54' 33" W. It is of brick and 60 feet high.

Baratier, baŕ'a-ti-ay', JOHANN PHILIPP: b. of French ancestry at Swabach, near Nuremberg, Jan. 19, 1721; when five years old spoke French, German, and Latin; when seven could repeat the Psalms in Hebrew; and when nine composed a Hebrew dictionary; when thirteen years old translated the *Itinerary* of Benjamin of Tudela. He wrote a reply to Crellius's *Artemonius*, called *Antiartemonius* (1735), and a *Disquisition on the Succession of the Roman Pontiffs in very Ancient Times* (1749). He was a Protestant, studied theology and law. D. in Halle, Oct. 5, 1740.

Baratynski, baŕ-ra-tĕen'skĕe, JEWGENIZ ABRAMOVITCII: Russian poet; b. in the government of Tambov, Russia, Mar. 2, 1800; d. in Naples, Italy, July 11, 1844. He was educated in St. Petersburg, and became an ordinary soldier in the guard. As early as the age of twenty, however, he had written interesting verse. In 1826, having become an officer, he resigned from the service. His last years were spent in Paris and Naples. He is chiefly known as a lyric poet, having issued various collections of his lyric verse, as: *The Banquets* (1826); *The Ball* (1828); *The Death of Goethe* (1832); *Twilight* (1842). His complete works were published (Moscow, 1868) by his son.
A. R. MARSIL.

Barb [Fr. *barbe*, deriv. of *Barbarie*, Barbary]: name of a breed of horses which originated among the Moors of Barbary, who introduced it into Spain. Barbs are remarkable for their endurance, docility, and gentleness. The Carthaginian cavalry, which decided several victories over the Romans, are said to have been mounted on horses of this breed, which is a variety of the Arabian horse. The celebrated "Godolphin Arabian" was a barb, as were most of the progenitors of the thoroughbred horse of the present day.—Barb is also the name given in New Jersey to the kingfish (*Menticirrus saxatilis*).

Barbacena, baŕ-baŕ-thay'naŕ, FESBERTO CALDEIRA BRANT, Marquis of: a Brazilian soldier and diplomatist; b. at Sabora in 1772. He was appointed by the Emperor of Brazil to negotiate concerning the independence of that country with Portugal, and for his success was created a marquis. He was afterward twice Minister of Finance. He introduced steam-engines, steamboats, and the printing-press into Brazil. D. in Rio Janeiro, June 13, 1841.

Barbados, baŕ-bay'dŕs (perhaps from Span. *barbado*, bearded, but it was early called St. Bernardo): the most eastern of the Caribbean islands (see map of West Indies, ref. 8-M); is a British colony. Its capital, Bridgetown, is situated in lat. 13° 4' N., and lon. 59° 37' W. The island is 21 miles long, 14 miles wide, and has an area of 166 sq. miles. It is nearly encircled by coral reefs, which are dangerous to navigation. The highest point of the island has an altitude of 1,104 feet. Destructive hurricanes often occur here. The soil is fertile, and produces sugar, cotton, arrowroot, etc. The population and prosperity of Barbados have increased since the abolition of slavery, Aug. 1, 1834. In 1890 the imports were \$6,000,000 and the exports \$5,900,000, and 85,261 hhd. of sugar were raised. There are 24 miles of railway and 58 miles of telephonic communication. In 1891 the public debt was \$150,000. Pop. (1891) 182,322—the most densely populated island in the world. The diocese of Barbados includes the Windward islands from St. Lucia to Granada, of which the see is Bridgetown, the capital; and it enjoys a legislative appropriation of \$50,000 annually. The public schools of Barbados are under Government control. It is headquarters for the British troops in the West Indies.
M. W. H.

Barbados Cherry: the edible fruit of a small West Indian tree (*Malpighia glabra*). Each fruit contains three seeds. The leaves of *Malpighia urens*, which also has edible fruit, have stinging hairs on the lower side.

Barbados Gooseberry: the edible fruit of *Pereskia aculeata*, a shrubby plant of the family *Cactaceae*, having a round stem, thick, alternate leaves, and large spines. The fruit has expectorant properties. The plant grows in the West Indies.

Barbados Leg: See ELEPHANTIASIS.

Barbados Tar, or **Petroleum**: a black, opaque, inflammable liquid of the consistence of molasses. By distillation it yields naphtha and a residuum of asphaltum.

Barbara, SAINT: a virgin martyr of the ancient Church in regard to whom traditions clash. Baronius accepts the story of her martyrdom at Nicomedia in the reign of Maximinus (235-238), and says that she had been a pupil of Origen. Assemani thinks she suffered martyrdom under

Galerius, about 306, at Heliopolis in Cœle-Syria. She is the patron saint of artillery, and the protectress against lightning and fire. The powder-magazine on French men-of-war is still called "Sainte Barbe." She is commemorated Dec. 4.

Barbarian [from Fr. *barbarien*, deriv. of *barbarie*, land of barbarians; from Lat. *barbarus*, Gr. *βάρβαρος*]: a term applied by the ancient Greeks to all foreigners and all who could not speak the Greek language. Plato divided the human family into two great classes—*Hellenes* (Greeks) and *Barbaroi* (barbarians). After the Persian invasion the Greeks used the word as a term of reproach, implying hostility to their own freedom and civilization. After the Romans had conquered Greece, and had become in some measure Hellenized, the word barbarian was applied to all nations except Greeks and Romans. St. Paul uses the word in this sense in Romans i. 14; see also Acts xxviii. 4.

Barbaros'sa: the name of two brothers, renegade Greeks and natives of Mitylene, who became Turkish corsairs, and were the scourge of Christendom for many years (1510-46). The elder, Aruch (Horuk or Ouradjh), made himself master of Algiers, but was defeated by Charles V., captured and beheaded (1518). He was succeeded in 1518 as ruler of Algiers by his brother, Hayraddin, a Christian corruption for Khair-ed-Deen. He obtained Tunis by conquest in 1532, and became the chief admiral of Sultan Solyman in his war with the Emperor Charles V. D. in Constantinople, July 4, 1546.

Barbarossa, EMPEROR: See FREDERICK I.

Barbaroux, baŕ'-ba-roo', CHARLES JEAN MARIE: French Girondist and eloquent advocate; b. at Marseilles, Mar. 6, 1767. He was chosen a deputy to the Legislative Assembly in 1791, and a member of the National Convention in 1792. He denounced Robespierre, and on the trial of the king voted for an appeal to the people. He was distinguished for his energy and personal beauty. Having been proscribed by the Jacobins in May, 1793, he fled from Paris. He was guillotined at Bordeaux, June 25, 1794. See his *Mémoires* (1822).

Bar'bary [of Arab. origin]: an extensive region of Northern Africa, comprising the modern Barca, Tripoli, Tunis, Fezzan, Algeria, and Morocco; extending from Egypt to the Atlantic Ocean. It is included between lat. 25° and 37° N., and lon. 10° W. and 25° E. It included the ancient *Mauritania*, *Numidia*, *Africa propria*, and *Cyrenaica*. Barbary is divided by the Atlas Mountains. The north side comprises Tunis, Tripoli, Morocco, and Algeria. The south is called Beled-el-Jereed (i. e. the country of dates). The soil is generally fertile. It was very rich and populous under the rule of the Carthaginians and of the ancient Romans, who became masters of this region about 146 B. C. It was conquered about 430 A. D. by the Vandals, who misgoverned it for a hundred years, and it fell under the domination of the Arabs in 647 A. D. The inhabitants are mostly Mohammedans.

Barbary Ape, **Pigmy Ape**, or **Magot**: one of a small species of tailless monkey (*Inuus caudatus*); found in but



The magot, or Barbary ape.

one place in Europe—the Rock of Gibraltar. It also abounds in Northern Africa, especially among rocky mountains and forests. It is gregarious, displays great agility in

passing from tree to tree, and usually walks on four feet. It is of a greenish-gray color, and rather larger than a large cat. Bands of these apes often plunder gardens. This species of monkey is occasionally seen in captivity, and is capable of being trained to many tricks.

Barbauld, ANNA LETITIA: English authoress; b. in Kibworth, Leicestershire, June 20, 1743; was a daughter of Rev. John Aikin. She published a volume of poems in 1773, and was married in 1774 to Rochemont Barbauld, a Dissenting minister, with whom she taught a boarding-school for ten years at Palgrave, Suffolk. She published, besides other works, *Devotional Pieces* (1775) and *Early Lessons for Children*, and assisted her brother, Dr. John Aikin, in the composition of a popular work called *Evenings at Home*. D. at Stoke Newington, Mar. 9, 1825. She wrote also *A Legacy for Young Ladies*, published after her death. See a *Life of Mrs. Barbauld*, by Lucy Aikin, prefixed to her works (2 vols., 1825).

Bar'becue [ultimately from Haytian *barbacoda*, a framework of sticks set upon posts, generally for use in drying or smoking meat]: term originally applied, especially in the Southern States, to the practice of roasting an ox or other large animal whole; since applied in the U. S. to a social entertainment on a large scale, generally in the open air, where animals are roasted whole and provisions and drink provided in generous quantities. A barbecue was formerly a favorite means of celebrating political victories.

Barbed Wire: See WIRE AND WIRE-DRAWING.

Bar'bee, WILLIAM J., M. D.: b. in Winchester, Ky., in 1816; educated at Miami University, O.; practiced medicine ten years in Cincinnati, O., and became widely known as a teacher, author, and preacher among the Disciples of Christ. He has published *Physical and Moral Aspects of Geology*, *The Cotton Question*, and various religious and scientific and other works. He died at the residence of his eldest son in Kentucky, Oct. 27, 1892.

Bar'bel: a fish of the genus *Barbus*; of the carp family, or *Cyprinidae*. It resembles the American sucker, but is furnished with four soft barbels, pendent from the snout



Barbel (*Barbus barbus*).

and upper jaw, and suggesting the name; derived from the Latin *barba*, beard. The numerous species of barbel are all inhabitants of fresh water, and seek their food by inserting their snouts into the mud like swine. The common barbel is abundant in England, and affords sport to anglers, but is not much esteemed for food. It sometimes measures 3 feet long, and weighs about 16 lb. Another species called binny or barbel is abundant in the Nile and the Jordan, and is esteemed for food. It sometimes weighs 70 lb. D. S. J.

Barbé-Marbois, bāār-bay' māār-bwaā', FRANÇOIS, Marquis de: French statesman; b. at Metz, Jan. 31, 1745; consul-general to the U. S., and intendant of San Domingo (1785-90), where he introduced many reforms; returned to France, and in 1795 became a member of the council of elders, but was accused of various offenses and exiled; recalled in 1801, he became director of the treasury under Napoleon; negotiated the sale of Louisiana to the U. S.; was made a Senator in 1813, and Minister of Justice in 1816. He wrote *Complot d'Arnold* (1816); *Histoire de la Louisiane* (1828), etc. D. Jan. 14, 1837.

Barber [earlier *barbour*, from O. Fr. *barbeor*, as if from Lat. **barba'tor*, deriv. of Lat. *barba*, beard]: a person who shaves others and cuts their hair. This trade or profession is very ancient, and is mentioned by the prophet Ezekiel (chap. v. 1). In China and other Oriental countries barbers shave the whole or part of the head. The practice of shaving the beard was common among the ancient Egyptians, Greeks, and Romans. Among the ancient Israelites the re-

moval of the beard by shaving or plucking it out was a sign of mourning. In former times barbers served the public in the capacity of surgeons, and performed the operation of bleeding. The spiral red stripe seen on the barber's pole is said to symbolize the winding of a ribbon round the arm previous to letting blood. In London the barber-surgeons formed a corporation with certain privileges. They were incorporated in England in 1461, and were united with the surgeons in the reign of Henry VIII. The connection was dissolved in the reign of George II. by an act, the preamble of which affirms that the trade of a barber is "foreign to and independent of the practice of surgery." Quite recently the surgeons of the Swedish navy were also barbers for the crews. The barber's art was practiced in Greece about 420 B. C., and is said to have been brought from Sicily to Rome in 299 B. C.

Barber, FRANCIS: soldier and teacher; b. at Princeton, N. J., in 1751; graduated at Princeton in 1767. He entered the army in 1776 with the rank of major, and took part in the battles of Trenton, Princeton, Brandywine, Germantown, and Monmouth. He was afterward raised to the rank of colonel, and in 1781 was selected by Gen. Washington for the delicate duty of suppressing a mutiny of the troops, which he performed with success. He was killed accidentally by the fall of a tree at Newburg, Jan. 11, 1783.

Barber, JOHN WARNER: b. at Windsor, Conn., in 1798. He published a *History of New Haven* (1831); *Historical Collections of Connecticut* (1836), Massachusetts (1839), New Jersey (1844), Virginia (1844), Ohio (1847); *Incidents of American History* (1847); *Elements of General History* (1844); *Our Whole Country* (1861), and several other works. D. at New Haven, Conn., June, 1885.

Barberini, bāār-be-ree'nee, FRANCESCO: an Italian cardinal; nephew of Pope Urban VIII.; b. in Florence in 1597. He became librarian of the Vatican, and translated the twelve books of Marcus Aurelius from Greek into Italian. He was the founder of the great Barberini Library. D. in Rome in 1679.

Bar'berry: a plant of the genus *Berberis* and family *Berberidaceae*; comprises many species, which are all shrubs and natives of temperate climates in both hemispheres. They have six stamens, which, when touched at the base, exhibit irritability. The fruit is a berry with two or three seeds. They are divided into two sub-genera, sometimes ranked as genera; those with simple leaves forming the *Berberis*, and those with pinnate leaves the sub-genus *Mahonia*. The barberries of Asia are numerous and important for their fruits. Those of our Pacific slope are *Mahonias*. The common barberry (*Berberis vulgaris*) is a native of Europe, sparingly naturalized in the U. S., a shrub armed with spines, and produces small oval red berries in pendulous clusters, which contain free malic acid, and are valuable for preserves and jelly. The bark is astringent, and is used in medicine, and the inner bark and root furnish a good yellow dye. On account of its yellow color the inner bark was formerly in much repute as a remedy for jaundice. Several fine species of *Berberis* grow in the central and western portions of North America. *B. aquifolium*, with spiny leaves and yellow flowers, is generally cultivated as an ornamental shrub. *B. pinnata* of Oregon bears blue, acid berries, and is sometimes called the *Oregon grape*. *B. canadensis* is a native of the Alleghanies. Parts of South America abound in native species of the barberry.

Barberry Family (*Berberidaceae*): herbaceous or shrubby dicotyledons, with the parts of the flower all free from one another, and one or few simple pistils. Therefore related to buttercups, magnolias, and moonseeds. There are about 100 species, widely distributed, especially in temperate regions. The barberry and May-apple are well-known members of this family. CHARLES E. BESSEY.

Barber's Itch: a term applied somewhat indiscriminately by the public and many physicians to two distinct diseases. 1. A majority of cases are instances of *sycosis non-parasitica*, or pustular eruption on the face, from the irritation of too frequent and close shaving. The face is inflamed, red, tender, and nodular, with numerous pustules of various size, discharging pus, which mats in the stumps of the beard and forms scabs. 2. The second form is the true barber's itch, or *Tinea sycosis*, contracted by contact of person or the soiled and contaminated razors and brushes of the barber. It is really "ringworm in the beard." Each hair of the infected beard is covered with a whitish powder of parasitic

scales or sporules. The parasitic vegetation is the *Trichophyton tonsurans*. In either the *syccosis non-parasitica* or the true *syccosis* the inflammation is to be removed by frequent applications of cold water, perfect cleanliness, and soothing lotions, as of glycerine, opium, and acetate of lead. With the first form such methods will suffice. In the second or parasitic form all the infected hairs should be pulled out with the depilation-forceps, and the parasites destroyed in the hair-follicles by parasiticide lotions or unguents. Chief of these are sulphurous acid, either pure or diluted, carbolic acid in glycerine, weak solutions of corrosive sublimate, and ointments of sulphur, nitrate of mercury, and white precipitate.

Revised by WILLIAM PEPPER.

Bar'bet [Fr. and O. Fr. *barbet*, from Lat. *barbatus*, bearded, deriv. of *barba*, beard]: a bird of the genus *Laimodon*; related to the *Picidae*, or woodpeckers. The barbets have a large conical beak surrounded with tufts of bristles; hence the name. They inhabit warm countries, particularly tropical Africa, and feed on insects.

BARBET is also the name given to birds of various genera, chiefly South American and Asiatic, allied to the kingfishers and the trogons.

Revised by D. S. JORDAN.

Barbet: a small variety of the poodle-dog, remarkable for its activity, intelligence, and fidelity to its master; but equally distinguished for its ill-temper and its dislike of all strangers. It is also very liable to disease, and hence is not a general favorite.

Barbey d'Aureville, bãr-bay'dō-re-věe-lee', JULES ANÉDÉE: French novelist; b. at St. Sauveur-le-Vicomte, Nov. 2, 1808; wrote a great number of volumes of a character, on the whole, very brutal and perverse. He, however, attracted the attention of a certain noisy set of writers and readers. The most lauded of his productions are *Une vieille maîtresse* (1851, 5th ed. 1886); *L'Ensorcellée* (1854); *Les Œuvres et les Hommes, XIX^e Siècle* (7 parties, 1861-87); *Le Chevalier Destouches* (1864); *Memoranda* (1885). D. in Paris, Apr. 23, 1889.

A. R. MARSH.

Barbier, bãr'bi-ay', PAUL JULES: French dramatist of remarkable fecundity; b. in Paris, Mar. 8, 1825. His first work was *l'Ombre de Molière*, played at the Théâtre Français (Jan. 15, 1847). Since then he has written almost innumerable plays, besides librettos for both grand and comic opera. He has had many *collaborateurs*, among them Carré, Barrière, Decourcelle. His librettos have been set to music by Meyerbeer, Gounod, Thomas, Reyer, Saint-Saëns, and others.

A. R. MARSH.

Barbou, bãr'boo': name of a celebrated French family of printers, the descendants of John Barbou, of Lyons, who lived in the sixteenth century. His press published in 1539 a beautiful edition of the works of Clement Marot.—His son, HUGH BARBOU, having removed to Limoges, published his celebrated edition of Cicero's *Letters to Atticus*, 1580.—JOSEPH GÉRARD BARBOU, of the same family, settled in Paris, and continued in 1755 a series of Latin classics in duodecimo, begun in 1743 by Coustelier. The series rivals the Elzevirs of earlier date, and is much prized for its elegance and correctness.

C. H. THURBER.

Bar'bour, JAMES: statesman; b. in Orange co., Va., June 10, 1775. He was Governor of Virginia 1812-14; author of Virginia anti-dueling law, and a Senator of the U. S. 1815-25. He voted to recharter the U. S. bank, and became president of the Senate *pro tem*. He was Secretary of War in the cabinet of John Quincy Adams (1825-27); was sent as minister to England in 1828, but was recalled in 1829. In 1839 he was president of the Whig national convention. D. in Orange co., Va., June 8, 1842.

Barbour, or **Barber**, JOHN: Scottish poet; a contemporary of Chaucer; b. about 1320. He became Archdeacon of Aberdeen in 1356, and went to Oxford in 1357 to complete his education. About 1374 he was appointed one of the auditors of the exchequer. His chief work is a natural epic called *The Bruce*, a history of Robert Bruce, which, in addition to its poetical merit, has much historical value. D. Mar. 13, 1396.

Barbour, JOHN HUMPHREY: divine, educator, and writer of the Protestant Episcopal Church; b. at Torrington, Conn., May 29, 1854; educated at Trinity College, Hartford, and at the Berkeley Divinity School, Middletown, Conn.; ordained priest in 1878. Rector of Grace Chapel, Hartford, Conn., 1876-89; librarian of Trinity College 1882-89; Professor of the Literature and Interpretation of the New Testament in the Berkeley Divinity School, and

librarian, since 1889. His *Beginnings of the Historic Episcopate* (New York, 1887) has reached a second edition.

WILLIAM STEVENS PERRY.

Barbour, JOHN S.: U. S. Senator; b. in Culpeper co., Va., Dec. 29, 1820; bore the name of his father (1790-1855), who served five terms in Congress (1823-33), and was a States-rights advocate; studied law at University of Virginia; served in the Virginia Legislature; president of the Orange and Alexandria R. R.; in Congress from 1881-87; chairman of the committee which overthrew the Mahone hold upon Virginia; U. S. Senator in 1889. D. in Washington, D. C., May 14, 1892.

Barbour, OLIVER LORENZO: lawyer; b. at Cambridge, Washington co., N. Y., July 12, 1811. He was reporter of the New York Court of Chancery from 1847-49; of the New York Supreme Court from 1849-76. Hamilton College made him LL. D. in 1859. D. at Saratoga, N. Y., Dec. 17, 1889.

Barbour, PHILIP PENDLETON: a jurist; b. in Orange co., Va., May 25, 1783; was a brother of James, noticed above. He gained distinction as a criminal lawyer; became a member of Congress in 1814; was chosen Speaker of the House (1821), resigned 1825; re-elected to Congress 1827, resigned again 1830. He was appointed an associate judge of the Supreme Court of the U. S. in 1836. D. at Washington, D. C., Feb. 24, 1841.

Barbour, WILLIAM McLEOD, D. D.: Congregationalist; b. at Fochabers, Scotland, May 29, 1827; graduated at Oberlin College 1859, and at Andover Theological Seminary 1861. He was pastor at South Danvers (now Peabody), Mass., 1861-68, professor in Bangor Theological Seminary 1868-77, and Professor of Divinity in Yale College from 1877 until 1887, and principal and Professor of Theology in the Congregational College in Montreal, Canada, 1887-96.

GEORGE P. FISHER.

Bar'bourville: capital of Knox co., Ky. (for location of county, see map of Kentucky, ref. 5-I); on L. and N. R. R., and on the Cumberland river, 116 miles S. E. of Frankfort. It is situated in a farming, mining, and lumbering region. Pop. (1880) 250; (1890) 1,162; (1900) 1,010.

Barboursville, or **Cab'ell Court-house**: the capital of Cabell co., West Va. (for location, see map of West Virginia, ref. 8-D); on railroad and the Guyandotte river, 154 miles S. W. of Wheeling. It became the seat of a State normal school. July 13, 1861, it was the scene of a brilliant action in which the Federal troops were successful. Pop. (1880) 361; (1890) district, 1,838; (1900) district, 2,118; town, 429.

Barboza: Brazilian poet. See CALDAS BARBOZA, DOMINGOS.

Barbuda, bãr-boo'da (Fr. *La Barboude*): one of the British West India islands; 22 miles N. of Antigua (see map of West Indies, ref. 6-M). Its area is 60 sq. miles. It is of coral formation, has no harbor, and is partly covered with forests. It is a dependency of Antigua, in the colony of the Leeward islands. It belongs to the Codrington family, and has a local proprietary government.

Bar'ca (anc. *Cyrena'ica*): a maritime district of Northern Africa; bounded N. by the Mediterranean, E. by Egypt, S. by the Libyan desert, and W. by Tripoli and the Gulf of Sidra; area about 60,700 sq. miles. It is deficient in permanent streams, and the southern part is a desert, but the soil near the sea is fertile. On the mountain-sides are pines, date-palms, and olive trees. The inhabitants are Arabs and Berbers, who are Mohammedans. Formerly it belonged to Tripoli, but since 1869 has been immediately dependent upon Turkey. Pop. estimated at 302,000. Capital, Benghazi.

Barcelona, bãr-se-lō'na, or bãr-thăy-lō'na: a province of Spain; comprising the southeastern part of Catalonia, and sloping toward the Mediterranean. It has an area of 2,985 sq. miles. It is one of the most fertile and best-cultivated provinces of Spain. Pop. (1887) 899,264.

Barcelona [Lat. *Bar'cino*; Gr. Βαρκελών; name said to be from *Barca*, the surname of the Carthaginian general Hamilcar]: the most important manufacturing city of Spain; capital of the province of the same name; in Catalonia, beautifully situated on the Mediterranean; 113 miles E. of Lerida; lat. 41° 23' N., lon. 2° 11' E. (see map of Spain, ref. 14-K). Next to Cadiz, it is the most important seaport of Spain. Pop. (1887) 272,481. It is surrounded by a wall, and defended by a citadel and the strong fort of Montjoi. The city is divided into the old and the new town by a beautiful prome-

nade called La Rambla. The streets of the new town are more spacious and regular than those of the old. Many of the houses are built of hewn stone, and have an imposing appearance. The most remarkable public edifices are the Gothic cathedral, which is about 600 years old, and the Audiencia, or Palacio de la Deputación, which is now occupied by the courts of law. Barcelona has a university, several public libraries, a fine theater, an academy of arts and sciences, and two museums. Here are extensive manufactures of silks, woolen stuffs, calicoes or figured cotton stuffs, lace, shoes, and firearms, which, with copper, wine, and brandy, constitute the principal exports of the city. The harbor is commodious, but is obstructed by a bar which excludes vessels drawing more than 12 feet of water. This is the most populous city of Spain except Madrid. Barcelona is supposed to have been founded by Hamilear Barca. The Romans became masters of it at the end of the third Punic war (146 B. C.). It was taken by the Saracens or Moors about 714 A. D., and became an independent state in 878. In the twelfth century it was annexed to Aragon. In 1714 it was taken by the Duke of Berwick after a long and heroic defense.

Barcelona: a town and seaport of Venezuela; capital of the state of Bermudez; on the Caribbean Sea; at the mouth of the river Neveri; lat. 10° 10' N., lon. 64° 48' W. (see map of South America, ref. 1-D). The houses are built of mud, and the climate is unhealthful. Pop. 13,000.

Bar'clay, or Barklay, ALEXANDER: British writer and translator; supposed to have been born in Scotland about 1475. He studied in one of the English universities, traveled on the Continent, and was made a priest in the College of Ottery St. Mary in Devonshire. He afterward entered the Benedictine monastery of Ely, probably in 1511, and on the dissolution of the monasteries, in 1546, he became Vicar of Much Badew, and in March Vicar of Wokey. The first named he held till his death; the second he resigned in 1552 to accept the rectory of All Hallows, Lombard Street, London. He wrote the lives of several saints, translated Sallust's *Jugurthine War* and a French poem called *The Castle of Labor* (1506). His most popular work is his *Ship of Fools* (1509), a free translation from the German of Sebastian Brandt. D. at Croydon; buried there June 10, 1552. See Jamieson's edition of the *Ship of Fools* (Edinburgh, 1874). Revised by HENRY A. BEERS.

Barclay, JOHN: English satirist; b. at Pont-à-Mousson, Lorraine, Jan. 28, 1582; d. in Rome, Aug. 15, 1621. His celebrated work *Argenis* appeared in the same year. Cowper called it the best romance that ever was written. It has been translated into numerous languages. It is a political allegory, containing several allusions to the state of Europe.

Barclay, JOHN, M. D.: b. on a farm in Perthshire, Scotland, Dec. 10, 1758; was educated at the United College of St. Andrews, where he afterward studied divinity. He was licensed as a preacher by the Dunkeld Presbytery; he became tutor at Edinburgh in 1789 to the family of Sir James Campbell, and commenced the study of medicine; took the degree of M. D. in 1796. He became a noted lecturer on anatomy, commencing his lectures at Edinburgh in 1797, and continuing them until a short time before his death. D. in Edinburgh, Aug. 21, 1826, and left to the Royal College of Surgeons his anatomical collection, afterward called the Barclayan Museum.

Barclay, ROBERT: reformer, and apologist for the Society of Friends: b. at Gordonstown, in Morayshire, Scotland, Dec. 23, 1648. He was educated in Paris at the Scottish College, of which his uncle was rector, and learned to write and speak Latin correctly and fluently. He returned to Scotland in 1664, and became a member and minister of the Society of Friends in 1667. In 1670 he married Christian Mollison, and in the same year published a defense of his fellow-religionists, entitled *Truth Cleared of Calumnies*. He afterward published a *Catechism and Confession of Faith* (1673), and the *Anarchy of the Ranters* (1676). In 1677 he visited Germany on a religious mission in company with George Fox and William Penn. In addition to superior talents, he had moral courage, which qualified him for the part of a reformer. His principal work is *An Apology for the True Christian Divinity, as the same is held forth and preached by the People called in scorn Quakers* (1676), written and published in Latin at Amsterdam, and afterward (1678) translated by the author into English, and published in London (a standard book; many later editions and re-

prints). This work exhibits great logical acumen, and has been commended by eminent persons of different creeds. In 1679 he published a *Vindication* of his *Apology*, which had been criticised by several writers. He was appointed governor of the province of East Jersey—which had been set apart for a Quaker settlement wherein their doctrine of toleration could have free scope, and the persecuted for religion's sake might find an asylum—in 1682, but he never went to America. D. at Ury, Oct. 3, 1690. His *Catechism, Treatise on Church Government*, formerly called *Anarchy of the Ranters*, and *Apology* are reprinted by the Friends' Book Store, Philadelphia. See his *Life* by Joseph G. Bevan (London, 1802), and by Wilson Armistead (Manchester, 1850); cf. *The Histories of the Quakers*, by W. Sewell (London, 1722, repr. Philadelphia, 1844), and by F. S. Turner (London, 1889). Revised by S. M. JACKSON.

Barclay de Tolly, baar'klay'de-tōl-lay', MICHAEL ANDREAS, Prince: a celebrated Russian general of Scottish extraction; was b. at Luhde-Grosshoff, Livonia, Dec. 16 (27) 1761. He fought against the Swedes in 1790, and against the Poles in 1792 and 1794. With the rank of major-general he led Benningsen's advanced guard in 1806. In 1809, at the head of 10,000 men, he crossed the frozen Gulf of Bothnia, and advanced as far as Stockholm. In 1810 he was appointed Minister of War. He became in 1812 commander-in-chief of the Army of the West, but, having been defeated by the French at Smolensko in August of that year, in obedience to popular clamor the emperor reluctantly supplanted him by Kutuzof, but after his death (1813) he again obtained the chief command of the army, which he directed at Bautzen, Culm, and Leipzig. He was raised to the rank of field-marshal in Paris in 1814. D. at Insterburg, East Prussia, May 14 (26), 1818.

Barcokh'eba, or Barkochba (i. e. son of a star), SIMON: a famous Jewish impostor, claiming to be the Messiah. The name by which he is known was given to him by Rabbi Akiba, the most noteworthy of his converts, who believed his Messianic claims and applied to him the prophecies Num. xxiv. 17; Hag. ii. 6, 7. In the reign of Hadrian (A. D. 132) he excited an insurrection among the Jews, and seized Jerusalem and many fortified places. After a long and bloody contest the city was retaken by the Roman General Julius Severus, and Barcokheba was killed in the fortress of Bethar, tradition says, on the 9th of Ab (August), 135. His disappointed countrymen afterward changed his name to Bar-coziba (son of a lie). See J. H. Schwarz, *Der Bar-Coehbaische Aufstand*, Brünn, 1885.

Revised by S. M. JACKSON.

Bard, SAMUEL, M. D., LL. D.: physician; b. in Philadelphia, Apr. 1, 1742; educated at Edinburgh, where he was an inmate in the family of Dr. Robertson, the historian. He practiced in New York city, and was the family physician of Gen. Washington. He published several medical works, and became president of the College of Physicians and Surgeons of New York. He was an active promotor of benevolent enterprises. D. at Hyde Park, N. Y., May 24, 1821. See his *Life* by Rev. John McViekar (New York, 1822).

Bardeleben, baar-de-lay'ben, KARL: German anatomist; b. at Giessen, Mar. 7, 1849; studied in Greifswald, Heidelberg, Berlin, and Leipzig, taking the degree of M. D. at Berlin in 1871; appointed prosecutor and professor in the University of Jena 1873; author of *Beiträge zur Anatomie der Wirbelsäule* (1874); *Die Gesetzmässigkeit des Knochenbaues und seine allgemeine Bedeutung*; the anatomical part of his father's *Lehrbuch der Chirurgie*, etc.

Bardesa'nes of Edes'sa, properly Bar-Daisan (i. e. son of the river Daisan, because he was born on its banks): b. at Edessa, July 11, 155 A. D.; lived at the royal court in great favor; went as missionary to Armenia after the fall of his patron (217); d. perhaps at Edessa, 223. He is commonly but not quite justly called a Gnostic. He was an astrologer, and, although in the main an orthodox Christian, had peculiarities due to Valentinian Gnostic or pagan influences. The treatise attributed to him, *The Dialogue on Fate* or *Book of the Laws of Countries*, was written by some early follower. It was known only from the fragment of the Greek translation preserved in Eusebius's *Preparatio Evangelica*, vi. 9, 10, but the complete original Syriac text was brought by Archdeacon Tattam from the Syrian convent in the Nitrian desert in 1843; recognized by W. Cureton and published by him in 1855, with an English translation; republished in the *Ante-Nicene Fathers*, vol. viii., 723-734

(New York, 1886). Ephraem Syrus, who flourished about two centuries later, says Bardesanes wrote also 150 hymns, which appear to have been more dualistic than the treatise just spoken of. The best compendious notice of Bardesanes is by Hort in Smith and Wace's *Dictionary of Christian Biography*.
Revised by S. M. JACKSON.

Bard'ings, or **Bard**, or **Barding**: a bard is any piece of armor for a horse; hence, bardings are the protective trappings of a horse, whether housings made defensive by stuffing and quilting, or chain-mail or forged pieces of steel. Such defenses were not used in antiquity; they reached their greatest development at the end of the fifteenth century. A horse thus protected is said to be barded.

RUSSELL STURGIS.

Bardsley, CHARLES WAREING: b. at Keighley, Yorkshire, England, 1834; educated at Oxford 1868; ordained deacon 1870; Vicar of Ulverston with Osmotherley, diocese of Carlisle. Author of *English Surnames, their Sources and Significations* (3d ed. 1875); *John Lexley's Troubles* (3 vols., 1876); *Memorials of St. Anne's, Manchester* (1876); *Romance of the London Directory* (2d ed. 1879); *Curiosities of Puritan Nomenclature* (2d ed. 1880); *Chronicles of the Town and Parish of Ulverston* (1884); *Her Grandfather's Bible, a Tale of Furner's Fells* (2d ed. 1886).

Bardsley, JOHN WAREING, D. D.: Bishop of Carlisle; b. at Keighley, Yorkshire, England, 1835; educated at Trinity College, Dublin; ordained in 1860, and became Bishop of Sodor and Man in 1887, whence he was transferred to Carlisle in 1892. He has published *Counsels to Candidates for Confirmation* (1882), and *The Origin of Man* (1883).

Bardstown: town (founded in 1785); capital of Nelson co., Ky. (for location of county, see map of Kentucky, ref. 3-G); on branch of L. and N. R. R.; 39 miles S. E. of Louisville; has public schools (white and colored), several academies, and six churches. Its industries are distilling, milling, and coopering. Pop. (1880) 1,803; (1890) 1,524; (1900) 1,711. EDITOR OF "NELSON COUNTY RECORD."

Barebones, **Barebone**, or **Barbon**, PRAISEGOD: b. in London in 1596; was a leather-seller; became a Baptist and preacher. He defended paedobaptism. He preached in his own large house and was very popular. He was also wealthy. On July 4, 1633, he was summoned to Parliament by Cromwell, and his enemies called the Parliament "Barebones's" or the "Little Parliament." It was dissolved the same year, and Barebones did not sit again. When Gen. Monk came to London, Barebones headed a procession of the people, and presented a remonstrance to Parliament against the restoration of Charles II. (1659). He was in the Tower during 1662. D. in London, Dec., 1679.

Revised by S. M. JACKSON.

Bare-footed Fri'ars [in Lat. *Discalceati fratres*]: an appellation of certain Roman Catholic monks who either wear sandals or go entirely barefoot. They are connected with various congregations of the strict observance in nearly all the orders. There are also barefooted nuns. In some places they wear shoes in severe weather.

Baregine, bār-ay'zhin: a mucous-like substance produced by the algæ which grow in mineral springs. It abounds in the hot springs of Barrèges in France; hence the name. It is a substance resembling, to some extent, the white of an egg, imparts a flesh-broth flavor and odor to the water, and is prized for that reason.

Bareilly, baā-ray'lēē: a city of British India: in the Northwest Provinces; on the river Jua; 151 miles E. of Delhi; principal city of a district of the same name (see map of N. India, ref. 5-E). It contains a number of mosques, a college, and many Hindu schools. Here are manufactures of cutlery, carpets, brazen water-pots, tables, and ornamental chairs. Bareilly was a scene of outrage and rapine during the mutiny of 1857, when the Sepoys murdered a number of Europeans. Pop. (1891) 121,870.

Barentz, baa'rents, WILLEM: Dutch navigator; made repeated attempts to reach China through the Arctic Ocean; reached lat. 78° N. on his third expedition; d. near Nova Zembla on June 20, 1597. In 1871 Captain Carlsen found Barentz's winter quarters undisturbed after a lapse of 274 years. A part of his journals were recovered 1875. See Van Campen's *Barentz's Relics* (London, 1877).

Barère de Vienzac, baā-rār'de-vi-ō-zaak', BERTRAND: a French demagogue and lawyer; b. at Tarbes, Sept. 10, 1755. He was elected in 1792 to the Convention, in which he voted

for the death of the king. In Apr., 1793, he was chosen a member of the Committee of Public Safety. He supported the Jacobins in their contest with the Girondists, and became the reporter of the committee which usurped supreme power in July, 1793. He was the first who proposed that "terror should be the order of the day," and he dressed the atrocious decrees of the committee in such flowery language that he was called the "Anacron of the guillotine." On the 9th Thermidor, 1794, he acted with the enemies of Robespierre. He was banished as a regicide in 1816, but was permitted to return in 1830. He has been called one of the most graceful and accomplished liars in history. D. in Paris, Jan. 13, 1841. See *Mémoires de Barère* (2 vols., Paris, 1834; 2d ed. 4 vols., 1843) and the notice of Barère in Macaulay's *Essays*.

Baretti, baā-ret'tēē, GIUSEPPE: Italian writer; b. at Turin, Apr. 25, 1719; removed to London in 1751, and became a teacher of Italian and a friend of Dr. Johnson. He published the *Italian Library* (1757); *Italian and English Dictionary* (1760); and *Travels through Spain, Portugal, and France* (1770), which is highly commended by Dr. Johnson; *Spanish and English Dictionary*; and many other works. D. in London, May 5, 1789. See G. Franchi's *Notizie intorno alla Vita di G. Baretti* (1790).

Barfod, baar'fōd, PAUL FREDERIK: a Danish historian; b. at Lyngby, Jutland, Apr. 7, 1811; became assistant in the royal library in Copenhagen 1866. His *Fortællinger af Fædrelandets Historie* appeared in 1853 (4th ed. in 1874).

R. B. ANDERSON.

Barfurush, baār-foo-roosh' (i. e. the mart of burdens): important commercial town of Persia; province of Mazanderan; on the river Bahbul; 14 miles from its entrance into the Caspian Sea, and about 110 miles N. E. of Teheran (see map of Persia and Arabia, ref. 2-H). It has an extensive trade, and contains numerous colleges and caravanserais. The bazaars are large, and filled with a great variety of goods. A good road extends from this town to its port, Meshedi-Ser, on the Caspian. Pop. 50,000.

Bargain and Sale: the act of conveying and transferring real or personal property for a valuable consideration. The term is also employed to indicate the instrument by which the transfer is made. In the law of real estate this form of conveyance is in extensive use. The original mode of conveying corporeal real estate was by means of a ceremony termed *LIVERY OF SEISIN* (*q. v.*), in which the seller delivered to the purchaser some visible symbol, such as a clod of earth or twig of a tree, in the name of the property to be conveyed. This method of conveyance came to be regarded as cumbersome and inconvenient. It was governed by strict and technical rules, and the estates that could be created by it were inelastic—not readily molded to the demands of a growing civilization. The attention of conveyancers was attracted to other methods more suited to modern necessities. These methods were found in the doctrine of uses. (See *USES*.) A use in land was a notion derived from the Roman law, by means of which the formal title remained in one person, while the beneficial estate or enjoyment of the profits appertained to another. It corresponded in the main to the idea of trusts in modern law. (See *TRUST*.) A use could be created by a pecuniary or other legal consideration. For example, if an owner of land for a pecuniary consideration purported by present words to sell it, he would be at once converted into a formal owner, and the person advancing the money would be the beneficial owner, or, in technical language, would have "a use" in the land. He could become formal or legal owner by the action of a court of equity, which would, on application, direct that a conveyance should be made. While the law was in this condition an important statute was passed, 27 Hen. VIII., c. 10, called the *Statute of Uses*, the effect of which, in substance, was to declare that one who had acquired a use under certain prescribed conditions in an estate in land should be the legal or formal, as well as the beneficial, owner. One great consequence of this statute was to introduce new conveyances. The principal one was "bargain and sale." The sale of land for a consideration, as already explained, created a use, and the statute gave the owner of the use the title. A subsequent statute (known as the *Statute of Frauds*) requires conveyances to be in writing. This is the foundation of the modern system of conveyancing, both in England and the U. S. Other conveyances, proceeding either wholly or in part on the same theory, are "covenant to stand seised" and "lease and release." In the first of these the

consideration is the affection between near relatives, technically called a "good" consideration, as distinguished from "valuable." In the second, the doctrine of uses is resorted to to put the purchaser in constructive possession of an estate for years in the land, whereupon he may receive a release, and thus become complete owner.

T. W. DWIGHT.

Bargue, baarg, CHARLES: genre-painter; b. in Paris, and died there in 1883 in poverty when about twenty-five years of age. He was a pupil of Gérôme, painted only a few pictures, and never exhibited at the Salon. His works are highly prized by collectors for their minute finish and depth of color, and for their extreme rarity. *Playing Chess on the Terrace*, his last work, is in the collection of Mrs. William H. Vanderbilt, New York.

W. A. C.

Barham, baar'am, RICHARD HARRIS (whose pen-name was *Thomas Ingoldsby*): English clergyman and humorist; b. at Canterbury, Dec. 6, 1788. He was educated at Brasenose College, Oxford; held various church livings, and in 1842 was appointed divinity lecturer at St. Paul's. His most noteworthy work is the *Ingoldsby Legends* (1840 and 1847), a series of comic tales in grotesque, irregular meters, frequently reprinted. D. in London, June 17, 1845. See his *Life* by his son (London, 2 vols., 1870; 3d ed. 1880).

HENRY A. BEERS.

Bar Harbor: a noted summer resort of Hancock co., Me. (for location of county, see map of Maine, ref. 8-F); situated on Frenchman's Bay and on east side of Mt. Desert island. Pop. of Mt. Desert town (1890) 1,355; (1900) 1,600.

Bari, baa'rēe (anc. *Barium*): a fortified city and seaport of Italy; capital of the province of Bari; situated on the Adriatic Sea, 58 miles by rail N. W. of Brindisi (see map of Italy, ref. 6-G). It is defended by a massive old castle of Norman origin. The harbor admits only small vessels. Bari is the see of an archbishop, and has some fine ecclesiastical buildings, among which is the priory of St. Nicholas, founded in 1087. It contains a cathedral, also manufactures of silk, cotton, linen, and glass. *Barium* was a very ancient city, and was flourishing as early as 200 B. C. Pop. of commune, 64,000.

Bari, or **Bari delle Puglie**, baa'rēe-dē-le-pool'ye: a province of Apulia, Italy; bounded N. E. by the Adriatic Sea, S. by Lecce and Potenza, W. by Potenza, and N. W. by Foggia; area, 2,293 sq. miles. The soil is very fertile, producing wheat, fruits, and wine. The climate is very hot in summer. Pop. (1891) 756,071. Capital, Bari.

Baril'la: a crude, impure carbonate of soda, which is a considerable article of commerce, and is used in the manufacture of soap and glass. It is procured by burning plants of the genus *Salsola* or other plants which grow near the sea. Large quantities of it are exported from Spain and the Balearic isles. The *Salsola sativa* is cultivated on ground adjacent to the sea, by which it is occasionally submerged, the sea being admitted by flood-gates through an embankment. The *Salsola* is cut in September, is dried, and burned in a hole in the ground.

Barinas, vaa-ree'naās, or **San Carlos**: a town in the state of Zamora, Venezuela; near the river Santo Domingo (see map of South America, ref. 1-C); founded in the sixteenth century; has suffered devastation twice within a century. It is noted for the exportation of the tobacco which bears its name. Pop. 4,000.

Baring, bay'ring, Sir FRANCIS: an English financier; b. at Larkbear, near Exeter, Apr. 18, 1740; was the father of Lord Ashburton, and the principal founder of the great banking-house of Baring Brothers & Co. of London. He was made a baronet in 1793. D. in London, Sept. 10, 1810.—His eldest son, THOMAS, b. June 12, 1772, was a member of the House of Commons 1830-32. D. Apr. 3, 1848. For his second son, Alexander, see ASHBURTON.

Baring-Gould, SABINE: clergyman and author; b. at Exeter, England, Jan. 28, 1834; was educated at Clare College, Cambridge; visited Iceland in 1862; took orders in 1865; was appointed curate of Horbury, subsequently of Dalton; rector of East Mersca 1871, of Lew Trenchard 1881; and published *Myths of the Middle Ages* (1868); *The Origin and Development of Religious Belief* (1870); *Legends of the Patriarchs and Prophets* (1871); *Lost and Hostile Gospels* (1874); *Lives of the Saints* (15 vols., 1872-77); *Tragedy of the Cæsars* (2 vols., 1892); and other works to the number of about fifty, chiefly on religious subjects or

relating to folk-lore, legend, and popular superstitions. He also in later years became noted for his novels, as *Mehalah*; *Richard Cable*; *John Herring*; *Gaverocks*.

Revised by HENRY A. BEERS.

Barit'ah: a large Australian bird belonging to the *Corvidæ* (crow family). The bill is large and conical, the base



Baritah, or piping crow.

of it extending far backward on the forehead. The *Gymnorhina tibicen* (piping crow or piping grackle) has a melodious voice, is easily tamed, and learns to whistle tunes. There are several genera of these birds.

Baritone: See BARYTONE.

Ba'rium [name devised by Davy from *baryta* (Gr. *Bapty*, heavy), after the analogy of *rhodium*, *strontium*]: one of the alkaline earthy metals; chem. symbol, *Ba*; atomic weight, 137. It occurs in nature chiefly in the forms of sulphate, barite, barytes, or heavy spar, of carbonate, witherite, and of silicate, harmotome. It is very rarely prepared in the metallic state. Barium salts are prepared either from the native carbonate by the action of acids, or from the native sulphate by first reducing it to sulphide by treating with sawdust or some other reducing agent, then treating this with the proper acids. The most important salts are the chloride and nitrate; both are used as tests for sulphuric acid and soluble sulphates. The chloride is used as a preventive of boiler incrustations, owing to its action on the sulphate of lime of the feed-water. It is also extensively used for the preparation of an artificial sulphate known as *blanc fixe*, which is used in enameling paper. Barium forms a protoxide, BaO , called baryta, and a dioxide, BaO_2 . The latter is employed in the preparation of hydrogen dioxide, H_2O_2 . Baric hydrate, BaH_2O_2 , is the most soluble of the alkaline earthy hydrates; it is used in the laboratory as a test for carbonic acid, with which it forms a white precipitate. Baric sulphate is one of the most insoluble salts known. In its native form, barytes or heavy spar, it is extensively mined and used to adulterate white lead, an application for which it is specially adapted by its high specific gravity. The soluble barium salts are all poisonous. Any soluble sulphate, as sodic, Glauber's salt, or magnesia sulphate, Epsom salt, is an antidote.

C. F. CHANDLER.

Bark: the outer parts of the stem of plants, especially of trees. It is best developed on trees of cool climates, such as conifers, oaks, cottonwoods, maples, etc., but the name is also applied to the outer part of the stem in many herbaceous plants. The cortical part of the stem in a hemp plant includes all the tissues outside of the woody cylinder. Here the inner bark consists largely of fibrous cells intermingled with sieve cells and soft tissue; next to this externally is a mass of soft tissue containing more or less chlorophyll, and external to this is the epidermis. This is essentially the structure of the cortex of the young stems of our trees, but as the stems become older the epidermis splits off, and soon the green parenchyma cells disappear also. The bark is henceforth composed of the aggregated annual layers of fibrous, sieve and soft tissue, intermingled with a greater or

less development of cork, i. e. modified soft tissue. (See HISTOLOGY, VEGETABLE.) The annual layers can not long be distinctly recognized in the bark, and in the older portions of trees the outer layers of bark, becoming dry and lifeless, are gradually shed or thrown off. The peculiar juices and characteristic properties of a plant are often most abundant in the true bark, which is the most important part of many medicinal plants, especially of CINCHONA (*q. v.*). In making leather, tanners prefer those kinds of bark which contain most tannic acid. Oak bark is chiefly used in the tanneries of Europe. In the U. S. the bark of several species of oak, and also that of the hemlock, is used. The Spaniards employ the inner layer of the bark of the cork-tree (*Quercus suber*), and the Australians that of the eucalyptus.

Revised by CHARLES E. BESSEY.

Bark-beetle, or Bark-beetle: any one of several coleopterous insects, belonging to the family *Scolytidae*. They bore holes in bark, deposit their eggs in the inner bark, and often kill the tree. One species (*Tomicus typographus*, or the typographic beetle) infests the forests of Germany in great numbers. In 1783 it caused the death of a million pines or more in the Hartz Forest. It receives its name from the circumstance that the burrows formed by it in feeding upon the soft wood immediately within the bark often present a rude resemblance to printed characters. The U. S. have several destructive species.

Barker, A. S.: commander U. S. N.; b. in Massachusetts, Mar. 13, 1843; graduated at the Naval Academy in 1861. He served in the steamer Mississippi at the passage of Forts Jackson and St. Philip and capture of New Orleans, Apr. 24, 1862, and in the attack on Port Hudson, Mar. 14, 1863, where the Mississippi grounded and was destroyed; and afterward in the Monongahela at the siege of Port Hudson, and was in various engagements in her with batteries on the Mississippi river; was promoted to a captaincy May 5, 1892; rear admiral 1899.

Barker, EDMUND HENRY: English philologist; b. at Hollym, Dec. 22, 1788; studied at Cambridge; edited numerous classical works, including the *Revision of Stephen's Thesaurus Linguae Graecae* (12 vols. folio); lost all he had in a lawsuit. D. in London, Mar. 21, 1839.

Barker, FORDYCE, M. D., LL. D.: b. at Wilton, Me., May 2, 1818; educated at Bowdoin College 1837, and studied medicine in Boston and Paris. He became in 1845 Professor of Midwifery in the Medical School at Brunswick, Me.; held the same position in the New York Medical College (1850-57), and in 1860 became Obstetric Physician and Professor of Midwifery at Bellevue Hospital Medical College, New York; published many papers on obstetrical and other kindred subjects, a treatise on *Seasickness*, and one on *Puerperal Diseases*. His private practice was large and lucrative. He was a model man in all the relations of life. He was president of the New York Academy of Medicine, and a leading man in his profession. D. in New York city, May 30, 1891.

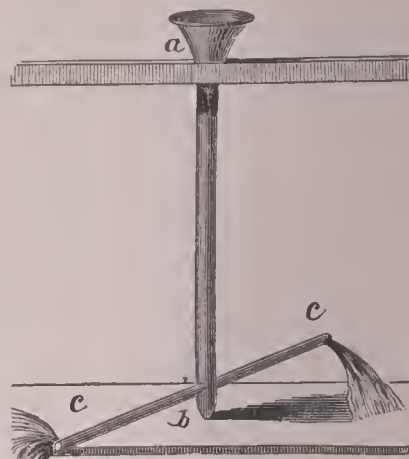
Barker, GEORGE FREDERIC, M. D.: chemist and physicist; b. at Charlestown, Mass., July 14, 1835. He became an apprentice in 1851 in a philosophical instrument manufactory in Boston, where he remained until 1856, in which year he entered the Yale Scientific School, and graduated as Bachelor of Philosophy in 1858. He was chemical assistant for two winters (1858-61) in the Harvard Medical School. In 1861 he was appointed Professor of Chemistry and Geology in Wheaton College, Illinois, and was acting Professor of Chemistry in 1862-63 in the Albany Medical College, where he graduated as M. D. in 1863. Early in 1864 he became Professor of Natural Sciences in the Western University of Pennsylvania at Pittsburg, was instructor (1865) in the Yale Medical College, and was appointed Professor of Physiological Chemistry and Toxicology at Yale in 1867. In 1878 he was chosen president of the American Association for the Advancement of Science. In 1873 he became Professor of Physics in the University of Pennsylvania. In 1876 he was elected a member of the National Academy of Sciences. In 1881 he received the decoration of commander of the Legion of Honor from the French Government. He was one of the U. S. commissioners to the Paris Int. Elec. Exhibition in 1881, a delegate to the Int. Congress of Electricians, and a vice-president of the jury. He was appointed by President Arthur a member of the U. S. Electrical Commission in 1884. Among his various productions may be named a *Lecture on the Force of*

Nature, delivered (1863) before the Chemical Society of Union College, by whom it was published; and one on the *Correlation of Vital and Physical Forces*, delivered (Dec. 31, 1869) before the American Institute in New York; republished in France. He is the author of a *Text-book of Elementary Chemistry* (New York, 1870), which has already passed through twenty editions.

Barker's Mill, or Segner's Wheel: a hydraulic machine invented by Dr. Barker toward the end of the seventeenth century. It is a device in which the reaction due to two water jets, *c c* (see cut), is utilized to produce rotary motion. The tube from which the jets issue tends to revolve in the direction opposed to that of the water emitted. The machine is sometimes called the *centrifugal mill*.

E. L. N.

Barking-bird (*Hylactes tarsi*): a small bird of the family *Pteroptochidae*, found in Chili; remarkable for its cry like the yelping of a small dog.



Barker's mill.

Barks'dale, WILLIAM: a brigadier-general in the Confederate service; b. in Rutherford co., Tenn., Aug. 21, 1821; killed at Gettysburg, Pa., July 2, 1863. He was educated at Nashville University, removed to Mississippi, studied law, and was admitted to the bar. He served in the Mexican war. In 1853 he was elected to Congress from Mississippi, and resigned his congressional seat and became a brigadier-general in the Confederate army; and it was at the head of his brigade that he was killed on the second day of the battle of Gettysburg.

Bar'laam: b. at Seminara in Calabria, Southern Italy, near the end of the thirteenth century; was of Greek descent. He became a monk in a Roman Catholic monastery of the order of St. Basil; continued his studies afterward at Thessalonica, becoming proficient in theology, philosophy, and mathematics; went to Constantinople in 1327, where he joined the Greek Church, and was made Abbot of St. Salvador (1331). In 1339 he was sent by the emperor to Avignon to try to bring about a union between the Greek and Latin Churches, but the scheme failed. Being condemned for heresy, he returned to Italy and the Roman Church in 1341, and was made Bishop of Gerace in Calabria in 1342. He is chiefly known, however, as the person from whom Petrarch unsuccessfully endeavored to learn Greek. D. there in 1348.

Barlaam and Jos'aphat (or Joasaph): a Greek religious romance or legend, often erroneously attributed to Johannes Damascenus, a Byzantine theologian of the eighth century. According to the legend, Josaphat is the son of a heathen King of India. In consequence of an astrologer's prediction, he is shut up in a palace by his father, and surrounded with young and beautiful attendants, in order that he may learn nothing of misery, disease, or death. Later the prince is allowed to make excursions from his retreat, but the streets are carefully cleared of the sick and unfortunate. By accident, however, he sees on one occasion a blind man and a leper, and on another he meets a man broken down by age. These sights, and the explanation of them given him by his tutors, make him very thoughtful. Barlaam, an ascetic, gets admitted to the prince, and converts him to Christianity and the monastic ideal. The prayers and threats of the king and the temptations devised by the magician Theudas can not shake Josaphat's faith, and both the king and Theudas become converts. Forty days after his father's death Josaphat abdicates. After long and perilous wanderings he finds Barlaam, and joins in his ascetic devotions, remaining with him till the old monk dies, and continuing the same austerities till his own happy end. The narrative contains a number of parables (such as *The Trumpet of Death*, *The Caskets*, *The Fowler and the Bird*, *The Man in the Pit*), which became a part of the anecdotic literature of the later Middle Ages (see Benfey, *Pantschatantra*, i. 80; Braunholtz, in the bibliography at the end of this article; T. F. Crane, *Exempla from the Sermones Vulgares of Jacques de Vitry*, London, 1890; Oesterley, *Gesta Romanorum*, pp. 736, 739, 745, etc.). It also contains an elaborate exposition

of Christian theology (with a marked tendency to polemic against the Monotheistic heresy) and of Christian ethics. The author is enthusiastic in his praise of the monastic life. His style is rhetorical, and shows the influence of John Chrysostom and Gregory Nazianzen.

Barlaam and Josaphat is really a Christian *rifacimento* of a lost Sanskrit or Pāli legendary biography of the Būddha, and most of the parables it contains are Būddhistic (see Liebrecht, who compares the *Lalitavistara*). The name *Josaphat* has even been identified with *Bodhissatva*, a title of the Būddha (*Zeitschrift der Deutschen Morgenländ. Gesellschaft*, xxiv. 480; Zotenberg, p. 68; Hommel, p. 178). Yet both Barlaam and Josaphat stand as saints in the Roman Martyrologium (Nov. 27) and the Greek Menæa (Aug. 26). The history of the passage of this Būddhist legend into Christian hagiology is obscure. The author of the Greek romance professes to have heard the story from certain pious (εὐλαβεῖς) men of India, who had translated it from trustworthy records or memorials. Zotenberg, combining this statement with another embodied in the title as given in most of the older MSS., thinks it likely that this Greek romance was written by John, a monk of the convent of St. Saba in Jerusalem, about 634, on the basis of communications from Nestorians from India. But one of the oldest MSS. (eleventh century) asserts that the book was translated from Iberian (i. e. Georgian, Grusinian) by Euthymius Iberus (d. 1026); and the discovery in 1887 of a Grusinian version has persuaded Rosen of the truth of this note. He supposes the monk John, who can not in any case be Johannes Damascenus, to have written the romance (probably in Syriac) in the first part of the seventh century, deriving his materials from Nestorian pilgrims. John's text, he conjectures, was turned into Grusinian by monks of the same convent, and this Grusinian translation was the source of the Greek romance, which he takes to be the work of Euthymius. The extant Grusinian version bears the name of Sophron Palæstinus, whom Hommel wishes to identify with Sophron, the friend of St. Jerome (fourth century). Hommel derives this text from a lost Syriac version of a Pehlevi translation (also lost) of the original Būddhist legend, and compares the literary history of the *Kalilah wa-Dimnah* (see PILPAY). He postulates a similar derivation for three non-Christian versions of the *Barlaam* that have come down to us: (1) Arabic, thought to be by the celebrated physician Rhazes (ar-Rāzī, ninth to tenth century), and preserved in an unpublished work of al-Kummī (d. 991) on the Mahdī and in an unpublished Persian translation; (2) Arabic, an anonymous abstract in a Halle MS., edited by Hommel, *Abhandlungen des VII. internat. Orientalisten-Congresses zu Wien*, 1887; (3) Hebrew, by Ibn Chisdai, a Spanish Jew (d. 1240), based on a lost Arabic translation. From these three versions, the relations of which have not been fully cleared up, it is possible partly to reconstruct the Būddhist form of the legend.

The Greek *Barlaam and Josaphat* was very popular. It was translated into Arabic (earliest MS. thirteenth century), and thence into Ethiopic (1553). A Slavonic rendering made it known to Servia, Bulgaria, Roumania, and Russia. Fragments of a French version have been discovered. A Latin translation was made in the twelfth century, and this was inserted by Vincent of Beauvais (d. 1264) in his *Speculum Historiale* (bk. xv., ch. 1-63), was condensed by Jacobus a Voragine (1230-98) for his *Legenda Aurea* (see JACOBUS A VORAGINE), and has given rise, mediately or immediately, to prose or verse translations in almost all the tongues of Western Europe. Thus there are versions in French (poem of Gui de Cambrai, thirteenth century; poem of the Anglo-Norman Chardry, thirteenth century; prose, twelfth century; mystery, about 1400), Provençal (prose, MS. of 1343), Spanish, Italian (various prose texts; mystery), Rhæto-Romanic (prose, seventeenth century or earlier), Czech (MSS. of fifteenth century), Middle High German (poem of Rudolf von Ems, thirteenth century; other fragments), Norse (*Barlaam og Josaphats Soga*, about 1200), Swedish (prose, fifteenth century), Icelandic (fifteenth century), Middle English (prose and verse), etc. A complete catalogue would take much space.

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G. L. KITREDGE.

Bar-le-Duc, baar'le-dük', or **Bar-sur-Ornain**, baar'sür-ōr-nāin': a town of France; capital of the department of Meuse; is on the river Ornain, and on the railway which connects Paris with Nancy, 159 miles by rail E. of Paris (see map of France, ref. 3-H). It has a communal college, a normal school, and a public library; also manufactures of cotton stuffs, hosiery, and calicoes. Its trade is facilitated by a canal which connects the Marne with the Rhine. Pop. (1896) 18,249.

Barlet'ta (anc. *Bardulum*): a fortified seaport of Italy; in the province of Bari; on the Adriatic, and on a rocky island 34 miles by rail W. N. W. of Bari; lat. 41° 20' N., lon. 16° 19' E. (see map of Italy, ref. 5-F). It is well built, has handsome stone houses, and wide, well-paved streets. It contains a fine cathedral, a college, a strong citadel or castle, and a colossal statue of the Emperor Heraclius, said to have been found in the sea. Grain, wine, oil, and fruits are exported from this town. Pop. 35,000.

Barley (in Lat. *hor'deum*): a valuable cereal of the family *Gramineæ*; said to be more widely distributed than any other grain. It was cultivated by the ancient Hebrews, Greeks, and Romans, and was an important article of food in remote antiquity; mentioned in Exodus ix. 31. It is adapted to both cold and warm climates. Three species are known to agriculture, the common (*Hor'deum vulgare*) two-rowed (*H. distichon*) and the six-rowed (*H. hexastichon*). Late writers regard these as forms of one species. Barley meal is used for bread in Northern Europe, but in many parts of the world this grain is mostly malted (*germinated*) for the manufacture of beer. It is also valuable as food for horses. When the pellicle of the grain is removed and the grain is rounded, it is called pearl-barley, which is used as food for invalids. The sprat or battledore barley (sometimes called German rice) is much esteemed in Germany. It has only two rows, and has widely spreading awns. The Nepal or Himalaya barley is well adapted for cold and mountainous regions, as it produces good crops at the height of 14,000 feet above the level of the sea. Barley is sown in the spring, and is cultivated in the same manner as spring wheat. Nearly all the American barley is used for malt.

Revised by L. H. BAILEY.

Barleycorn, JOHN: a personification of the spirit of barley or malt liquor; used in humorous poetical composition and in jocular parlance. There is an old whimsical English tract entitled *The Arraigning and Indicting of Sir John Barleycorn*, printed for Timothy Tossopot, in which Barleycorn is described as of "noble blood, well beloved in England," etc.; but John Barleycorn is best known from Burns's humorous poem of that name.

Barlow, FRANCIS CHANNING: major-general; b. at Brooklyn, N. Y., Oct. 19, 1834; graduated first in his class at Harvard College in 1855; served in the Union army 1862-65. He was at Fair Oaks and in almost every subsequent battle of the Army of the Potomac, and won a distinguished reputation as a brave and able officer. He was Secretary of State

for New York in 1866-68, and was elected Attorney-General of New York in 1871. From 1873 he practiced law in New York city, where he died Jan. 11, 1896.

Barlow, JOEL: poet; b. at Redding, Conn., Mar. 24, 1754; graduated at Yale College in 1778. He served as chaplain in the army in the Revolutionary war, after which he studied law. He produced in 1787 *The Vision of Columbus*, a poem which was very popular, and which he expanded into an epic, *The Columbiad* (1807). Having visited Europe on business in 1788, he passed some years in Paris during the French Revolution, and amassed a competence by trade or speculation. He returned to the U. S. in 1805. He was sent as ambassador to France in 1811, and died near Cracow, Dec. 24, 1812, while on his way to Wilna, whither he had been invited to meet Napoleon. His best poem is *Hasty Pudding* (1793), a mock heroic. See *Life and Letters of Joel Barlow*, by Charles Burr Todd (New York, 1886). Revised by HENRY A. BEERS.

Barlow, WILLIAM HENRY, F. R. S.: civil engineer; past president of the Institution of Civil Engineers; hon. mem. Société des Ingénieurs Civils; son of Prof. Barlow. B. at Woolwich, England, 1812; educated at Woolwich; pupil of H. B. Palmer, M. I. C. E. In 1832 erected buildings and plant at Constantinople for reconstruction of Turkish ordnance for Messrs. Maudsley & Field; reported on lighthouse at entrance of Bosphorus; received the decoration of "Nishan." In 1833 was assistant engineer of the Birmingham and Manchester Railway, then resident engineer of the Midland Counties; became engineer of the Midland Railway when formed. In 1857 he took offices in London and became consulting engineer of the Midland Company. He made many of the new lines of the Midland Railway, including its London end and the St. Pancras station. He was joint engineer with Sir John Hawkshaw for the completion of Clifton bridge, a description of which he contributed to the Institution of Civil Engineers. He was associated with Sir John Fowler and Mr. T. Harrison to decide the general-plan of the Forth bridge, and himself designed and constructed the new Tay bridge. He was one of the judges of the Centennial Exposition (Philadelphia, 1876), and vice-president of the Royal Society in 1881. He did much to facilitate the use of steel in constructions, and was a member of three Government commissions: 1. To decide the coefficient for steel to be used in engineering structures; 2. To ascertain the cause of the fall of the first Tay bridge; 3. To report on the provision against wind-pressures in engineering structures.

He was a member of the Ordnance Committee in 1881, which he resigned from ill health in 1888. He became a member of the Institution of Civil Engineers in 1845, and its president in 1880. His wife was Selina Crawford, daughter of W. Coffin, of the Royal arsenal. He has written several papers for the Philosophical Society, and taken part in numerous papers and discussions in the Institution of Civil Engineers upon almost every department of engineering.

WM. R. HUTTON.

Bar'mecides (sing. **Barmecide**): the name of a distinguished and powerful Persian family, which was derived from Barmak or Barmek. His son, Khâled-ben-Barmak, became the Prime Minister of the Caliph Al-Mansoor, and also of Al-Mahdi, who appointed him tutor to Haroun-al-Raschid. Yahya, the son of Khâled, was vizier under Haroun-al-Raschid, to whom he rendered important services. Yahya had four sons, named Fadhl, Mohammed, Musa, and Jaafar, who enjoyed the favor of the sovereign. Fadhl was vizier for some time. Haroun-al-Raschid, who was jealous of their power and popularity, ordered them to be put to death about 802 A. D. (See JAAFAR.) The virtues and misfortunes of the Barmecides have been celebrated by many Oriental poets and historians.

Barmecide's Feast: the name of a celebrated tale from the *Arabian Nights*; often applied to an ostentatious display of worthless bounty. The tale is as follows: Schacabac being reduced to great poverty, and having eaten nothing for two days together, made a visit to a noble Barmecide in Persia, who was very hospitable, but withal a great humorist. The Barmecide was sitting at his table, that seemed ready covered for an entertainment. Upon hearing Schacabac's complaint, he desired him to sit down and fall to. He then gave him an empty plate, and asked him how he liked his rice-soup. Schacabac, who was a man of wit, and resolved to comply with the Barmecide in all his humors, told him it was admirable, and at the same time lifted up the empty spoon to

his mouth [apparently] with great pleasure. The Barmecide then asked him if he ever saw whiter bread. Schacabac, who saw neither bread nor meat, answered, "If I did not like it, you may be sure I should not eat so heartily of it." Several other fine dishes were served up in idea, which both of them commended and feasted on after the same manner. This was followed by an invisible dessert; and Schacabac, at length being tired of moving his jaws up and down to no purpose, desired to be excused, for that really he was so full he could not eat a bit more. "Come, then," said the Barmecide, "you shall taste of my wines, which, I may say without vanity, are the best in Persia." He then filled their glasses out of an empty decanter. Schacabac would have excused himself from drinking so much at once, because he said he was a little quarrelsome in his liquor; however, being pressed to it, he pretended to take it off, having beforehand praised the color and afterward the flavor. Being plied with other imaginary bumpers of different wines, he pretended to grow flustered, and gave the Barmecide a box on the ear; but immediately recovering himself, "Sir," said he, "I beg ten thousand pardons, but I told you before that it was my misfortune to be quarrelsome in my drink." The Barmecide, who was pleased with the complaisance of his guest, then ordered a good substantial dinner to be served up.

Bar'men: a town and valley of Rhenish Prussia; on river Wipper; 17 miles by rail E. N. E. of Düsseldorf. The town is 3 miles E. of Elberfeld, or, according to one statement, is a continuation of Elberfeld, with which it forms one uninterrupted street 6 miles long (see map of German Empire, ref. 4-C). Barmen is the principal seat of the ribbon manufacture on the Continent, and its fabrics are distributed to all parts of the world. Here are also manufactures of cotton and linen goods, velvet, lace, hardware, and chemical products. The district which contains Barmen and Elberfeld is the most populous, industrious, and thriving in Germany. Barmen has a handsome church, an asylum for the deaf and dumb, an exchange, etc. Pop. (1885) 103,066; (1895) 126,992.

Bar'nabas [Gr. Βαρνάβας, from a Heb. word meaning son of consolation], SAINT: an early Christian and apostle; originally named JOSEPH; was born in the island of Cyprus. He was a companion and fellow-laborer of the apostle Paul on his first missionary journey, and appears to have been the principal founder of the church of Antioch, to which he was sent by the church of Jerusalem. "He was a good man, and full of the Holy Ghost and of faith" (Acts xi. 24). His falling out with Paul prevented his going with the latter on his second missionary journey (Acts xv. 39). He returned to Cyprus, and was still active in A. D. 57 (cf. 1 Cor. ix. 6). According to one tradition, he was the first Bishop of Milan.

Barnabas, Epistle of: an epistle of twenty-one chapters, which is supposed to have been written between 107-120 A. D. After having been lost sight of for several centuries, this epistle was first published in 1645, but the first four chapters and a part of the fifth were only in Latin. In 1859 Tischendorf discovered the whole in Greek MS. of the fourth century at Mt. Sinai, and it was published in 1862. Another MS. (dated 1056) was discovered at Constantinople by Bryennios in 1875. It was formerly ascribed to the apostle Barnabas, but it is evidently the work of another and later hand. It is frequently cited by the Fathers, and was by many regarded as being of authority in the Church, some even claiming for it a place in the sacred canon. It is chiefly directed against the Judaizing Christians, and its principal value now is in the light it throws upon the customs and doctrines of the Christians of that time. Several English translations have been published. The best recent editions of Barnabas are by Funk (1878) and Gebhardt and Harnack (1878), and that contributed by Rev. J. R. Harmer, Fellow of Christ Church College, Cambridge, to the edition of *The Apostolic Fathers*, issued by the trustees of the Lightfoot Fund (1891). This text and translation, prepared by the personal friend and collaborateur of the late Bishop of Durham, leaves nothing wanting for the critical study of this epistle.

Revised by W. S. PERRY.

Bar'nabites: an order of monks which was founded by Zaccaria at Milan in 1530, and were so called because they preached in the church of St. Barnabas. Their designation properly is "Regular Clerks of the Congregation of St. Paul." Their duties were to attend the sick, to preach, to instruct the young, etc. They became numerous, and established monasteries or colleges in Italy, France, Austria, and Spain.

Bar'naby, Sir NATHANIEL, K. C. B.: chief naval architect and director of naval construction of the British navy; b. in Chatham in 1829, of a family which has produced many generations of shipwrights in the royal dockyards. Apprenticed to the trade of shipwright at Sheerness in 1843, in 1848 he won by competition an Admiralty scholarship in the school of naval architecture at Portsmouth. In 1854 he superintended the construction of two gun-vessels built for the royal navy. In 1855 he entered the designing-office at the Admiralty, and during the thirty years he served there he was concerned in the design and construction of all but three of the entire list of British sea-going fighting ships, armored and unarmored, in existence, or building at the time of his retirement in 1885. From 1863 to 1870 this office was under the control of Sir Edward J. Reed, who also is credited with the design of some 35,000 tons of ironclads during the first three years of his service. Mr. Barnaby was appointed chief naval constructor in 1872, after the retirement of Sir E. J. Reed. He aided in the substitution of steel for iron in ship-building. He initiated the Admiralty list of subsidized merchant ships, constructed with appreciable fighting or transportation value in time of war. One of the four founders of the Institute of Naval Architects in 1860, he has contributed many papers to its Transactions, and wrote the articles on the *Navy and Ship-building* for the *Encyclopædia Britannica*. He was made a Companion of the Bath in 1876, on the recommendation of Mr. Disraeli, and a Knight Commander of the Bath in 1885, on the recommendation of Mr. Gladstone.

W. M. R. HUTTON.

Barnacle: See CIRRIPIEDIA and BALANUS.

Bar'nacle Goose, or **Brant Goose** (*Branta ber'nicle*): a bird which frequents the coasts of Britain in winter, and migrates northward in spring. It is smaller than the common wild goose, and is esteemed for food. The plumage of the upper part of its body is ash-gray and black, and that of the lower part white. The name of barnacle is sometimes applied to other species of wild geese. All of them are remarkable for powerful flight and distant migrations, and prized for the table. The barnacle goose is a winter bird of passage in the U. S. It takes its name from the old belief that barnacles were often transmuted into geese—a superstition which was once shared by learned and unlearned alike.

Revised by D. S. JORDAN.

Bar'nard, F. E.: astronomer; b. in Nashville, Tenn., Dec. 16, 1857. In his youth he learned the art of photography, and it was with the slender means gained by its practice that he was enabled to purchase his first telescope. About 1878 he began to search for comets, but it was not until September, 1881, that his efforts were rewarded with success. From this time until 1891 he found one, two, or three comets almost every year. In 1883 he entered the Vanderbilt University as Fellow in Astronomy, taking charge of their small observatory, and at the same time taking a course of instruction in the subjects most necessary to astronomical pursuits. Graduating in 1887, he resigned the position of instructor in astronomy to accept that of astronomer at the Liek Observatory. Here he showed himself one of the most zealous and enthusiastic of observers. In 1892 he was allowed to search the heavens with the great 36-inch telescope, and on Sept. 9 he found a new satellite of Jupiter, thus adding a fifth to the four which had been discovered by Galileo. In 1889 he received the degree of A. M. from the University of the Pacific, and in 1892 the Lalande medal of the French Academy was awarded him for the discovery of the new satellite of Jupiter.

S. NEWCOMB.

Barnard, DANIEL DEWEY, LL. D.: a lawyer and Whig politician; b. at Sheffield, Mass., July 16, 1797; graduated at Williams College in 1818, was admitted to the bar at Rochester, N. Y., in 1821; was county attorney in 1826, and a member of Congress from New York (1828-30 and 1839-45). He traveled in Europe in 1830-31, corresponding with a Rochester newspaper; removed to Albany in 1832; became noted in the Whig party, and as a member of the New York Assembly; and was U. S. minister to Prussia (1849-53). He was the author of many published reviews, speeches, etc., including *An Historical Sketch of the Colony of Rensselaerwick*. D. at Albany, N. Y., Apr. 24, 1861.

Barnard, FREDERICK AUGUSTUS PORTER, S. T. D., LL. D., L. H. D., D. C. L.: mathematician, physicist, educator, and divine; b. at Sheffield, Mass., May 5, 1809; graduated at Yale College in 1828; tutor there 1830; Professor of Mathematics and Natural Philosophy in the University of Ala-

bama 1837-48; Professor of Chemistry and Natural History in the same 1848-54; Professor of Mathematics, Natural Philosophy, and Civil Engineering in the University of Mississippi 1854-61; president of the University of Mississippi 1856-58; and chancellor of the same 1858-61. In 1854 he took orders in the Protestant Episcopal Church; resigned his chancellorship and his chair in the university in 1861 on account of the civil war; moved to Washington, D. C., and in 1863-64 was connected with the U. S. coast survey, in charge of chart-printing and lithography. In May, 1864, he was elected president of Columbia College, New York city, which he resigned in 1888 on account of failing health. He received the honorary degree of LL. D. from Jefferson College, Mississippi, in 1855, and from Yale in 1859; also degree of S. T. D. from the University of Mississippi in 1861, and that of L. H. D. from the regents of the University of the State of New York in 1872. In 1860 he was a member of the eclipse expedition sent to Labrador (Cape Chudleigh) by the U. S. Coast Survey; and during his absence was elected president of the American Association for the Advancement of Science. In the act of Congress establishing the National Academy of Sciences (1863) he was named as one of the original corporators, and was chairman of the physical section, 1870-72; in 1867 he was one of the U. S. commissioners to the Paris Exposition. He was also a member of the American Philosophical Society, an associate member of the American Academy of Arts and Sciences, corresponding member of the Royal Society of Liège, and member of many other scientific and literary associations. During his long residence in the South, Dr. Barnard was actively engaged in promoting public education, both primary and higher, encouraging and assisting in all departments of scientific research and literary culture. He was a persistent advocate of the higher education of women in the old colleges, and the Barnard annex for girls to Columbia College, New York, is named for him in recognition of his labors for its creation. His publications have related chiefly to scientific and educational subjects. Among these may be mentioned *Letters on College Government* (1854); *Report on Collegiate Education* (1854); *Art Culture* (1854); *History of the American Coast Survey* (an extended Report to the American Association for the Advancement of Science, 1857); *University Education* (1858); *Undulatory Theory of Light* (1862); *Machinery and Processes of the Industrial Arts, and Apparatus of the Exact Sciences* (1868); *Metric System of Weights and Measures* (1871). D. in New York city, Apr. 27, 1889. See his *Memoirs*, by John Fulton (New York, 1896).

Barnard, HENRY, LL. D., L. H. D.: an eminent educator; b. at Hartford, Conn., Jan. 24, 1811; graduated at Yale in 1830; called to the bar in 1835; while in the Legislature of Connecticut (1837-40) he reorganized the public schools. He was secretary of the board of school commissioners (1838-42); school commissioner of Rhode Island (1843-49); superintendent of schools in Connecticut (1850-54); president State University of Wisconsin (1856-59), and of St. John's College, Annapolis, Md. (1865-66). The normal-school system found in him one of its earliest and most efficient promoters. He published, besides other works, *The Connecticut Common School Journal*, which had reached several volumes in 1855; *Normal Schools in the United States and Europe* (1851); *Education in Factories* (1842); *School Libraries* (1854); *Hints and Methods for the Use of Teachers* (1857); and *National Education in Europe* (1851), when he commenced the publication of the *American Journal of Education*. He was U. S. commissioner of education 1867-70. In 1886 he began the publication of *The American Library of Schools and Education*, which was to comprise 800 of his reports, treatises, etc. D. in Hartford, Conn., July 5, 1900.

Barnard, JOHN: a famous minister of Marblehead, Mass.; b. in Boston, Nov. 6, 1681, and graduated at Harvard in 1700. He was a chaplain in the Port Royal expedition of 1707, of which he wrote an unpublished account. Visiting England, he was offered a chaplaincy to Lord Wharton, but refused to conform. He was ordained colleague minister of Marblehead in 1716, and there remained for life. He took great pains in establishing the fisheries and commerce of his people. He published *A History of the Strange Adventures of Philip Ashton* (1725); a version of the Psalms; sermons, etc. D. at Marblehead, Mass., Jan. 24, 1770.

Barnard, JOHN GROSS, LL. D.: military engineer; b. in Sheffield, Mass., May 19, 1815; was a brother of the president of Columbia College, New York; graduated at U. S. Military Academy 1833; commissioned as brevet second lieutenant in

the corps of engineers. In 1835 was sent to the Gulf coast, where he served seventeen years as an assistant or principal engineer for the fortifications of Pensacola and New Orleans, and on works of harbor improvement. During the war with Mexico he was twice called to the field, and received the brevet of major "for meritorious services while serving in the enemy's country." In 1850 he was named by the President (Taylor) as chief of a scientific commission for the survey of the Isthmus of Tehuantepec, with the view of establishing a route of commerce and travel to our newly acquired Pacific possessions. The report drawn up by J. J. Williams (1852) gives the first full account of that isthmus ever published. In 1854 Barnard was in charge of the construction of the new fortifications of San Francisco, Cal.; in 1855-56 superintendent of the U. S. Military Academy. Subsequently, till 1861, he was in charge of the fortifications of New York harbor. Serving as chief engineer under Gen. McDowell in the first Bull Run campaign, he was present on the field of that battle, as also at the earlier combat at Blackburn's Ford, the very first of the inchoate "Army of the Potomac." As chief engineer (with the rank of brigadier-general) of the Army of the Potomac in the Virginia Peninsula campaign of 1862, he directed the siege operations at Yorktown and before Richmond; and subsequently, as "chief engineer of the defenses of Washington," the extensive works for the defense of the national capital. In the campaign of 1864-65 he served on the staff of Lieut.-Gen. Grant as "chief engineer of the armies in the field," until the surrender of Lee's army at Appomattox Court-house, at which he was present. He was breveted through several grades, and finally received the brevet of major-general U. S. army "for gallant and meritorious services in the field"; also breveted July 4, 1864, major-general U. S. volunteers "for meritorious and distinguished services." From the close of the civil war he served as senior member of the board of engineers for permanent fortifications, and as a member of the U. S. lighthouse board. He was a member and original incorporator of the National Academy of Sciences. The degree of A. M. was conferred upon him by the University of Alabama in 1838, and of LL. D. by Yale College 1864. He was a member of the American Institute of Architects, and an honorary member of the American Society of Civil Engineers. His principal publications are *The Phenomena of the Gyroscope Analytically Examined* (1858); *Notes on Sea-coast Defense* (1861); *Reports of the Engineer and Artillery Operations of the Army of the Potomac* (1863); in conjunction with Gen. W. F. Barry, chief of artillery, *Report on the Defenses of Washington* (1871); *Report on the Fabrication of Iron for Defensive Purposes*, etc. (1871), made in conjunction with Gen. H. G. Wright and Col. P. S. Michie; *The North Sea Canal of Holland, and Improvement of Navigation from Rotterdam to the Sea; Problems of Rotary Motion Presented by the Gyroscope, the Precession of the Equinoxes, and the Pendulum*. In May, 1864, he was nominated brigadier-general and chief of engineers. The nomination was withdrawn at his own request. Retired with rank of colonel of engineers Jan. 2, 1881. D. at Detroit, Mich., May 14, 1882.

Barnaul, baär-nowl': a town of Siberia; government of Tomsk; at the junction of the Barnaul with the river Ob; 230 miles S. S. W. of Tomsk (see map of Asia, ref. 3-F). It has a mining-school, four churches, and several hospitals. All the gold of the Altai Mountains is brought here to be smelted. A magnetic and meteorological observatory was established here about 1841. Pop. (1897) 29,408.

Barnave, baär'naav, ANTOINE PIERRE JOSEPH MARIE: a French revolutionist and advocate; b. at Grenoble, Oct. 22, 1761. He was elected in 1789 to the States-General, and became a leader of the popular party. As a member of the National Assembly he opposed the absolute veto, and advocated the confiscation of church lands and the abolition of convents. He was a member of the committee appointed to attend the king on his return from Varennes to Paris in 1791, after which he became a more moderate reformer, and even defended the royal cause. This change of course rendered him unpopular. He retired to private life in Sept., 1791, and was guillotined in Paris, Nov. 29, 1793. According to Macaulay, he was "the best debater in the National Assembly, but he flinched before the energy of Mirabeau." He left several political treatises, among which is *Réflexions politiques*. See *Life of Barnave*, by M. de Salvandy, and *History of the Girondists*, by Lamartine.

Barnburners: a nickname given to that portion of the Democratic party of the State of New York which opposed the extension of slavery and supported Van Buren against Cass for President in 1848. They were esteemed too radical by their adversaries, one of whom illustrated his meaning by a story of a farmer who was so greatly annoyed by an owl that he shot the bird, and in doing so set fire to his barn, which was destroyed. The barnburners, led by Col. Samuel Young, Hon. Silas Wright, Michael Hoffman, etc., opposed further borrowing for the improvement or extension of their State canals, and were hostile generally to public debts, corporate privileges, etc.

Barnby, Sir JOSEPH: musician; b. at York, England, Aug. 12, 1838; studied at the Royal Academy of Music, London. In 1875 he was appointed successor and director of musical instruction at Eton, which position he held till appointed head of the Guildhall School of Music in London in 1892. He was conductor of the oratorio concerts in London established by Messrs. Novello, Ewer & Co., and has been the conductor of the Royal Albert Hall Choral Society since its establishment. His compositions have been chiefly of a sacred character, and include many church services, anthems, hymn tunes and chants. He edited *The Hymnary: a Book of Church Song*, published in 1872, which contains sixty-three tunes of his composition. Sullivan's *Church Hymns with Tunes* contains fourteen of Barnby's composition, and *Hymns Ancient and Modern* fourteen. His cantatas *Rebekah* and *The Lord is King*, the latter composed for the Leeds festival of 1883, are two examples of larger form. Barnby's music is immensely popular both in England and the U. S., many of his songs and part songs, as well as his church music, being as well known here as there. He was knighted in Aug. 1892. D. in London, Jan. 28, 1896. D. E. HERVEY.

Barnegat Bay: Ocean co., N. J.; connects with the Atlantic by an inlet over a mile wide. The bay extends 23 miles N. to the mouth of the Meteteunk river. There is a lighthouse 150 feet high on the south side of the inlet, with a flashing white light; lat. 39° 45' 48" N., lon. 74° 6' 3" W. Barnegat Bay is separated from the ocean by Squan Beach and Island Beach.

Barnes, ALBERT: Presbyterian divine; b. at Rome, N. Y., Dec. 1, 1798. He graduated at Hamilton College in 1820; became in 1830 pastor of the First Presbyterian church at Philadelphia, where he remained until 1867. He declined the degree of D. D. and was much opposed to its use. As a commentator on the Scriptures, Mr. Barnes was popular with the religious community on both sides of the Atlantic. The circulation of his *Notes on the New Testament* (in eleven volumes) is said to have reached more than a million volumes. He commented also on *Isaiah* (1840), *Job* (1844), *Daniel* (1853), and the *Psalms* (1871). Among his other works may be named *The Church and Slavery* (Phila., 1857); *The Atonement in its Relations to Law and Moral Government* (1859); *Lectures on the Evidences of Christianity* (1868); *Life at Threescore and Ten* (1869). He was tried for heresy because he maintained an unlimited atonement; was acquitted, but the tension produced resulted in the dismemberment of the Presbyterian Church (1837), and he became one of the most prominent advocates of the New School doctrines. He did not love controversies, however, and so rejoiced in the union of the Old and New School branches in 1870. D. in Philadelphia, Dec. 24, 1870.

Barnes, CHARLES RIED, M. A., Ph. D.: botanist; b. in Madison, Ind., Sept. 7, 1858; educated in Hanover College and Harvard University; Professor of Botany and Geology in Purdue University 1879-87; Professor of Botany in University of Wisconsin 1887 to present. He is one of the editors of the *Botanical Gazette*, and in conjunction with Dr. Coulter and Dr. Arthur published a *Handbook of Plant Dissection* (1886). He has written papers upon North American mosses, including *Keys to Genera and Species of North American Mosses* (1890). CHARLES E. BESSEY.

Barnes, EARL, M. S.: See the Appendix.

Barnes, JAMES: soldier and engineer; b. at Boston, Mass., in 1806; graduated at West Point in 1829; was a lieutenant of artillery till he resigned from the army July 31, 1836; served at Military Academy as assistant instructor 1829-30, and 1833-36; at Fort McHenry, Md., 1830-32; in Black Hawk expedition 1832; and at Charleston harbor 1832-33, during the threatened nullification of South Carolina. He was a prominent civil engineer (1836-57), and constructed

many important railroads. At the beginning of the civil war he resumed the military profession as colonel of Eighteenth Massachusetts volunteers; was appointed Nov. 29, 1862, brigadier-general U. S. volunteers, and served in the Virginia peninsula 1862, Northern Virginia campaign 1862, in Maryland campaign 1862, and at Antietam; in Rappahannock campaign 1862-63, at Fredericksburg and Chancellorsville, in Pennsylvania campaign, in several skirmishes, and at the battle of Gettysburg (wounded); was in command of the defenses of Norfolk and Portsmouth, Va., 1863-64, of St. Mary's district 1864-65, and Point Lookout camp for prisoners of war 1864-65. Brevet major-general U. S. volunteers Mar. 13, 1865, for meritorious services, and mustered out of service Jan. 15, 1866. With health destroyed he remained at his home in Springfield, Mass., where he died Feb. 12, 1869.

Barnes, JOSEPH K.: brigadier-general and surgeon-general U. S. army; b. in Philadelphia, July 21, 1817; educated in Philadelphia, receiving his degree of M. D. from the medical department of the University of Pennsylvania, class of 1838. He followed the practice of his profession in the hospitals and as physician to the outdoor poor of Philadelphia till June 15, 1840, when he was appointed an assistant surgeon in the army, and a surgeon Aug. 29, 1856. In 1863 (Feb. 9) he was appointed medical inspector, and Aug. 10 medical inspector-general, with the rank of colonel. On Aug. 25 he was placed in charge of the surgeon-general's office, and Aug. 22, 1864, received the appointment of surgeon-general until retired, June 30, 1883, having administered the responsible duties of his department with marked ability. D. in Washington, D. C., Apr. 5, 1883.

Barnes, JOSHUA: b. in London, Jan. 10, 1654; studied at Cambridge, England; became professor of Greek there 1695. He was highly esteemed as a scholarly editor of *Euripides* (Cambridge, 1694), *Anacreon* (1705), and *Homer* (1710); but his scholarship was inexact, and so his works have little permanent value. D. in Cambridge, Aug. 3, 1712.

Barnes, THOMAS: b. about 1785; educated at Christ's Hospital, London, and at Pembroke College, Cambridge. He became chief editor of the *London Times* 1817, and finally one of the proprietors. He placed it beyond reach of competition. D. in London, May 7, 1841.

Barnes, WILLIAM: philologist, clergyman, and poet; b. in Dorsetshire, England, Feb. 22, 1800; published a number of works, among which were *English Speechcraft* and *Poems of Rural Life in the Dorset Dialect*. D. as rector of Winterbourne Came, Oct. 7, 1886.

Barnesville: town; Pike co., Ga. (for location of county, see map of Georgia, ref. 4-G); on Ga. Cent. R. R., 60 miles S. by E. of Atlanta; has two large buggy-factories and a cotton-factory. Appropriations have been made (1892) for water-works and electric lights. Barnesville is the seat of Gordon Institute. Pop. (1880) 1,962; (1890) 1,839; (1900) with suburbs, 3,036. EDITOR OF "GAZETTE."

Barnesville: city; Clay co., Minn. (for location, see map of Minnesota, ref. 5-A); 218 miles from St. Paul, on Gt. Northern R. R., the division headquarters and shops of which are located here. Pop. (1890) 1,069; (1900) 1,326.

Barnesville: village; Belmont co., O. (for location of county, see map of Ohio, ref. 5-I); 32 miles W. of Wheeling, on B. and O. R. R. It has a variety of manufactures, is the commercial center of a large and wealthy agricultural district, and is noted for its superior strawberries and tobacco. Pop. (1880) 2,435; (1890) 3,207; (1900) 3,721.

Barnet, or Chipping Barnet: market-town of Hertfordshire, England; 11 miles N. N. W. of London. Great cattle fairs are held here. The famous battle of Barnet was fought near here in 1471 between the Yorkists and Lancastrians, in which the latter were routed. The Earl of Warwick, "the king-maker," their leader, was killed. The result of this battle was to firmly establish Edward IV. Pop. 4,500.

Barnett, JOHN: musician; b. near Bedford, England, July 15, 1802, of German parentage. When ten years old, having a remarkable contralto voice, he was articulated to Samuel James Arnold, manager of Drury Lane theater, London, where he sang in many English operas. Studied first under C. E. Horn and Price, and later under Perez, Ferdinand Ries, Schneider and Kalkbrenner. His first musical dramatic work, a musical farce, was produced in 1825; his oratorio *The Omnipresence of the Deity* in 1829; the

Mountain Sylph, his most famous work, in 1834; *Fair Rosamond* in 1836; and *Farinelli* in 1838. In 1841 he retired from public life, and lived at Cheltenham till his death, Apr. 17, 1890. He wrote much miscellaneous music, including upward of 2,000 songs, and several operas and other works were left in manuscript. D. E. HERVEY.

Barnett, JOHN FRANCIS: musician; son of Joseph Alfred Barnett; professor of music, and nephew of John Barnett, the composer of *The Mountain Sylph*; b. in England in 1837; studied first under his parents, both being excellent musicians; then under Dr. Henry Wylde; next at the Royal Academy of Music, London, where he won the Queen's scholarship; and finally at the Leipzig Conservatory under Hauptmann, Rietz, Plaidy, and Moscheles. He returned to London in 1861, and has since pursued a successful career as composer. His chief works are *The Raising of Lazarus* (1873), which was originally sketched out during his student career; *The Ancient Mariner*, for the Birmingham festival (1867); *Paradise and the Peri*, Birmingham festival (1870); *Lay of the Last Minstrel*, Liverpool festival (1874); *Good Shepherd*, Brighton festival; *Building of the Ship*, Leeds festival (1880); *Harvest Festival*, Norwich festival of 1881. He has also composed many smaller works both for voices and instruments, together with a symphony, and overture for full orchestra, and trios, quartets, and quintets for pianoforte and string instruments. He also completed the orchestration of Schubert's unfinished symphony. D. E. HERVEY.

Barnett, JOSEPH ALFRED: See the Appendix.

Barneveldt, JOHN VAN OLDEN: an eminent Dutch statesman; b. at Ameersfoort in Utrecht, Sept. 14, 1547. He was a member of an important embassy sent to England in 1585, and after his return was appointed advocate-general of Holland. He was an adversary of the Earl of Leicester, and became the head of the republican party, while Maurice of Nassau was the chief of its opponents. Barneveldt opposed the ambitious designs and warlike policy of Maurice, and in 1609 concluded a truce with Spain for twelve years. He was for many years grand-pensionary of Holland. The animosity between the two parties was aggravated by religious dissension. Barneveldt favored the Arminians or Remonstrants, while Maurice patronized the intolerant Gomarists, who were also supported by the majority of the army, the clergy, and the populace. The Synod of Dort having condemned the Arminians in 1618, Barneveldt was accused of treason, unjustly convicted and beheaded at The Hague, May 13, 1619. See Motley's *Life of Barneveldt*.

Barn-owl: one of certain species of owls, in which the facial disk is long and subtriangular in form, constituting the genus *Strix*. *S. flammea* is the common European species. The closely related American species is *Strix pratensis*. This solemn-looking and fierce little owl is more abundant southward and westward than along the Atlantic States. See OWL. D. S. J.

Barnsley: a market-town of England; in the West Riding of Yorkshire, on the river Dearne, 11 miles N. of Sheffield, on the North Midland Railway (see map of England, ref. 7-H). It is situated on a hill, has coal and iron mines, and manufactures of linen, glass, etc. The damasks and drills of Barnsley were considered to be unrivaled. Here are also bleaching and dye works and iron foundries. Pop. (1891) 35,427.

Barnstable: port of entry and capital of Barnstable co., Mass. (for location of county, see map of Massachusetts, ref. 5-K); on Old Colony R. R. and Barnstable Bay, 72 miles S. S. E. of Boston. The inhabitants are principally engaged in maritime pursuits and cranberry culture. The southerly portion of the township, on Vineyard Sound, is a noted place of summer resort, and contains Hyannis, Hyannis Port, Cotuit, Wianno, Craigville, Osterville, and Centerville. Pop. of township (1880) 4,242, including 780 in village; of township (1890) 4,023; (1900) 4,364. EDITOR OF "PATRIOT."

Barnstaple: a town and seaport of Devonshire, England; on the river Taw; 6 miles from its mouth, and 40 miles by rail N. W. of Exeter (see map of England, ref. 13-D). The Taw is here crossed by an old bridge of sixteen arches. Barnstaple is pleasantly situated and well built, and has manufactures of pottery, lace, etc. The harbor has been filled with sand, so that it will not admit large vessels. Pop. (1891) 13,058.

Bar'num, PHINEAS TAYLOR: showman; b. in Bethel, Conn., July 5, 1810; d. in Bridgeport, Conn., Apr. 7, 1891.

His father kept an inn and a country-store, and died poor in 1825. Barnum wandered about, and was in business in Brooklyn, New York, and other places. Having saved a little money, he returned to Bethel, opened a small store, took the agency of a State lottery for building the Groton Monument, moved into a larger store and failed. He married in 1829, and soon after started a weekly newspaper called *The Herald of Freedom*; was prosecuted for libel, and imprisoned for sixty days. He went to New York and Philadelphia in 1834. In the latter city he bought for \$1,000 a colored slave woman, Joyee Heth, represented to be the nurse of George Washington and 161 years old; from her exhibition his receipts soon reached \$1,500 a week. She died a year after, but her venerable age was more than doubtful. In 1841, without any funds, he bought Scudder's American Museum in New York, which he called Barnum's Museum; and with his profits paid his indebtedness the first year. In 1842 he introduced the dwarf, Charles S. Stratton (Gen. Tom Thumb), whom he exhibited in the U. S., France, and England. In 1849 Barnum engaged JENNY LIND (*g. v.*) to sing in America for 150 nights, at \$1,000 a night. The gross receipts in 1850-51 in nine months were over \$712,000. In 1856-57 he indorsed notes for nearly \$1,000,000, which went to protest, and wiped out all of his estate except a fortune settled on his wife. He again visited England in 1857 with Tom Thumb, and gave lectures. His museum in New York was burnt July 13, 1865. Another one was also destroyed by fire Mar. 3, 1868. Afterward, in the spring of 1871, he established his "Greatest Show on Earth," the firm being Barnum, Bailey & Hutehinson. He was four times a member of the Connecticut Legislature, and was mayor of Bridgeport. His benefactions were large and numerous. He wrote *Humbugs of the World* (New York, 1865); *Lion Jack, a Story* (1876); and an autobiography (1855, n. e. 1869 and later).

B. B. VALLENTINE.

Barnwell, ROBERT WOODWARD, LL. D.: statesman; b. at Beaufort, S. C., Aug. 10, 1801; graduated at Harvard in 1821. He studied law; was a member of Congress from South Carolina (1829-33); U. S. Senator in 1850; and member of the Confederate Congress. He was president of South Carolina College (now University of South Carolina) (1835-41); and after the civil war held the same position until 1873. D. at Columbia, S. C., Nov. 25, 1882.

Baroach': See BROACH.

Barocchio, or **Barozzi**, GIACOMO DA VIGNOLA: See BAROZZO.

Barocci, bã-rot'chêe, or **Baroccio**, bã-rot'chi-ô (FIORI FEDERICO D'URBINO): a famous Italian painter; b. at Urbino in 1528. Among his best works are a *Descent from the Cross*, at Perugia, and a *Holy Family*, in the Museum at Naples. He also engraved in excellent style a number of his pictures. D. in Urbino, Sept. 30, 1612.

Baroche, bã-rôsh', PIERRE JULES: a French advocate and minister of state; b. in Paris, Nov. 18, 1802. He became a member of the Constituent Assembly 1848-49, and was Minister of the Interior in 1850; Minister of Foreign Affairs in 1851 from April to October. He was appointed president of the council of state immediately after the *coup d'état* of Dec., 1851, and became Minister of Justice and Keeper of the Seals in 1863. Senator in 1864. D. in St. Helier's, Jersey, Oct. 29, 1870.

Baroda, bã-rô'da: a tributary state in Northern Bombay, British India. It is in several distinct irregular patches, the largest of which is between Ahmadabad and Palanpur, and includes the towns of Patan, Sidhpur, Barnagarh, and Maisana; a second is about the city of Baroda, and a third in the S. of the peninsula of Kathiawar. Total area, 8,569 sq. miles. Pop. (1901) 1,950,927. These districts are under a Mahratta prince called the Guicowar, or Gaikwar, of Baroda. It came into dependence on Great Britain in 1802. In 1874 the ruling Gaikwar, Malhar Rao, was tried for attempting to poison the British resident, and, though not convicted, was deposed. The districts of Baroda are very fertile, producing cotton, grain, tobacco, flax, and indigo. Baroda city is the capital.

M. W. H.

Baroda: a city of Hindustan; in Guzerat; situated about 90 miles by rail N. N. E. of Surat; lat. 22° 16' N., lon. 73° 14' E. (see map of N. India, ref. 8-C). It is the residence of the gaikwar, a Mahratta prince, and has an extensive trade, for which its position is advantageous. A railroad extends from Baroda viâ Surat to Bombay, 231 miles. It is a rich city in proportion to its size. Pop. (1891) 116,460.

Barom'eter [from Gr. βάρος, weight + μέτρον, measure]: an instrument for measuring the weight or pressure of the atmosphere. If a tube of uniform bore be bent into the form of the letter U, and partially filled with a liquid, the height of the liquid column, as measured above the bend, will be found to be the same in both branches. This will continue to be true though the air be withdrawn from above the liquid on both sides—a thing which may easily be effected by suitably connecting the two extremities of the tube with an air-pump. But if, while things are in this condition, the air be gradually readmitted to one of the branches and not to the other, the column in that branch will steadily sink, and that in the other will correspondingly rise. Arresting this process at any moment, we may say that the difference of height of the two liquid columns is a measure of the pressure of the air on the surface of the lower; or that the *weight* of a column of the liquid having a height equal to this difference is just equal to the pressure on that surface. In this experiment it would be easy to expel the liquid entirely from one branch of the tube, without establishing an equilibrium with the column in the other, unless the apparatus should be of inconveniently large dimensions, or the liquid employed should be one having great specific gravity. Mercury, in fact, which is nearly fourteen times (13.6) heavier than water, is the only liquid convenient for the purpose of the experiment; and if this be used, the difference of height of the columns in the two branches will be found to be about 30 inches when the full pressure of the atmosphere is admitted to one branch, while it is wholly withdrawn from the other. The weight of a vertical column of mercury, therefore, of uniform horizontal section, 30 inches in height, is equal to the mean pressure of the atmosphere at the surface of the earth on an area equal to the base of the column. The same fact is demonstrated more expeditiously by simply taking a straight tube 32 or 33 inches in length (Fig. 1), closed at one extremity and open at the other, filling it entirely full of mercury, placing the thumb firmly on the open end, inverting it and plunging this extremity beneath the surface of mercury in a basin, and finally removing the thumb. The column will fall, and stand as before at about 30 inches above the level of the mercury in the basin. This is the original experiment of Torricelli, made early in the seventeenth century, by which he furnished the first satisfactory explanation of the phenomena which the old philosophers vaguely ascribed to nature's abhorrence of a vacuum.

If the pressure of the atmosphere were invariable, the barometer would be an instrument of no practical use, and would simply serve to illustrate an interesting physical truth. But this pressure is constantly fluctuating, and its fluctuations are measured by the varying heights of the Torricellian column. All that is necessary to form a barometer, therefore, is to connect with the tube and basin of Torricelli some kind of scale suitable to measure these variations. In the barometers commonly used in Great Britain and the U. S. this scale is divided into inches and decimals; in France, and in continental Europe generally, into millimeters. If the instrument is to be stationary, the scale need only have a range of 3 or 4 inches, since even in localities where the fluctuations are largest they never transcend these limits. The divisions directly marked on the scale are made sufficiently large to be read by the unassisted eye. For smaller divisions a vernier must be employed. (See VERNIER.) In the best instruments the height of the column may be read by means of the vernier to the $\frac{1}{1000}$ th of an inch. Some little practice is required in order to learn to read with accuracy. The vernier carries a horizontal index which moves close to the glass tube containing the mercurial column; but the top of the column is rounded, so that the highest point is distant from the index by half the exterior diameter of the tube. Ordinarily the bore of the tube is small, not exceeding three-sixteenths to three-eighths of an inch; but in large standards a tube an entire inch in bore is often employed, and in such instru-

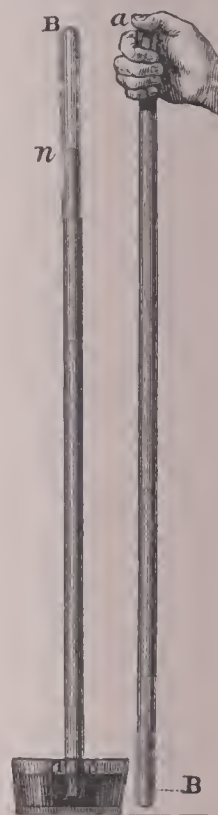


FIG. 1.

ments the index is a ring or thimble surrounding the tube entirely.

The height of the column must be measured from the surface of the mercury in the basin; but the level of this surface itself varies with the rising and falling of the column in the tube. To provide against error from this cause, the whole scale is in some barometers made movable, and is raised or depressed, as may be necessary, by means of a thumb-screw, before observation. An ivory point directed downward from a short projecting arm carried by the scale is brought so as exactly to meet its image reflected in the mercury of the basin, and this indicates that the zero of the scale is in its true position. In other instruments, and generally in those in common use, the adjustment is made by raising or depressing the level of the mercury itself while the scale remains fixed. Instead of the ivory point, an ivory float is sometimes used, carrying an upright stem on which is a fiducial mark designed to be brought, in the adjustment, into coincidence with a similar fixed mark.

In tubes of small bore the mercurial column does not reach the full height due to the pressure, owing to the effect of CAPILLARY ACTION (*q. v.*). A small correction is therefore necessary on this account, which depends on the diameter of the tube. With tubes of large dimensions this effect is insensible; and it may in any case be completely eliminated by giving to the barometer the form shown in Fig. 2, called a siphon barometer, in which the basin is dispensed with, and the tube is bent upward at the bottom, the recurved part serving as a substitute for the basin. In this form of the instrument, if the bore be uniform throughout, every fluctuation of pressure occasions equal and opposite movements of the two surfaces of mercury; and the reading on a fixed scale will change only half as much as in the common instrument. The whole scale should therefore be movable; or if a fixed scale only be used, the divisions should be made of only half their nominal magnitude. Barometric indications of fluctuating atmospheric pressure are sometimes magnified by transforming the vertical movements of the mercurial column into rotary movements of a long index upon a dial. The siphon barometer presents a convenient means of doing this. A float introduced into the open short arm of the siphon, and connected by a silk thread with a small pulley on the axis of the index, will render conspicuous even a very minute change in the altitude of the column. The uncertain action of this apparatus, however, owing to friction and other causes, is such as to deprive it of any scientific value.

The form of barometer now most generally approved, constructed originally by Fortin, of Paris, and since adopted by Casella, Beck, and others of London, and by James Green, of New York, who has made in it important improvements, is shown in Fig. 3. In this the glass tube is entirely surrounded by a protecting tube of brass, somewhat

enlarged at the top, for convenience in applying a scale and vernier, and having a vertical opening at the same part to allow the summit of the mercurial column to be seen. The cistern at the bottom, which is of boxwood except the upper portion, which is a short glass cylinder, is similarly protected—the glass portion, however, being uncovered, in order to allow the surfaces of the mercury in the cistern to be visible. The cistern has a bottom of flexible leather, which rests on a broad disk of metal supported by a vertical screw, of which the milled head is represented in the figure below the instrument. By turning this screw the level of the mercury in the cistern is brought to the true zero of the scale, indicated by a fixed fiducial point of steel or ivory seen within the cistern.

Since the barometer measures the pressure of the atmosphere, and since this pressure is simply the weight of a vertical column of the aerial ocean above the level of the place of observation, it follows that, if we carry the instrument from a lower to a higher level, the barometric column will fall. One of the most important uses of the barometer, therefore, is as a means of determining heights. (See *HYPSOMETRY.*) But a barometer intended for this purpose, or a so-called "mountain barometer," must have a construction in a number of respects differing from the barometer in common use. It must have, of course, a much larger range of scale, and especial care must be taken to guard it against the danger of fracture in transportation. If it is a cistern barometer, the cistern should be air-tight, and should have no communication with the atmosphere, except through an aperture which may be stopped by a closely fitting screw or cock; and the adjusting screw at the bottom should have so large a range of movement as to allow all the air of the cistern to be expelled by raising the leather bottom, so that the cistern and tube may be both entirely filled with the mercury. The danger of fracture from the oscillations of this dense liquid may thus be avoided. The best mercurial mountain barometer, however, is the siphon barometer of Gay-Lussac, shown in Fig. 4, *a*, without its scale or mounting. In this instrument a tube bent in the manner shown, and closed at both ends, has two straight portions, of small but equal bore, connected by an intermediate portion so much smaller that when, after being filled with mercury, it is reversed, as shown in Fig. 4, *b*, the mercury will be held in the bend by capillarity. The only communication with the air is by the aperture *o*, which is so small that any drops of mercury which may fall into the short arm from the bend, when the instrument is reversed, can not escape. The design, however, is to have no excess of mercury beyond what will be held by capillarity in the position *b*. This tube is suitably supported throughout its whole length, and protected by a surrounding tube of brass. The zero of its scale is at the middle of the length, and it reads from this zero both upward and downward. The readings are taken at both surfaces of the mercury, and their sum gives the true barometric height. The scale is usually inscribed on the tube itself. In transporting the instrument it is carried in the inverted position, where the mercury, filling the whole tube, is necessarily prevented from oscillating. It is usually carried by the mountaineer in a leather case swung over his back, and when set up for observation is suspended in gimbals, supported by a tripod.

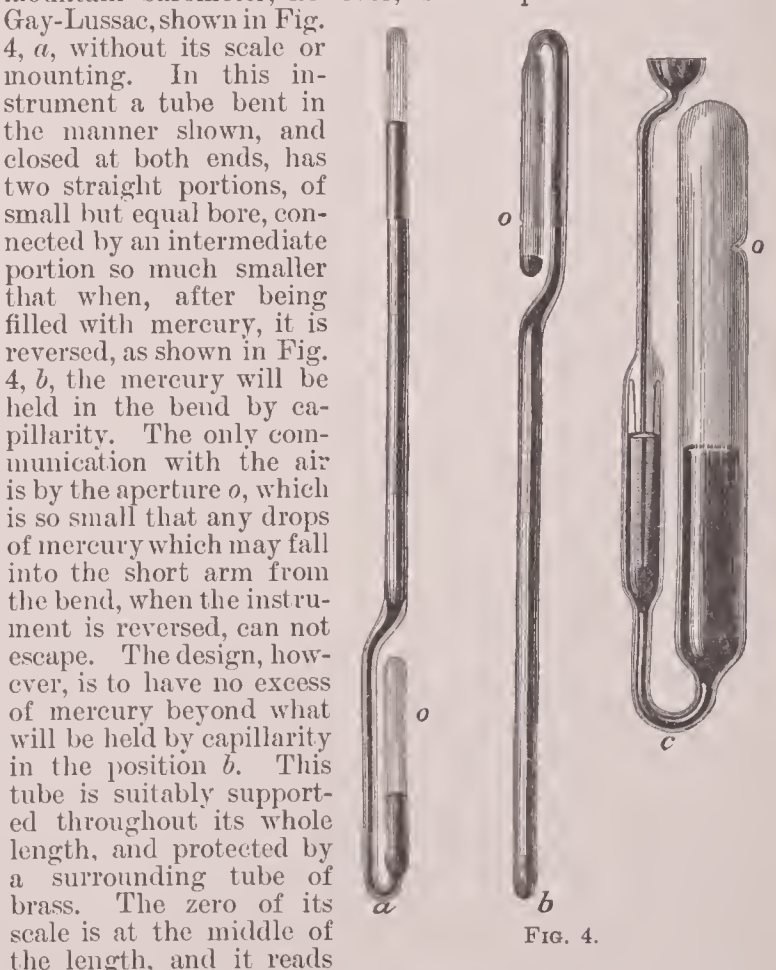


FIG. 4.



FIG. 2.

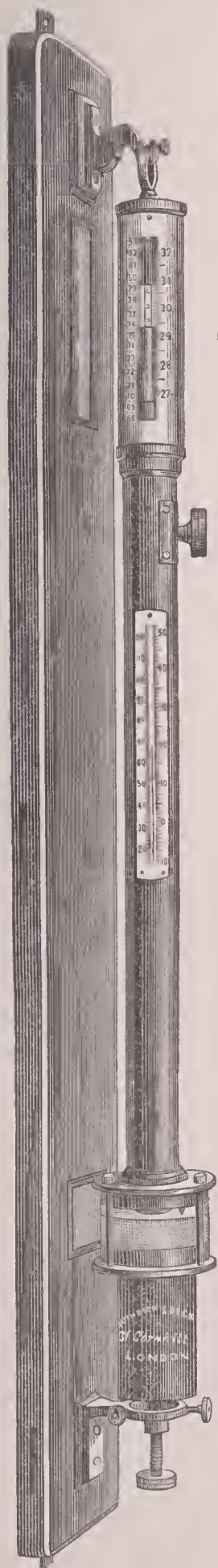


FIG. 3.

When a barometer of this kind is carried from place to place, subject to occasional jars and concussions, sometimes perhaps in a horizontal position, there is a possibility that

minute portions of air may now and then intrude into the tube, between the mercury and the glass. An effectual contrivance for preventing these from making their way into the Torricellian vacuum was devised by M. Buntzen, which is represented in Fig. 4, *c*. The capillary part of the tube is divided; the extremity of the upper portion is drawn out to a minute orifice; that of the lower is widened, so as to form a globular or cylindrical chamber contracted at the mouth; and then the two are united again by fusion in the manner shown in the figure. Any air which may make its way into the tube from below is caught in this chamber, and afterward, when the instrument is inverted for transportation, it escapes by the way it entered. The invention evinces a high degree of ingenuity.

When scientific accuracy is necessary in barometric observations, all mercurial barometers require that their readings should be corrected for temperature. According to Regnault, the absolute dilatation of mercury between 0° and 100° C. = 32° and 212° F., is 0.01813, or about $\frac{1}{55}$ th of its bulk. This corresponds to $\frac{1}{9916}$ th of the bulk for each degree of Fahrenheit's thermometer, which would be equal, for the mean column of 30 inches, to an increase of altitude of about $\frac{1}{330}$ ths, or $\frac{1}{330}$ th per degree. Assuming the height at 32° F., therefore, to be the normal height, the reading at 54° F. will be $\frac{2}{330}$ ths, or $\frac{1}{165}$ th inch too great; at 76° F., or so-called "summer-heat," $\frac{4}{330}$ ths, or $\frac{1}{82}$ th inch too great; and at 98° F., $\frac{6}{330}$ ths, or 0.2 inch too great. The correction for any temperature may be made by calculation from the data here given; but it is more convenient to be provided with a table which has been calculated in advance for all the temperatures to which the observation is likely to extend.

The process of filling the mercurial barometer is one which requires great care. In pouring mercury into a long and narrow tube it is almost impossible to avoid introducing along with it some bubbles of air, which adhere with tenacity to the sides of the tube, but which, after the tube is inverted, gradually find their way into the space above the column and vitiate the vacuum. These may be expelled by boiling the mercury in the tube before inversion, when they will be carried off with the vapor. The operation is attended with some danger to the tube, the boiling-point of mercury being about 360° C., and the concussions of the heavy column in ebullition violent. It is expedient, therefore, to introduce at first only a small quantity, and after boiling that to add more, and so proceed till the tube is filled, always applying the heat at a point but a few inches below the top of the column. Mr. Green, however, recommends filling the tube completely before beginning the operation, then boiling downward from the top, and finally upward from the bottom.

It is of the highest importance that the mercury used in barometers should be quite pure. To be entirely safe on this score, the metal should be distilled before using. The effect of the presence of impurities is to diminish the specific gravity of the fluid, and therefore to make its indications uncertain; but it is also to tarnish the tube, and to render observation after a time difficult or impossible.

Other fluids besides mercury may, of course, be employed in the construction of barometers, but the height of the column will in every case be greater in proportion as the specific gravity of the liquid is less. Water, for example, requires a column of 34 feet, mean height. Very few water barometers have ever been constructed. The first of the kind was erected by Otto Guericke, the inventor of the air-pump, in his house at Magdeburg. The upper portion of the tube only, to an extent of about 6 feet, was of glass, and this was but partially exposed to view, the rest being concealed behind the woodwork of the apartment. Floating on the top of the liquid the inventor had introduced a diminutive figure of a man, which, with the rising of the column in fair weather, presented itself to view, but with the approach of foul weather retreated out of sight. On the other hand, the fluctuations of height of the water column are proportionally large, and serve to render conspicuous slight changes of pressure, which, in the mercurial barometer, are nearly or quite imperceptible. It is an objection, however, to the water barometer that its indications are largely affected by the vapor from the liquid which occupies the space above the column, and that the error thus arising varies with the temperature. Thus at 70° F. the column is depressed by this cause 10 inches; at 80° F., 14 inches; and at 90° F., nearly 20 inches; while even at 32° F., the freezing-point, below which the water barometer is unavailable, the depres-

sion from the same cause is no less than $2\frac{1}{2}$ inches. There are water barometers in the rooms of the Royal Society of London, and in the theater of the natural philosophy class in the University of Edinburgh. About the middle of the nineteenth century a barometer of large dimensions, in which the fluid used was sulphuric acid, was set up at the Smithsonian Institution in Washington by James Green, of New York, under the direction of Prof. Henry. This liquid is free from the objection of forming vapor in the Torricellian void; and owing to its large specific gravity a column of it less than 20 feet high suffices to balance the mean atmospheric pressure. Such, however, is the avidity with which this acid absorbs watery vapor that its exposed surface must be in some manner protected from direct contact with the atmosphere. The protection used in this case was a balloon of india-rubber firmly secured to the short arm of the siphon barometric tube. But, though moisture was thus excluded, air was found to make its way gradually into the void above the column, and the instrument was finally disused and taken down.

A description of barometer known as the aneroid barometer, employing no liquid, has come extensively into use. It is the invention of M. Vidi, a physicist of France.

The instrument itself consists essentially of a flat cylindrical box formed of thin corrugated metal, from the interior of which the air has been nearly exhausted; the immediate effect being to bring the top and bottom into contact with each other by atmospheric pressure. The touching surfaces are then separated by means of a strong spring at-

tached to the center of the upper surface, while the lower is held down, the whole being placed within a larger box properly adapted to receive it. With the varying pressure of the atmosphere the separation of the surfaces is greater or less, or the spring is more or less bent, and the movements thus occasioned are transmitted by proper multiplying-apparatus to an index which traverses a

dial like that of a watch (Fig. 5). Aneroid barometers often perform very well, and perform well for long periods; but in time the spring is liable to lose its elasticity, so as to render the indications untrustworthy. These instruments should therefore be occasionally compared with standard mercurial barometers. They are very convenient for transportation, being constructed of various dimensions, from 8 or 10 inches in external diameter down to 2, and are often graduated to serve as mountain barometers for heights as great as 12,000 or 16,000 feet.

Another form of barometer without liquid, and in external appearance resembling the aneroid, is Bourdon's metallic barometer, improved by M. Richard, of Paris. In this, a broad and nearly flat tube of thin metal, bent into the form of a horseshoe, having been exhausted of

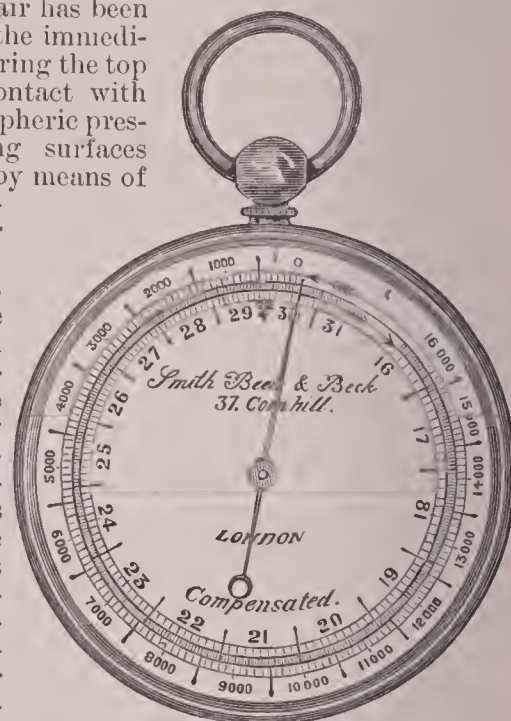


FIG. 5.—Aneroid mountain barometer.



FIG. 6.

air, is secured by the middle part of the box inclosing it, while the ends left free are connected by delicate chains or wires with the apparatus controlling the index (Fig. 6). The effect of increased atmospheric pressure upon an exhausted tube of this form is to bring the extremities nearer together, and that of diminished pressure to cause them to recede; and these changes are shown by the index on the dial.

Long-continued observations of the barometer have demonstrated that there are certain fluctuations of atmospheric pressure which are periodical and regular, though not large; while such as are noticeable for their magnitude are subject to no obvious law. Of periodical fluctuations there is a semi-diurnal inequality having its maximum at about ten o'clock morning and afternoon, and its minimum at four, afternoon and morning. Its magnitude varies with the latitude, being greatest (0.104 inch) at the equator. In lat. 40° it is 0.05 inch, and in lat. 70° only 0.003 inch. There is also an inequality dependent on the seasons, which in some parts of the earth is large, and in others almost or quite imperceptible. Where it is noticed, the highest reading occurs in January, and the lowest in July, or a little later. At Peking, in China, the mean pressure for the first of these months is three-fourths of an inch greater than that for the second. A large part of Asia is similarly affected. At Havana the fluctuation is hardly a quarter of an inch, the minimum seems not to be reached before the month of August, and the decline of the monthly means is not regular. At Boston and at London the monthly means throughout the year scarcely differ from each other by the tenth of an inch, and an annual inequality can hardly be said to exist. The position of the moon seems to have a slight influence on atmospheric pressure, but this, even where most observable, is little more than half a hundredth of an inch.

The non-periodic fluctuations of pressure are very much greater than the periodic. If we call the difference between the greatest and least readings of the barometer within any month the *monthly oscillation*, and combine the observations of many years for the same month, we shall obtain the mean monthly oscillation. This is least near the equator, and increases toward the poles. At the equator it hardly exceeds 0.1 inch; in lat. 30° it is 0.4 inch; in lat. 45°, over the Atlantic, it is 1 inch; in lat. 65° it is 1½ inches. During the three winter months the mean is about one-third greater. On the continents bordering the Atlantic the means are usually less than over the intervening ocean. The *extreme* fluctuations of the barometer, however, very much exceed these means. In Boston the greatest height observed in thirty-seven years is 31.125 inches, and the least, 28.47 inches—difference, 2.655 inches. The greatest observed range at London is 3 inches; at St. Petersburg, 3.5 inches. Within the tropics the range is small. At Christiansborg, near the equator, the greatest range observed in five years was 0.47. Loomis's *Meteorology*.

The barometer is often spoken of as a weather-glass; and the scale of the instrument is often inscribed with words indicative of the weather which may be expected when the head of the column stands opposite them. This is, however, apt to convey very erroneous notions; for neither the actual nor the approaching weather can be correctly inferred from a knowledge of only a single one of the conditions which determine meteorological phenomena. The indications of the thermometer, the anemometer, and the hygrometer, and the progressive changes denoted by those instruments, are quite as important to the prediction of the weather as those of the barometer. Moreover, the prognostications derived from these instruments which would be justified in one part of the world would not be at all so in another where the physical conditions are different. One remark, however, is true generally. Inasmuch as there can be no considerable change in the condition of the atmosphere as to heat or moisture or movement which is not accompanied or immediately preceded or followed by a change of pressure, therefore when the barometer continues steady, whether it be high or low, the actual state of the weather, whatever it may be, is likely to last. It may be added that a rapid movement of the barometer upward or downward, say three-fourths of an inch in twenty-four hours, is of unfavorable augury. Also that a very rapid fall will probably be followed by a violent wind. A slow movement upward gives assurance generally of fair weather.

While observation enables us thus, in some manner, to connect the fluctuations of the barometer with the varying conditions or aspects of the weather, it is not easy in all cases to assign satisfactory causes for the fluctuations them-

selves. The low state of the column which is commonly observed to accompany the formation of heavy clouds and the fall of rain or snow shows that the popular language, which speaks of the atmosphere at such times as "heavy," is scientifically incorrect. Many hypotheses, among them some which, in the present state of science, would be pronounced absurd on the face of them, have been proposed to account for the phenomena; but the true reason of at least the more conspicuous variations of atmospheric pressure must be looked for in rarefaction by heat, of which the ultimate source is the sun. Different portions of the earth's surface become unequally heated by the solar radiation. The heat thus acquired is imparted by the earth to the atmosphere above it, of which the portions most heated are also most dilated, and, in consequence of their diminished specific gravity, tend to rise. In rising they are further dilated by diminished pressure, and their temperature consequently falls until their contained vapor is condensed to cloud, with evolution of its latent heat. The heat evolved increases the rarefaction, and the upward movement continues. The rarefied column is not changed in weight by the mere fact of its rarefaction; but as its altitude is increased it necessarily overflows at top upon the surrounding air, of which the pressure is thus augmented, while its own is correspondingly diminished. As a necessary consequence, the barometer below it falls; and as rain naturally follows the precipitation of vapor, the rain-area will usually be found to correspond with the area of low barometer. Of periodical oscillations, the diurnal are in like manner traceable to heat. Those of longer period depend on causes less easy to ascertain.

For fuller information as to the barometer and its uses, see *Smithsonian Miscellaneous Collections*, vol. i., p. 693, by Prof. Guyot and J. W. C. Coffin (1862); also *Manual of the Barometer*, by J. W. Belville (London, 1849); also the *Smithsonian Annual Reports* of the years 1855, 1856, 1859, and 1867. The report of 1856 has a detailed description of the construction of Green's standard barometer; that of 1867 contains an important memoir by Marshal Vaillant on the horary variations. Loomis's *Meteorology* and Reid's *Law of Storms* may also be consulted with advantage. See also **GAS**.

Revised by E. L. NICHOLS.

Barometric Light: See **ELECTRIC DISCHARGE**.

Bar'ometz, sometimes called **Tartarian** (or **Scythian**) **Lamb**: the prostrate stem (rhizome) of a fern (*Aspidium barometz*) which grows in salt plains near the Caspian Sea. It is covered with a shaggy, silky down, and has some resemblance to an animal. It was anciently believed to be half plant, half animal. It was also known as **baranetz**.

Baron: the title of the lowest degree of hereditary peers in Great Britain and Ireland; is the next below that of viscount. The word was formerly used to include the whole English nobility, because all noblemen were barons. The distinction between the greater and lesser barons seems to have been made at an early period in most of the countries of Europe. The greater barons, who were the king's chief tenants, held their lands directly, or *in capite*, of the crown; while the lesser held of the greater by the tenure of military service. The greater barons had a perpetual summons to attend the parliament or great councils of the nation. The practice of conferring the rank of baron by letters-patent, and as a mere title of honor apart from the possession of land, originated in 1387. Barons are sometimes created by writ, but this mode is nearly obsolete, and creation by patent is the surest way of insuring the hereditary character of the peerage. On great occasions a baron wears a coronet adorned with six pearls set at equal distances on the chaplet. He is addressed as "my lord" or "your lordship," and is styled "right honorable." In France and Germany and in many other countries a baron is a nobleman next in rank to a count. Formerly in Scotland a baron was not necessarily a nobleman, but was a holder of land in what was called baronial right. There are at present several classes of barons: (1) barons of England; (2) barons of Great Britain; (3) barons of the United Kingdom (all the members of these classes have seats in the House of Lords); (4) barons of Scotland; and (5) barons of Ireland; the members of the two latter classes have no seat in the House of Lords unless chosen as representative peers. The life peerage, rarely conferred, does not entitle to a seat in the House of Lords. Certain judges of the exchequer courts of England and Ireland are called barons of the exchequer.

Baron, baä'rōn', originally **Boyron**. **MICHAEL**: French actor; b. in Paris, Oct. 8, 1653. His father, a leather-mer-

chant, having fallen in love with a very beautiful traveling actress, left his business and entered the same troupe. The actress became the mother of Michael Baron. Going to Paris in after years, Michael, a very handsome young man, attracted the attention of the great Molière, who became his friend and instructor. Baron rose rapidly to the first rank of his profession, and was as eminent in tragedy as in comedy. He was with justice called "the honor and the marvel of the French stage." As a writer of plays he was very prolific. His beauty and talents caused his name to be mixed up with much of the gross scandal of the time. His personal vanity was very great. He used to say, "Every century might produce a Caesar, but it took ten thousand years to produce one Baron." It is commonly reported that he died upon the stage, but in reality, though stricken with apoplexy on the stage, he lived after that event more than two months. D. in Paris, Dec. 3, 1729. Revised by B. B. VALLENTINE.

Baron, PIERRE, called **Peter Baro**: b. in Étampes, France, Dec., 1534; became a Protestant, and escaped to England in Queen Elizabeth's time. In 1574 he was appointed Lady Margaret Professor of Divinity at Cambridge, an office which he held till 1596, notwithstanding the strong opposition which his doctrinal teachings encountered. He was an opponent of Calvinism, then strongly maintained at the university and by the Archbishop of Canterbury—Dr. John Whitgift. Baron was therefore subject to many vexatious annoyances, and was openly accused of heresy and of endeavoring to carry the university back to Romanism. He held to his course with great persistency, and even had the courage to preach against the famous Lambeth Articles, which had been drawn up to oppose him and his party. He was consequently forbidden to engage in polemics, and was made so uncomfortable that he was obliged to resign his position (1596) and retire to London, where he died, April, 1599, leaving a number of Latin treatises, since published in English.

Baronet [dimin. of baron]: a title of honor which is hereditary. A baronet is next lower than a baron, compared with whom, however, he is very inferior in rank. Baronets were first created in 1611 by James I., whose object was to raise money especially for the reduction of Ulster, but the money went mostly into the king's purse. The creation of baronets is limited only by the will of the sovereign, who confers the rank either by patent or by writ. A baronet is entitled to the prefix *Sir* to his name, and has precedence of all knights except bannerets, knights of the Garter, and privy councilors. Baronets are of four classes—those of Ulster, England, Nova Scotia (or Scotland), and the United Kingdom. James, having promised not to create more than 200 baronets in England, extended the title to Nova Scotia to raise money for its reduction, and this is the origin of the Scotch baronets. Sir William Alexander (Earl of Stirling) was the first American baronet. This process in Nova Scotia stopped in 1629, when the province was sold to France. No baronets of Scotland have been created since 1799.

Baro'nus, CESAR: Roman Catholic Church historian; b. in Sora, near Naples, Oct. 30, 1538; was a disciple of St. Philip of Neri. He became cardinal (1596), and librarian of the Vatican (1597). His celebrated *Ecclesiastical Annals* from the birth of Christ to 1198 A. D. (Rome, 1588-93, 12 vols. fol.; Antwerp, 1589-1603; Mayence, 1601-05, rev. ed.) was the result of twenty-seven years' labor. The annals of Baronius are continued by Reynolds to 1565, by Caderchi to 1571, and by Theiner to 1584 (in 1856). In 1864 Theiner began a new edition of the annals, but died suddenly in 1874. Baronius was a brilliant dialectician and stylist, but has been charged with many blunders, owing to his ignorance of Greek. Notwithstanding these errors and his strong partisan spirit, his *Annals* are conceded to possess very great learning and value. They were written in reply to the *Magdeburg Centuries*. He published a number of other works, characterized by the same faults and the same great learning as marked his *Annals*. D. in Rome, June 30, 1607.

Barony: the rank, title, or dignity of a baron; the territory or jurisdiction within which a baron exercises his lordship; specifically, the territory over which a court baron has jurisdiction, the court baron originally being a court in which the free tenants, or the freeholders, of a manor were the judges, and the steward of the manor the registrar. It anciently had jurisdiction in suits concerning lands held in the manor, and some other matters; but such courts are now rarely held, except with regard to certain fines, heriots, etc.

Barozzo, bāā-rod'zō, or **Barocchio**, bāā-rot'chi-ō, JACOPO: an illustrious Italian architect; b. at Vignola, near Modena, Oct. 1, 1507, from which fact he is often called VIGNOLA. He studied painting at Bologna, but was so fascinated by the study of perspective that he abandoned painting for architecture, in which art he attained a great reputation. He was employed by an association of antiquaries in Rome to take measurements and execute models of the remains of the ancient statuary of Rome. These models were afterward cast in bronze. In 1541 he went to Paris to superintend the casting of his copies, and while there was engaged in architectural pursuits. In 1550 he became architect to Pope Julius III. He designed the splendid palace of Cardinal Farnese (Caprarola), in which were placed some of his own pictures. He was engaged upon this work from 1555 to 1573. Meanwhile, upon the death of Michael Angelo in 1564, he succeeded the latter as architect of St. Peter's church. He published several valuable works on architecture, among which the best known is *Regole de' cinque ordini d'architettura* (1563), illustrated by engravings. This was long the standard authority in classic architecture. He was one of the designers of the Escorial Palace in Spain. D. in Rome, July 7, 1573.

Barquisimeto, bāā-keē-sē-may'tō: a city of Venezuela; capital of the state of Lara; on a branch of the river Portuguesa, a part of the Orinoco system (see map of South America, ref. 1-C). It is the fourth city in size in the republic. It was almost destroyed by an earthquake in 1812, previous to which it had about 15,000 inhabitants. It has a college, and is situated in a fertile and well-cultivated district. Pop. 32,000.

Barr: a town of Lower Alsace, Germany; 23½ miles by rail S. W. of Strassburg; situated on the east slope of the Vosges, at the mouth of the Uhlrichthal (see map of German Empire, ref. 7-D); has numerous vineyards, distilleries, manufactures of leather, arms, etc., and three annual fairs. Pop. (1890) 5,674.

Barr, AMELIA EDITH (Huddleston): Anglo-American novelist; b. at Ulverstone, Lancashire, England, Mar. 29, 1831; married Robert Barr in 1850, and has resided in the U. S. since 1854, first in Texas and afterward (1869) in New York State. Her husband died in 1867. Among her novels, which are largely historical, are *Romance and Reality* (New York, 1872); *Young People of Shakespeare's Time* (1882); *The Hallam Succession* (1884); *Jan Vedder's Wife* (1885); *A Daughter of Fife* (1886); *A Bow of Orange Ribbon* (1886); *Friend Olivia* (1891); *Beads of Tasmer* (1891); *Sister to Esau* and *A Rose of a Hundred Leaves* (1892). Scotch, north of England, and Dutch New York tales, with a plot of religious persecution, are her finest fields of invention.

HENRY A. BEERS.

Barrackpur, bār-rak-poor': a town and military cantonment of British India; on the left (or east) bank of the Hugli; about 15 miles above Calcutta (see map of N. India, ref. 8-I). It contains the country residence of the Governor-General of India, and many elegant mansions of the European citizens of Calcutta, who are attracted by the salubrity of the place. The adjacent country is covered with beautiful forests and a luxuriant tropical vegetation. Here is a noble park of 250 acres, which exhibits an admirable specimen of landscape-gardening. Barrackpur was called the cradle of the Sepoy mutiny (*q. v.*) of 1857. Several regiments of native troops were stationed here. They objected to biting off the ends of the cartridges for the Enfield rifle, believing the paper to be polluted with animal fat. A Sepoy named Mungal Pandey wounded an officer in Feb., 1857, whose blood was the first that was shed by the mutineers. Pop. (1891) 57,330.

Barracks: buildings for the habitation of troops. The word is sometimes applied to any collection of buildings densely occupied by human beings.

The experience of the civil war in the U. S. has demonstrated that ventilation, abundance of pure air, is more important to the health of man than complete protection from extremes of cold and heat. While soldiers camped in small and crowded tents, kept closed to exclude the cold, suffered from typhoid fever, the sick and wounded in hospital tents and in the light and open wooden barracks established as general hospitals, recovered more rapidly and certainly than those in what are called better buildings, closer and more substantial.

There are few large masonry barracks in the U. S., such

as are found on the continent of Europe in almost every large town. Most of the military posts are beyond the frontier which separates the country of civilization and cultivation from the region occupied, or rather traversed, by the nomadic Indian tribes, and the scarcely less nomadic white miner and hunter. A very few of these posts built on the open prairies, where timber is scarce and costly, have been constructed of stone or brick; some are of sun-dried bricks, called *adobes* by the Mexicans, and within recent years a few have been reconstructed in a more permanent manner. But the greater part of them are of wood—log houses in the timbered country, light frames covered with boards in the prairies. The open joints of the board wall-coverings and roofs and floors make it impossible to exclude fresh air, and they insure a circulation of air, notwithstanding the efforts of the occupants of the building to close all ventilating openings.

The principal and more permanent barracks of the U. S. are Madison barracks, Sackett's Harbor, N. Y.; Jackson barracks, New Orleans, La.; Jefferson barracks, St. Louis, Mo.; and Columbus barracks, Ohio, now used as recruiting dépôts; Fort Sheridan, Ill.; Mt. Vernon barracks, Mississippi; Benicia barracks, California; Vancouver barracks, Washington; Omaha barracks, Omaha; Fort Leavenworth, Kansas; Newport barracks, Kentucky; Presidio of San Francisco, Cal.; Ringgold barracks and Fort Brown, on the Rio Grande, Tex.; and Plattsburg barracks, Lake Champlain. In the official list published in the *Army Register* there are 140 military posts, including 19 arsenals, ordnance, and powder dépôts, 3 recruiting dépôts, and 1 engineer dépôt, at all of which there are barracks either owned or rented by the U. S.

At most of the U. S. navy-yards there are barracks for the marines, generally of masonry. Among them are the marine barracks of Washington, Charlestown, Brooklyn, Pensacola, and Benicia.

Since the Revolution, Paris has been enriched with very fine buildings as barracks. Those of the Prince Engène, the Napoleon barracks, and the new barracks on the Île de la Cité, are noble and beautiful buildings. But it seems impossible to so arrange these great buildings as to secure thorough and satisfactory ventilation. Without fresh air, and disturbed by the movement which must take place night and day among large bodies of men occupying large rooms, these palaces are not believed to have as low rate of mortality as the temporary cheap structures in which the U. S. army lives on the frontier.

There are large barracks in all the great European capitals. Stuttgart, St. Petersburg, Paris, Naples, Rome, are noted for the beauty and extent of their barracks. The Museo Borbonico at Naples was built for a cavalry barrack; in it are now collected the many remains of Roman and Greek art unearthed at Pompeii and Herculaneum.

The Romans, who conquered the known world and held it by military occupation, built strong barracks wherever they established a permanent post. They had no firearms, and a small garrison depended upon the strength of their walls to resist the attacks of barbarians. The remains of such barracks, nearly perfect, have been found of late years at ancient Roman stations in the wilderness of Syria and Palestine. While the Roman legionary was trained and practiced at hard work, he did not hesitate to use in all such constructions the forced labor of his captives of whatever rank or station. Our troops were obliged generally to build their own barracks, but, armed with rifles of long range, they depended upon their superior knowledge and discipline, and seldom fought the savages from behind their barrack-walls.

There are two uses to which barracks are put: one is protection during a siege and bombardment from the missiles of the enemy; the other, and far more constant use, is protection mainly from the weather.

Many of the seacoast forts of the U. S. make ample provision in vaulted casemates for the garrison during a siege, but such barracks in the climate of the coasts of the U. S. should never be occupied in time of peace. They are dark, damp, ill-ventilated, and unhealthy, and provision should be made for shelter outside the ramparts for the peace garrison in all cases. In the climate of Spain and Italy, of the West Indies, and of Mexico, it is probable that the custom of the tropics of living in rooms roofed with earth or masonry has not such disadvantages as farther north.

European practice allows from 420 to 1,200 cubic feet of space per man in barracks and hospitals; and the latter is

better than the former; but in practice the air-space is limited by the appropriations which the government grants. Thorough drainage of the buildings and of the sites is essential to health. Temporary cantonments should never remain long in one place. The troops should remove to fresh ground, and the old site should not be reoccupied until time and frost have thoroughly destroyed the effete animal and vegetable matter which collects about any large body of men.

All barracks are liable, on any temporary increase of the garrison, to overcrowding. In well-built houses each man should have at least 800 cubic feet of air-space, and in hospitals at least 2,000. In a room intended to be occupied by thirty men, at least 60,000 cubic feet of fresh air per hour should be admitted from the outside, and as much more as can be borne without inconvenience, a safe rule being that each man should have one cubic foot of fresh air per second. But all ventilating arrangements are liable to be obstructed by those for whose benefit they are intended, unless made on the most extensive and elaborate scale, and placed entirely beyond their control. A man feels the cold sensation from a draught more distinctly than the headache or oppression resulting from a close and impure atmosphere. He knows that if he stops the ventilating inlet near him he will get rid of the draught. He does not realize that at a future time his health may break down as a consequence of this interference. Practically, therefore, the most efficient barrack ventilation, except in the palaces of masonry built in Europe and ventilated by steam-power, is that inseparable from the imperfect construction of the building itself. These defects, beyond the skill and power of the soldier to remedy, save his health by supplying him continually with fresh air against his will.

The War Department has of late years adopted an iron barrack-bunk to be occupied by a single man, which gives space for circulation of air, and has abolished the use of the two-story double wooden bunks in which soldiers formerly slept.

BOOKS OF REFERENCE.—*Reports of the British Barrack Commission* (London, 1861); *Circulars Nos. 3 and 4 of the Surgeon-General of the United States; Reports on Barracks and Hospitals; Outline Description of Military Posts and Stations*, published in 1871 by the quartermaster's department. Revised by JAS. MERCUR.

Barraenda, bār-ra-koo'da, or **Barracouta** [native name]: a fish of the family *Sphyrænidæ*, notably *Sphyræna picuda*, *S. sphyræna*, and *S. argentea*, which are long, slender, very voracious fishes of the West Indian and other warm seas, highly valued as food.

Barrande, bār'raānd', JOAQUIM: eminent French palæontologist; b. at Sangués, Haute-Loire, France, Aug. 11, 1799. D. near Vienna, Austria, Oct. 5, 1883. His great work, *Système silurien du centre de la Bohême*, occupying nearly 6,000 quarto pages, is one of the most important single treatises on Palæozoic fossils. His *Theory of Colonies*, devised to explain the sporadic occurrence of fossil species or groups of species in formations older or younger than that of which they are characteristic, was an important contribution to the philosophy of geologic correlation. See PALEONTOLOGY. G. K. G.

Barrantes y Moreno, bār-raan'tāy-sē-mō-ray'nō, VICENTE: a Spanish poet and publicist; b. at Badajoz in Extremadura, Mar. 24, 1829. In 1848 he went to Madrid, and in 1850 he became a writer for the journals *La Ilustración* and *Las Novedades*. In 1851 appeared his novel *Siempre tarde*, which attracted general attention. His *début* as poet was soon after made with his *Baladas Españolas*. From 1851 he engaged also in politics, and his satiric articles entitled *Píldoras* brought a heavy fine upon him for their audacity. In 1859 he abandoned the Liberals and joined the New Catholic Conservatives—a change already prefigured in his novel *Juan de Padilla* (1855), in which he attempted to rehabilitate the old Spanish ideals of life and government. In 1866 he was made secretary to the Government for the Philippine islands, and in 1872 he became a member of the Spanish Academy. Among his works are: *La Joven España* (1854); *Narraciones extremeñas* (1872-73); *Viaje á los infiernos del sufragio universal*, etc. (1873); *Diccionario biográfico de hombres célebres extremeños*.

A. R. MARSII.

Barras, bār'raa', PAUL FRANÇOIS JEAN NICOLAS, Count de: a French Jacobin and regicide; b. at Fox-Amphoux, in Provence, June 30, 1755. He was chosen a deputy to the

States-General in 1789, and a member of the National Convention in 1792. He acted with the party called the Mountain, voted for the death of the king, and joined the enemies of Robespierre on the 9th Thermidor, 1794, in which crisis he was commander of the national guard. On the 13th Vendémiaire (Oct. 5, 1795) he was again appointed commander of the troops by the Convention. With the aid of Bonaparte he defeated the royalist insurgents of Paris on that day. He was one of the first five members of the Directory appointed in Nov., 1795, and acted a prominent part in the conflict of the 18th Fructidor (Sept. 4, 1797), after which he was perhaps the most powerful of the Directors. He was venal and dissolute, and abused his power. His political career was ended by the ascendancy of Bonaparte in 1799. D. in Paris, Jan. 29, 1829. See Thiers, *History of the French Revolution*; C. Doris, *Amours et Aventures du Vicomte de Barras* (4 vols., 1816).

Bar'ratry [from O. Fr. deriv. of *barat*, fraud; etym. obscure]: any distinct, unlawful, or dishonest act committed by the master or mariners of a vessel, tending to their own benefit and to the injury of the owner of the vessel. A mutiny of the crew, and forcible dispossession by them of the officers from the ship, would be a form of barratry.

HENRY WADE ROGERS.

Bar're: a village (and township); on B. and M. R. R. and on Ware river, Worcester co., Mass. (for location of county, see map of Massachusetts, ref. 3-F); 21 miles N. W. of Worcester; has an institute for feeble-minded children, and cotton, woolen, and straw factories. It was named in honor of Col. Isaac Barré. Pop. of township (1880) 2,419; (1890) 2,239; (1900) 2,059.

Barre: city (chartered 1894); Washington co., Vt. (for location of county, see map of Vermont, ref. 4-C); on railroad, 6 miles S. E. of Montpelier. It is the seat of Goddard Seminary, and has four churches; is the center of a large granite industry, and has manufactures of agricultural tools and castings. Pop. of village (1890) 4,146; (1900) 8,448.

EDITOR OF "ENTERPRISE."

Barre, baar, ANTOINE JOSEPH LE FÈVRE, de la: French naval officer; b. about 1625; Governor of Guiana in 1663; retook Cayenne from the Dutch in 1667; was made lieutenant-general in 1667, and was Governor of Canada 1682-85. D. in France, May 4, 1688.

Barré, baar-ray', Col. ISAAC: b. in Dublin, Ireland, in 1726, of French parents; entered the British army, where he served with great distinction, receiving a wound at Wolfe's victory at Quebec (1759), in consequence of which he ultimately became blind. He entered the British Parliament in 1761, where for years he nobly defended the rights of the American colonists. D. in London, July 20, 1802.

Barred-owl: a species of owl (*Syrnium nebulosum*) found in Eastern North America. The noisiest of our owls, but rather mild in temper.

Barrèges, baar'rezh', or **Barèges**: a celebrated watering-place of France; department of Hautes-Pyrénées, 23 miles S. of Tarbes (see map of France, ref. 9-D); 3,240 feet above the level of the sea. Here are warm sulphurous springs having a temperature of about 104° to 122° F., which are esteemed efficacious in cases of scrofula, gout, etc.

Barrel: a large wooden vessel for holding liquids or solids; bound with hoops, and formed of staves, which are wider in the middle than at the ends, and have beveled edges, which render the joints tight. Each end of the barrel is closed by a circular head. The arched arrangement of the staves enables it to resist pressure from without. The term is also applied to the quantity contained by a barrel, which varies for different substances. A barrel of flour in the U. S. is equal to 196 lb., and a barrel of pork or beef contains 200 lb. In wine measure, 31½ gal. make a barrel. A barrel of beer in England is equal to 36½ imperial gal.

Barrett, BENJAMIN FISK: Swedenborgian theologian; b. in Dresden, Me., June 24, 1808; educated at Bowdoin College (1832) and Harvard Divinity School (1838); adopted Swedenborgian views and held pastorates of the "New Church" in New York city (1840-48); in Cincinnati till 1850; worked at a trade four years in Chicago to recover his health; settled as a pastor in Philadelphia in 1855, and editor of the *New Church Monthly*; founded the Swedenborgian Publication Society (Philadelphia) in 1885, and presided over it until his death in Germantown, Aug. 6, 1892. Besides many pamphlets and periodical articles, he pub-

lished a *Life of Swedenborg*; *Doctrines of the New Jerusalem Church* (New York, 1842); *New Dispensation and Letters on the Divine Trinity*; *The Golden Reed* (New York, 1855); *Catholicity of the New Church* and *The Visible Church* (1856); *On Future Life* (1872); *The New Church: its Nature and Whereabout*; *Swedenborg and Channing*; and a *New View of Hell* (1872). He edited the *Swedenborg Library* (12 vols., 1876). See his collected works (Philadelphia, 1876).

Barrett, LAWRENCE: actor; b. in Paterson, N. J., Apr. 4, 1838. He first appeared in Detroit in 1853 in *The French Spy*. He played leading parts at the Boston Museum in 1858. At the Winter Garden in New York he acted Othello to Edwin Booth's Iago, and it was considered a most striking performance. He was a captain in a Massachusetts regiment during the civil war. In 1872 he played Cassius to Booth's Brutus. As Lanciotto in *Francesca di Rimini* he made a great success. In 1884 he played in London and was favorably received. Wrote a *Life of Edwin Forrest* (Boston, 1881). D. in New York, Mar. 20, 1891.

Barrett, WILLIAM ALEXANDER: See the Appendix.

Barrhead: a manufacturing town of Renfrewshire, Scotland; 7 miles S. W. of Glasgow (see map of Scotland, ref. 12-F). It has cotton-mills, a machine-shop, print-works, bleaching-works, etc. Pop. 8,000.

Barrias, baar'ree-aas', FÉLIX JOSEPH: historical painter; b. in Paris, Sept. 13, 1822. He was a pupil of Léon Cogniet, and was awarded the Grand Prix de Rome in 1844; Legion of Honor 1859; first class medal, Paris Exposition, 1889. Painted frescoes in the churches of St. Eustace and La Trinité, Paris. One of his compositions, *Landing of the French Troops in the Crimea*, is in the museum at Versailles. His work is academic and conventional, but sound in method.

W. A. C.

Barricade: a military barrier or defensive work, employed to obstruct the passage of an enemy through a road or a street of a city, or to protect troops against the fire of the enemy. Such works are formed of trees, wagons, paving-stones, chains, palisades, etc. They have been often used in popular revolts and street-fights, especially by insurgents in Paris. In 1588 the Roman Catholic faction raised barricades in Paris against Henry III., who was compelled to save himself by flight. A great number of barricades were erected in Paris by the popular party in the revolution of July, 1830, when Charles X. was dethroned. In June, 1848, the streets of Paris were again obstructed by barricades, and a bloody battle was fought between the government of Cavaignac and the Socialists or Communists, who were defeated. In order to counteract such operations, Napoleon III. widened and macadamized the principal streets of his capital, but barricades were again employed by the Communist insurgents in the spring of 1871.

Barrie: capital of Simcoe co., Ontario (Canada); at the western extremity of Lake Simcoe, and on the Northern and Northwestern Division of the Grand Trunk Railway; 65 miles N. N. W. of Toronto (see map of Ontario, ref. 3-D); has excellent schools, including a collegiate institute, 9 churches, a large trade, manufactures of woolen goods, and 3 weekly papers. Steamboats ply on the lake. The town was founded in 1832, and was incorporated as a town in 1871. Pop. (1881) 4,854; (1891) 5,550.

EDITOR OF "EXAMINER."

Barrie, JAMES MATTHEW: novelist; b. in Kirriemuir, Forfarshire, Scotland, May 9, 1860; educated in Dumfries and at Edinburgh University (1882); was journalist in Nottingham and London. His first tale was *Better Dead* (1887), a satire on London life. Next followed *Auld Licht Idylls* and *When a Man's Single* (1888); then *A Window in Thrums* (1889); *My Lady Nicotine* (1890); *The Little Minister* (1891); and a comedy (1892), written for J. L. Toole. *Sentimental Tommy* and *Margaret Ogilvie* (1896); *Tommy and Grizel* (1900). Barrie's delineations of Scotch life are vivid and pathetic.

Barrier Act: the common name of an act passed by the General Assembly of the Church of Scotland, Jan. 8, 1697, intended as a barrier against innovations and an obstruction to precipitate legislation.

Barrière, baar'ri-är', JEAN FRANÇOIS: French writer; b. in Paris, May 12, 1786; edited (with Berville) *Mémoires relatifs à la Révolution Française* (47 vols., 1822 et seq.) and (alone) *Mémoires relatifs à XVIIIème Siècle* (29 vols., 1846-64). D. in Paris, Aug., 1868.

Barrière, Théodore: French dramatist and satirist; b. in Paris, 1823; author of *Filles de marbre* (1853) in opposition to Dumas's *Dame aux Camélias*; *L'ange de minuit* (1861); *Malheur aux vaincus* (1872), etc. D. in Paris, Oct. 16, 1877.

Barrier-reef, The Great: a vast coral-reef situated off the northeast coast of Australia, and extending from lat. 24° 30' S., lon. 158° 20' E., to Bristow island, on the coast of the island of Papua, lat. 9° 15' S., lon. 143° 20' E., nearly 1,300 miles. It is at a distance varying from 10 miles to over 100 miles from the coast, and rises, generally precipitously, from a great depth. It has a number of breaks or passages.

Barrier Treaties: the name given to several treaties between Great Britain and foreign powers; the first between Great Britain and the Netherlands, negotiated by Lord Townsend in 1709. The Dutch pledged themselves to maintain the Queen of England's title and the Protestant succession, while the British engaged to assist the Dutch in preserving their barrier-towns. The second was concluded between the same powers at Utrecht in 1713. The third was signed at Antwerp in 1715, between Great Britain, the Netherlands, and the Emperor Charles VII.

Barringer, Daniel Moreau: politician; b. in Cabarras co., N. C., in 1807; graduated at the State University in 1826, and became a lawyer. He was several years in the State Legislature; represented the State in Congress for six years (1843-49); was U. S. minister to Spain from 1849 to 1853; a delegate to the Peace Congress of 1861, and to the national union convention at Philadelphia in 1866. D. at White Sulphur Springs, Va., Sept. 1, 1873.

Barrington: a post-village of Barrington township, Shelburne co., Nova Scotia; on the Atlantic coast (see map of Quebec, ref. 3-A); has thriving fisheries, ship-building, and coasting trade.—**BARRINGTON PASSAGE,** another village of the same township, has extensive fisheries, and is connected with Cape Sable island by ferry. Pop. of Barrington, 1,000.

Barrington: township; Bristol co., R. I. (for location of county, see map of Rhode Island, ref. 8-O); on Old Col. R. R., 8 miles from Providence. Brick-making is the chief industry. Pop. (1880) 1,359; (1890) 1,461; (1900) 1,135.

Barrington, Hon. Daines: an English jurist and naturalist; brother of Shute Barrington (1734-1826); for thirty-five years Bishop of Durham; b. in 1727. He published *Observations upon the Statutes, chiefly the More Ancient, from Magna Charta to the 21 Jac. I. c. 27* (1766), a standard work; wrote a *Dissertation on the Linnæan System*, and other works. D. in London, Mar. 14, 1800.

Barris, Willis Hervey, D. D.: theologian and scientist; b. at Barrisville (formerly Zilienople), Beaver co., Pa., July 9, 1821; educated at Allegheny College and General Theological Seminary, New York; ordained deacon 1850; leading clergyman in Iowa; for twenty years president standing committee of diocese, and for a quarter of a century Ely Professor Ecclesiastical History in the theological department of Griswold College, Davenport, Ia.; acting Professor of Hebrew and Biblical Exegesis, and dean of the faculty; interested in the study of geology and palæontology. His chief publications, other than sermons, essays, and reviews, are a series of articles on local geology contributed to the *Proceedings of the Davenport Academy of Natural Science*. His work on the *Blastoidea of the Hamilton Group* was republished in vol. viii. *Illinois State Geological Survey*. Dr. Barris's collection of crinoids was secured by Prof. Agassiz for the Peabody Museum of Harvard College. W. S. PERRY.

Barrister: in England, a lawyer who has been called to the bar, and who conducts the trial and argument of causes in court, as distinguished from an attorney, whose duty it is to draw the pleadings and prepare the case for trial. See ATTORNEY. H. W. R.

Barrois, baăr'wăă', Charles, Dr. Sc.: geologist; b. at Lille, France, Apr. 21, 1851; educated at the University of Lille, and afterward Professor of Natural Sciences in the same institution. In the organization of the official geological corps of France he has charge of the work in Brittany. His publications on the geology of France are both numerous and voluminous, and are at once distinguished by their ability and by their wide range of topics, which include stratigraphy, mountain structure, metamorphism, petrography, and several branches of palæontology. He is Bigsby

medalist and foreign member of the Geological Society of London, and was a vice-president of the International Congress of Geologists at the Washington meeting (1891). Among his greater memoirs are *Le Terrain crétacé supérieur de l'Angleterre et de l'Irlande* (1876); *Les Terrains anciens des Asturies et de la Galice* (1882); and *Faune du calcaire d'Erbray* (1889). G. K. G.

Barron, James: naval officer; b. in Virginia in 1769; served in the navy under his father, who was a "commodore of all the armed vessels of the Commonwealth of Virginia"; was commissioned lieutenant in the U. S. navy in 1798, and in 1799 was promoted to be a captain. He was employed on sea-service in the Mediterranean and other waters until 1807, and had acquired a high reputation for seamanship and discipline when the affair of the Chesapeake cast a shadow over his life. On June 22, 1807, the Chesapeake, bearing the pennant of Commodore Barron, sailed from Hampton Roads for the Mediterranean. The British war-vessel Leopard, about three o'clock in the afternoon, bore down upon and hailed the Chesapeake, informing Commodore Barron she had a dispatch for him. A boat being sent alongside, the message proved to be the instructions of Admiral Berkeley of the British navy to search the Chesapeake for deserters. This Commodore Barron refused to permit, and he wrote to Captain Humphreys, commanding the Leopard, that he knew of no deserters on the Chesapeake, and that his orders would not permit his men to be mustered by any other than their own officers. The lieutenant who had brought this dispatch to Commodore Barron returned to the Leopard, and shortly after this vessel opened fire on the Chesapeake, which proved to be entirely unprepared for battle. But one gun was discharged from the Chesapeake before she struck her colors. Three deserters were found on board, and taken to the Leopard, Commodore Barron being permitted to retain his ship, with which he at once returned to Norfolk. Barron was court-martialed for neglect of duty, found guilty, and suspended from the service for five years. Although restored to his rank and placed in responsible positions ashore, he never again did sea-service. A long correspondence with Commodore Decatur on the Chesapeake affair terminated in a duel between them at Bladensburg, Md., in 1820, in which both were severely wounded, Decatur mortally. Barron lived to be the senior officer in the U. S. navy. D. in Norfolk, Va., Apr. 21, 1851.

Barros, baar'rôs, João, de: one of the most eminent of Portuguese historians; b. at Viseu in 1496. He was appointed governor of the Portuguese possessions in Guinea in 1522. His greatest work is entitled *Asia, or the History of the Discoveries and Conquests of the Portuguese in the East Indies* (1552-62). He wrote only three decades of this work, which was continued by Diego de Couto to the twelfth decade. This history is admired for elegance of style and other merits. D. in Pombal, Oct. 20, 1570. See Manoel Severim de Faria, *Vida de João de Barros* (1624).

Barrow: a river of Ireland; rises in Queen's County, on the northeast slope of the Slieve Bloom Mountain. It flows in a general southward direction, passes by Carlow and New Ross, divides the counties of Kildare, Carlow, and Wexford from the counties of Queen's and Kilkenny, and, after uniting with the Suir, enters the sea through Waterford harbor. It is about 100 miles long, and is next in importance to the Shannon among Irish rivers. It is navigable for ships of 300 tons to New Ross, 25 miles from its mouth.

Barrow [O. Eng. *beorg*, mound; Germ., Dutch *berg*, hill]: a name of artificial mounds which are found in many countries, and were erected in ancient times in honor of eminent persons or for monumental purposes. They are formed of earth or stones, and contain in some cases human bones, with armor and utensils. In Great Britain there are numerous barrows, which are supposed to have been raised before the island was conquered by the Romans. One of the largest barrows in Europe is Silbury Hill, in Wiltshire, which has a vertical height of 170 feet and covers 5 acres. Many artificial mounds occur in the U. S., as at Grave Creek, West Va., and near Marietta, O.; also in Central America. See MOUND-BUILDERS.

Barrow, Isaac, D. D., F. R. S.: English pulpit orator and mathematician; b. in London, Oct., 1630. He graduated at Cambridge as M. A. in 1652, and became Professor of Greek in that place in 1660. He was appointed Lucasian Professor of Mathematics in 1663, but resigned that chair in favor of his pupil, the illustrious Newton, in 1669. In 1672 he was

appointed master of Trinity College, Cambridge. He published, besides other able works, *Lectiones Opticæ* (1669) and *Lectiones Geometricæ* (1670). His reputation as a theologian rests chiefly on his sermons, which were edited by Dr. Tillotson (3 vols., 1685). They are very remarkable specimens of clear and exhaustive argument. "The sermons of Barrow," says Hallam, "display a strength of mind, a comprehensiveness, and fertility which have rarely been equaled." Frequently reprinted is his *Treatise on the Pope's Supremacy* (London, 1680); e. g. 1851. D. in London, May 4, 1677. His personal character was noble. See Arthur Hill, *Life of Barrow*, prefixed to his collected works (1685); Ward, *Lives of the Professors of Gresham College*; biography by W. Whewell in vol. ix. of Napier's edition; Barrow's *Theological Works* (Cambridge, 1859, 9 vols.).

Barrow, Sir JOHN, Bart., F. R. S.: traveler; b. in Lancashire, England, June 19, 1764. As secretary to Lord Macartney he went to China in 1792, and to the Cape of Good Hope in 1797. He was secretary to the Admiralty for nearly forty years, and rendered many services to geographical science by promoting scientific expeditions. He was the chief founder of the Royal Geographical Society. Among his works are *Travels in South Africa* (2 vols., 1801-04); *An Account of the Mutiny of the Bounty* (1831); and *Voyages of Discovery and Research within the Arctic Regions* (1846). D. in London, Nov. 23, 1848. See his *Autobiographical Memoir* (1847).

Barrow, WASHINGTON: b. in Davidson co., Tenn., Oct. 5, 1817; became a lawyer; was for several years editor of the *Nashville Banner*, and a leader of the Whig party; State Senator in 1861. In 1841 he was appointed *chargé d'affaires* to Portugal, and was a Representative from Tennessee in Congress 1847-49. During the civil war he was arrested for alleged disloyalty, but was released soon after by order of President Lincoln. D. in St. Louis, Oct. 19, 1866.

Barrowe, HENRY: English Nonconformist; called to the bar in 1576. After a licentious youth he was converted, and abandoned the law. Being attracted to John Greenwood, he became interested in Church reform. Robert Brown influenced them in favor of independency, and Barrowe was illegally arrested Nov. 19, 1586. He was charged with publishing seditious books against the queen and Government, and spent the rest of his life in Fleet Prison. He was condemned with John Greenwood, and they were hanged Apr. 6, 1593. Barrowe wrote *A Brief Discovery of the False Churches*.

Barrow-in-Furness: a seaport and important town of Lancashire, England; on the Irish Sea, 18 miles W. N. W. of Lancaster (see map of England, ref. 6-E). It is on the peninsula of Furness, and is the western terminus of a railway which extends to Dalton, and connects Barrow with the whole railway-system of England. It is separated by a narrow channel from Barrow island, and has a good harbor, formed by the island of Walney, which is 8 miles long. This place, which in 1845 was only a small fishing-village, derives its prosperity from rich mines of iron ore (red hematite) and manufactures of iron and steel, and it has increased with great rapidity. The Barrow Hematite Steel Company has twelve blast furnaces in operation, and the quantity of ore taken from the mines is 500,000 tons annually. This ore yields about 57 per cent. of iron. The steel-works of Barrow are said to be the largest Bessemer steel-works in Britain. About 20,000 tons of slate are annually quarried in the vicinity. Barrow has a town-hall, a public library, and numerous churches. Large sums of money have been expended in converting the channel between the town and Barrow island into docks. Pop. (1891) 51,712; (1901) 57,589.

Barrows, ELIJAH PORTER, D. D.: b. at Mansfield, Conn., Jan. 5, 1805; graduated at Yale in 1826; taught school in Hartford 1826-31; was ordained in 1832; pastor of the first Free Presbyterian church, New York city, 1835-37; Professor of Sacred Literature in Western Reserve College 1837-52, and of Hebrew Language and Literature at Andover Theological Seminary 1853-66. In 1872 he entered the same professorship in Oberlin Theological Seminary. He published a *Memoir of Evertson Judson* (Boston, 1852); *Companion to the Bible* (New York, 1869); *Sacred Geography and Antiquities* (1872). He was one of the authors and editors of the *Bible with Notes* (American Tract Society), and published many articles in the *Bibliotheca Sacra*. D. in Oberlin, Ohio, Sept. 14, 1888.

Barrows, JOHN HENRY, D. D.: Presbyterian minister; chairman of the General Committee on Religious Congresses in connection with the Columbian Exposition of 1893; b. in Medina, Mich., July 11, 1847; was educated at Olivet College, Mich., and at Yale, Union, and Andover Theological Seminaries; pastor of the First Presbyterian church in Chicago 1881-96, and in 1883 published a history of that church, which he left to lecture in India, China, and Japan. He has also published *The Gospels are True Histories* (1891); *I Believe in God the Father Almighty* (1892); and *Henry Ward Beecher, the Pulpit Jupiter* (New York, 1893). W. J. BEECHER.

Barrows, SAMUEL JUNE: Unitarian minister and editor; b. in New York, May 26, 1845; educated at Harvard Divinity School and Leipzig University; became a Baptist minister, but soon exchanged that connection for Unitarianism; secretary to William H. Seward 1867-69; pastor of First Parish, Dorchester, Mass., 1876-80; editor *Christian Register* 1881; author of *The Doom of the Majority* (Boston, 1883); *A Baptist Meeting-house* (1885); *The Slaybacks in Camp* (1888); editor of various volumes of essays and sermons; noted as an earnest worker in educational and penal reforms, and for his linguistic attainments. His wife, BELLA C. BARROWS, has assisted him in his literary work.

Barrnudia, baăr-roon'dĕĕ-ăă, JOSÉ FRANCISCO: a statesman; b. in Honduras in 1779; raised the standard of revolt against the Spanish Government, and was chosen in 1829 president of the republic. As a member of the first Republican assembly, in 1824, he introduced and carried a decree for the abolition of slavery. In 1854 he was minister to the U. S., and d. Aug. 4, 1854, in New York city.

Barry: city (founded in 1836); Pike co., Ill. (for location of county, see map of Illinois, ref. 7-B); on Wabash R. R., 18 miles E. of Hannibal, Mo., 30 miles S. E. of Quincy, Ill. Barry has a high school, three churches, woolen-mill, flour-mill, and pork-packing establishments. The surrounding country is agricultural. Pop. (1880) 1,392; (1890) 1,354; (1900) 1,643. PUBLISHER OF "ADAGE."

Barry, ALFRED, D. D.: late Bishop of Sydney; b. in London in 1826; educated at Trinity College, Cambridge; ordained in 1850, and became Bishop of Sydney, Metropolitan of New South Wales, and Primate of Australia in 1884; Principal of King's College, London, 1868-83; Canon of Worcester 1871-81; Canon of Westminster 1881-83; but resigned in 1889, and in 1891 was appointed Canon of Windsor. Besides sermons and commentaries, he has published a *Life of Sir C. Barry*, his father; *What is Natural Theology?* (1876); *The Teacher's Prayer-book* (numerous editions); *The Parables of the Old Testament* (1889); *Christianity and Socialism* (1891). W. S. PERRY.

Barry, Sir CHARLES: English architect; b. at Westminster, May 23, 1795. He visited Italy, Greece, and Egypt about 1818. He designed the Manchester Athenæum and the grammar school of Edward VI. at Birmingham. In 1841 he became a royal academician. His design for the new Houses of Parliament was preferred to those of his competitors, and the work was commenced in 1840. D. in Clapham, London, May 12, 1860; buried in Westminster Abbey. See *Memoir of Sir Charles Barry*, by his son, the Rev. Alfred Barry (1867).

Barry, EDWARD MIDDLETON: b. in London, 1830; son of Sir Charles Barry, whom he succeeded as architect of the Houses of Parliament; also architect of the National Gallery and other prominent buildings. D. in London, Jan. 29, 1880.

Barry, JAMES: historical painter; b. in Cork, Ireland, Oct. 11, 1741; was patronized by Edmund Burke. He passed about five years at Rome, and became a member of the Royal Academy of London, but he was expelled from the same in 1797 on account of differences of opinion on methods of art-teaching. His masterpiece is *The Victors at Otympia*. D. in London, Feb. 6, 1806. See Cunningham, *Lives of Painters and Sculptors* (*Edinburgh Review* for Aug., 1810).

Barry, JOHN: naval officer; b. in Tacumshane, County Wexford, Ireland, in 1745; emigrated to America about 1760. He became commander of a U. S. frigate in 1776, and captured the British vessel *Atlanta* in May, 1781. After the reorganization of the U. S. navy he was appointed senior officer, and selected to command the frigate *United States*. D. in Philadelphia, Sept. 13, 1803.

Barry, JOHN WOLFE, M. Inst. C. E.: civil engineer; engineer of the extension of the Metropolitan District and Inner Circle (underground) Railways of London; youngest

son of the late Sir Charles Barry, R. A.: b. in 1836; educated at Trinity College, Glenside, Perthshire, and at King's College, London; studied first with Lucas Brothers, afterward articulated to Sir John Hawkshaw. While with the latter he was resident engineer on the Thames bridges and the Charing Cross and Cannon Street stations. Leaving Sir John Hawkshaw in 1867, he commenced work on his own account. He built the Lewes and East Grinstead Railway, the Faling and Fulham extensions of the Metropolitan District Railway, the Inner Circle Railway (these being extensions of the Underground Railway of London), the new Blackfriars bridge over the Thames, the Barry dock near Cardiff, and the railways to connect it with South Wales; engaged in the construction of the new Tower bridge for the corporation of London. In 1872 he visited the Argentine Republic, and laid out a railway from Buenos Ayres to Rosario. In 1886 he was appointed by the Government on the Royal Commission on Irish Public Works: in 1889 on a commission to settle important matters in connection with the river Ribble; and again in the same year on the Western Highlands Commission, having duties similar to those of the Irish Commission. Mr. Barry is member of the Council of the Institution of Civil Engineers, member of the Institution of Mechanical Engineers, Fellow of the Royal Institute, author of *Railway Appliances*, and of a course of lectures with Sir F. J. Bramwell on *Railway and Locomotive* (1882).

WM. R. HUTTON.

Barry, PATRICK: horticulturist; b. near Belfast, Ireland, in May, 1816. At the age of twenty he removed to the U. S., and in 1840 moved to Rochester, where he died June 23, 1890. In his earlier life he was editor of the *Horticulturist* and also of the *Genesee Farmer*. His book called the *Fruit Garden* has long been an authority upon pomological matters. He was well known from his connection with the nursery firm of Ellwanger & Barry.

Barry, WILLIAM FARQUHAR: soldier; colonel of the Second Artillery and brevet brigadier-general U. S. army; b. in New York city, Aug. 18, 1818; graduated at West Point in 1838. His first active services were in the war against the Indians in Florida 1852-53, when he was advanced to a captaincy. In the Mexican war he acted as aide-de-camp to Maj.-Gen. Worth. He served in the difficulties with the Indians in Dakota in 1856, and took part in the Utah expedition 1858. When the civil war broke out he was appointed chief of artillery of the army of the Potomac, with the rank of major and brigadier-general of volunteers. His gallant and meritorious conduct in the capture of Atlanta won him the brevet titles of colonel U. S. army and major-general of volunteers, Sept. 1, 1864. Mar. 13, 1865, he was breveted brigadier-general U. S. A. for gallant services in the campaign terminating in the surrender of the army under Gen. J. E. Johnston, and was made brevet major-general U. S. A. in 1865. Gen. Barry organized the entire artillery of the Army of the Potomac, and served in the field with that army as chief of artillery from Mar., 1862, to Sept., 1862, participating in the siege of Yorktown and the Seven Days' battles ending with Malvern Hill. He subsequently commanded the artillery serving in the defenses of Washington 1861-63, and served as chief of artillery in the armies commanded by Gen. Sherman. He was a member of various boards, and after the war was assigned to the command of the northern (lake) frontier for the preservation of the national neutrality; in 1867 appointed to command the U. S. Artillery School at Fortress Monroe. Gen. Barry was the author of *Engineer and Artillery Operations of the Army of the Potomac, A. D. 1861-62*, in conjunction with the writer, and *A System of Tactics for the Field Artillery of the United States*, in conjunction with Maj.-Gens. W. H. French and H. J. Hunt. D. near Baltimore, July 18, 1879.

Barry, WILLIAM TAYLOR: b. in Lunenburg, Va., Feb. 5, 1784; graduated at William and Mary College in 1803; became a lawyer; was member of Congress from Kentucky (1810-11); served in the war of 1812; was U. S. Senator (1814-16); was in turn a judge, lieutenant-governor, State secretary, and chief justice of Kentucky; Postmaster-General under Jackson (1828-35); and d. in Liverpool, Aug. 30, 1835, while on his way to Spain as U. S. minister.

Barry, COUNTESS DU: See DU BARRY.

Barry Cornwall: See PROCTER, BRYAN WALTER.

Bars, bôrsh: a county of Northern Hungary; area, 1,032 sq. miles. With the exception of a small part in the S., the country is mountainous, and is traversed by the Gran and

the Zsitva. The soil of the plain in the southern part is very fertile, and produces chiefly grain. Pop. (1890) 153,053. Chief town, Krennitz.

Barse, GEORGE R., Jr.: figure-painter; b. in Detroit, Mich., July 31, 1861. Pupil of Cabanel, Boulanger, and Lefebvre, Paris; member of the Society of American Artists 1889. His pictures latterly have been painted from motives found in Capri, Italy, where he went to reside in 1890, and his work is generally decorative in character.

W. A. C.

Bar-sur-Aube, baâr'sür-ôb' (Lat. *Bar'rum ad Al'bulam*): an ancient town of France; department of Aube; on the river Aube; 33 miles by rail E. S. E. of Troyes (see map of France, ref. 4-G). It has a trade in wine, hemp, grain, and wool. The allied sovereigns held a council here Feb., 1814, and here, in the same year, occurred two battles between the allies and the French. Pop. (1891) 4,342.

Bar-sur-Seine, baâr'sür-sayn' (Lat. *Bar'rum ad Seg'uanum*): a town of France; department of Aube; on the river Seine; 17 miles S. E. of Troyes (see map of France, ref. 4-G); was important in the Middle Ages. The allies defeated the French here in 1814. Pop. (1891) 3,237.

Barter: the exchange of one commodity for another, as distinguished from the exchange of a commodity for money. This is a primitive method of trading commonly practiced by barbarous peoples, but inadequate to the needs of the commerce of civilized nations, which demands a standard of value or money. (See MONEY.) Ships sailing to uncivilized countries often carry weapons, tools, or ornaments to be used in barter with savages. Farmers in the U. S. also often barter their produce for goods at the stores.

Revised by F. STURGES ALLEN.

Bartfeld, baart'felt, or Bartfa: an old town of North Hungary, in the county of Saros, on the river Tepla, 20 miles N. of Eperies (see map of Austria-Hungary, ref. 4-J). It has mineral baths, which are much frequented, and a considerable commerce in wine, brandy, linen, etc. Pop. 5,403.

Barth, baart, or Bardt: a seaport-town of Prussia, in the province of Pomerania, on the Binnensee, 15 miles W. N. W. of Stralsund (see map of German Empire, ref. 2-F). It has ship-building docks, and a trade in grain and wool. Pop. (1890) 5,578.

Barth, CASPAR, von (1587-1658): classical philologist; spent his life as a scholarly man of leisure in Halle and Leipzig. A prolific author, and much admired in his own day for his erudition and critical acumen; now chiefly remembered as an unscrupulous fabricator of text readings which he pretended to have discovered in neglected MSS.

ALFRED GUDEMAN.

Barth, HEINRICH: an enterprising German explorer; b. in Hamburg, Feb. 16, 1821. He traveled in Northern Africa in 1845, after which he extended his explorations to Palestine, Arabia, and Asia Minor, and published *Wanderings along the Shores of the Mediterranean* (1849). He joined Richardson and Overweg in an expedition to Central Africa, but they died in 1851, and he explored that country alone for about five years. In 1863 he became Professor of Geography in Berlin. He published *Travels and Discoveries in Central Africa* (5 vols., 1858), which is a very valuable work. D. in Berlin, Nov. 25, 1866.

Barthélemy, baâr'täyl'mee', JEAN JACQUES: French antiquary; b. near Aubagne, in Provence, July 20, 1716. He learned the Greek, Hebrew, Arabic, and Chaldean languages, and became keeper of the royal cabinet of medals in 1753, after which he traveled in Italy and collected many medals. He wrote several treatises on numismatics and ancient inscriptions. His principal and most popular work is *Travels of Anacharsis the Younger in Greece* (*Voyage du jeune Anacharsis en Grèce*, 4 vols., 1788), in which a young Scythian describes his observations in Greece in the fourth century B. C. It has been translated into many languages. He was admitted into the French Academy in 1789. D. April 30, 1795. See Mancini-Nivernais, *Essai sur la vie de J. J. Barthélemy* (1795); Villenave, *Notice sur les ouvrages de J. J. Barthélemy* (1821), in connection with a complete edition of his works in four volumes.

Barthélemy Saint-Hilaire, baâr'täyl'mee' säñ'téc'-lär', JULES: French scholar and journalist; b. in Paris, Aug. 19, 1805. He was an editor of the *National* and other liberal journals. In 1838 he became Professor of Greek and Latin Philosophy in the College of France; translated the works of Aristotle (4 vols., 1839-44), and wrote several works, among

which is *Du Bouddhisme* (1855). He was elected a member of the National Assembly in 1848. He was secretary to President Thiers in 1872-73. D. in Paris, Nov. 25, 1895.

Barthez, baär'tes', or **Barthès**, PAUL JOSEPH, M. D., LL. D.: French physician and writer; b. in Montpellier, Dec. 11, 1734. He became Professor of Medicine in that city in 1759, and removed to Paris in 1780, after which he was consulting physician to the king and a member of the council of state. He wrote, besides other works, *New Elements of the Science of Man* (1778). D. in Paris, Oct. 15, 1806. See Lordat, *Mémoires sur la vie de P. J. Barthez* (1818).

Bartholdi, baär'töl-dee', FRÉDÉRIC AUGUSTE: sculptor; b. at Colmar, in Alsace-Lorraine, Apr. 2, 1834; first studied painting under Ary Scheffer in Paris, but afterward devoted himself exclusively to sculpture, and began to exhibit in 1847. Among his best-known works are the busts of Eckmann and Chatrian, the statues *La Malédiction d'Alsace*; *Lafayette Arriving in America*; and *Liberty Enlightening the World*, the colossal figure of the goddess of Liberty (a complete lighthouse, see NEW YORK CITY) which the people of France presented to the U. S. Bartholdi is author of a description of this statue, published in 1885, was present at its unveiling, Oct. 28, 1886, and has been promoted to the rank of commander of the Legion of Honor.

Bartholin, baär'tō-lin, CASPER: b. in Malmö, Sweden, in 1585. He was famous for his precocity and learning; entered the University of Copenhagen when about eighteen, and afterward studied at Rostock and Wittemberg; was Professor of Medicine in the University of Copenhagen 1613 to 1624. He afterward became Professor of Divinity; wrote about fifty works, mostly on medical subjects. D. in Sorö, July 13, 1630.

Bartholin, THOMAS, M. D.: physician; son of Casper above; b. in Copenhagen, Oct. 20, 1619. He became in 1647 Professor of Mathematics, and next year of Anatomy, at Copenhagen, and wrote, among other works in Latin, one on the lymphatic vessels (the discovery of which he claimed); a treatise on the functions of the liver; and *Anatomia* (1641), which passed through many editions and obtained a high reputation as a text-book. His house, library, and MSS. were burned in 1670. Thereupon he was made physician to the king and librarian of the university. Grand councilor of Denmark in 1675. The Bartholin family produced many eminent physicians. D. Dec. 4, 1680.

Bartholin, THOMAS: b. April 8, 1659; d. Nov. 15, 1690. One of the founders of the study of northern antiquities. His chief work, *Antiquitatum Danicarum de Causis contemptæ a Danis adhuc Gentilibus Mortis Libri Tres*, was published at Copenhagen (where he was professor) in 1689. G. L. KITTREDGE.

Bartholomew: a bayou in Arkansas and Louisiana; rises in Jefferson County in the former State, flows nearly southward into Louisiana, and enters the Washita river at Washita city. It is navigable for steamboats for 250 miles.

Bartholomew [in Gr. Βαρθολομαῖος; in Lat. *Bartholomæus*]: saint, one of the twelve apostles; supposed to be the same as the Nathanael mentioned in John i. 45-49. We have no authentic information respecting his labors or his death. According to tradition, he preached the gospel in India.

Bartholomew, EDWARD SHEFFIELD: sculptor; b. in Colchester, Conn., in 1822. He practiced dentistry for a time, and then learned painting, but afterward became distinguished as a sculptor. From 1845 to 1848 he was in Hartford, and after two years spent in New York he went to Italy, where he died at Naples, May 2, 1858. Some of his works are greatly admired. Among them are *The Shepherd Boy*; *Youth and Age*, a monument to Charles Carroll; *Ganymede and the Eagle*, etc.

Bartholomew Fair: a great English market held annually in West Smithfield, London, on the festival of St. Bartholomew (Aug. 24, old style). The charter of this fair was granted by Henry I. in 1133. It was originally connected with the Church, under whose auspices miracle-plays, mysteries, and moralities were represented at the fair. In the first centuries of its existence this was the chief cloth-fair of the kingdom. Leather, pewter, and live cattle were also sold here. Crowds of people were attracted to it by a variety of popular amusements and the exhibitions of acrobats, tumblers, mountebanks, mummers, and merry-andrews. Having

ceased to be a place of traffic and become a nuisance, it was abolished in 1855. See Henry Morley, *Memoirs of Bartholomew Fair* (1859).

Bartholomew's Hospital, London: founded in 1102 by Rahere, the king's minstrel; was at first connected with a priory established by the same person. It was made a sanctuary by Edward II., but hospital and priory were both dissolved by Henry VIII., who founded the hospital anew, giving 500 marks yearly for its maintenance, on condition the city should give the like sum. There is a medical school attached to it, and the hospital relieves about 70,000 patients annually.

Bartholomew. St.: an island of the West Indies. See ST. BARTHOLOMEW.

Bartholomew, St., Massacre of: the massacre of French Protestants which commenced at Paris in the night of the 23d and 24th of Aug., 1572. During the minority of Charles IX. and the regency of his mother, Catherine de Médicis, a long civil war raged in France between the Catholics and Huguenots, whose leaders were the Prince of Condé and Admiral Coligny. In 1570 the court made to the Huguenots overtures which resulted in a treaty of peace. Charles invited Coligny and other leaders of that party to court, and received them with warm demonstrations of friendship, which were probably perfidious. The false security of the Huguenots was increased by a marriage between Henry of Navarre and Margaret, who was a sister of Charles IX. Many Huguenots went to Paris to attend the wedding in Aug., 1572. Probably the principal instigator of the massacre was Catherine de Médicis. Admiral Coligny was wounded by a shot from a window of the royal palace on the 22d. The general massacre commenced at two o'clock on Sunday morning, Aug. 24, and continued for several days. The provinces followed the example of the capital, with some exceptions. In regard to the number of victims there is no certainty. Estimates have varied from 1,000 to 10,000 for Paris, and from 2,000 to 100,000 for the whole of France. Naturally, in that age when the idea prevailed that religious dissidents were properly to be put to death as foes of God, and persecution was justified on all hands, the news of the massacre occasioned joy in Rome. A medal struck at the time is monumental proof of this. See Sismondi, *History of France*; H. Martin, *History of France*; De Thou, *Historia sui Temporis*; *The Massacre of St. Bartholomew*, by Henry White (London, 1868); especially H. M. Baird, *The Rise of the Huguenots* (New York, 1879, 2 vols., vol. ii.)

Bar'tizan: a term in architecture, first used by Sir Walter Scott, and employed by him to mean sometimes a balcony (as in *Waverley*); sometimes a fortified turret or flanking projection (as in *The Lay of the Last Minstrel* and in *The Eve of St. John*). Scott uses the participle "bartizaned" in the sense of embattled, or furnished with battlements (as in *The Heart of Midlothian*). In this sense it has been used by other writers, but the word has no authority and no positive signification.

Bart'lett, EDWARD TOTTERSON, D. D.: Professor of Ecclesiastical History, and dean of the Episcopal Divinity School, Philadelphia; b. in Philadelphia, July 25, 1843; was graduated at University of Pennsylvania 1865; received D. D. from his *alma mater* 1887; studied theology at Andover 1865-68; ordained 1869-70; professor and dean 1884. Chief literary work, other than occasional sermons, reviews, etc., is the third volume of *The Scriptures, Hebrew and Christian*, 1892; published in connection with the Orientalist, Rev. Prof. John Punnett Peters, Ph. D., formerly Professor of Hebrew in the Philadelphia Divinity School. Bartlett's contribution to this work was the New Testament volume.

Bartlett, ELISHA, M. D.: physician; b. in Smithfield, R. I., Oct. 6, 1804. He was the first mayor of Lowell, Mass.; delivered many medical lectures; became Professor of Medicine in the University of Maryland in 1844, and took the same position in the University of New York in 1850, which he left in 1852 to become Professor of Materia Medica and Medical Jurisprudence in the College of Physicians and Surgeons of the same city. Among other medical works, he wrote an *Essay on the Philosophy of Medical Science*. D. in Smithfield, July 18, 1855.

Bartlett, JOHN R.: U. S. naval officer; b. in Providence, R. I., Sept. 26, 1843; entered the naval academy Nov. 25, 1859; a commander in 1877; chief hydrographer to Bureau of Navigation, Washington, D. C., June 22, 1883, and was promoted to the rank of captain July 1, 1892.

He served in the steamer Mississippi at the passage of Forts Jackson and St. Philip and capture of New Orleans, Apr. 24, 1862. While attached to the steam-sloop Susquehanna he took part in both attacks on Fort Fisher, and was one of the assaulting party of Jan. 15, 1865, and was specially mentioned in the reports of Com. Godon and Lieut.-Com. Blake.

Bartlett, JOHN RUSSELL: writer; b. in Providence, R. I., Oct. 23, 1805; was one of the founders of the American Ethnological Society. He was appointed in 1850 commissioner to determine the boundary between Mexico and the U. S. He published, besides other works, a *Narrative of Explorations and Incidents in Texas and New Mexico* (2 vols., 1854); *Progress of Ethnology* (1847); *Dictionary of Americanisms* (1848); *Bibliotheca Americana* (4 vols., 1865-70); many records of Rhode Island from original documents; historian of the State's part in the civil war; local genealogies, and *Primeval Man* (1868). Secretary of State for Rhode Island 1855-72. D. in Providence, May 28, 1886.

Bartlett, JOSIAH, M. D.: physician and chief justice of New Hampshire; b. in Amesbury, Mass., Nov. 21, 1729. He signed the Declaration of Independence, and was a member of the Continental Congress in 1776-78. He became president of New Hampshire in 1790, and Governor of that State under the new constitution in 1793. D. in New Hampshire, May 19, 1795.

Bartlett, SAMUEL COLCORD, D. D., LL. D.: b. in Salisbury, N. H., Nov. 25, 1817; graduated in 1836 at Dartmouth College, where he was afterward tutor, and at the Andover Theological Seminary in 1842. In 1843 he was settled over the Congregational church in Monson, Mass.; in 1846 became Professor of Intellectual and Moral Philosophy in Western Reserve College; in 1852 took charge of the Franklin Street church, Manchester, N. H.; in 1857 became pastor of the New England church, Chicago, Ill.; and in 1858 was made Professor of Biblical Literature in the Chicago (Congregational) Theological Seminary. In 1873 he had leave of absence for a year to travel in the East. In 1877 he was made president of Dartmouth College, which office he resigned in 1892. He published *Life and Death Eternal*; *Sketches of Missions of the American Board*; *Future Punishment*; besides a large number of sermons, orations, addresses, and articles in the leading reviews. He contributed to the American edition of Smith's *Dictionary of the Bible*. D. in Hanover, N. H., Nov. 16, 1898.

Bartlett, WILLIAM ALVIN, D. D.: Presbyterian minister; b. in Binghamton, N. Y., Dec. 4, 1834; educated at Hamilton College, Union Theological Seminary, and the universities of Halle and Berlin, Germany. Before entering upon his present charge as pastor of the New York Avenue Presbyterian church, Washington, D. C., he was successively pastor of Congregational churches in Owego and Brooklyn, N. Y., and Chicago, Ill., and of the Second Presbyterian church in Indianapolis, Ind. He has published a serial story, *The Lost Image*, and contributed largely to periodical literature.

WILLIS J. BEECHER.

Bartlett, WILLIAM FRANCIS: volunteer soldier; b. in Haverhill, Mass., June 6, 1840; graduated at Harvard University in 1861. On the outbreak of the civil war he entered the service as a private soldier, and was appointed captain in the Twentieth Massachusetts July, 1861; at the siege of Yorktown, Apr., 1862, he lost a leg; was commissioned colonel of the Forty-ninth Massachusetts Infantry, which regiment he led in the assault on Port Hudson, La., May 27, 1863, where he was wounded in the leg and arm. On this occasion he displayed such daring, and was so conspicuous a mark, being mounted, that the Confederate officers gave orders not to shoot at him. Colonel of the Fifty-seventh Massachusetts Veteran Regiment, Aug., 1863; wounded in the battle of the Wilderness; brigadier-general of volunteers June 22, 1864, for conspicuous gallantry. He led the assaulting column at the explosion of the mine near Petersburg, July 30, 1864, and was wounded and taken prisoner. Brevetted major-general U. S. volunteers. D. in Pittsfield, Mass., Dec. 17, 1876.

Bartlett, WILLIAM HENRY: artist and writer; b. in London, England, Mar. 26, 1809. He traveled in many parts of Europe and America, and visited Egypt and Palestine. He published numerous popular works, illustrated with engravings designed by himself. Among his works are *Walks in and about Jerusalem* (1844), and *The Nile-boat, or Glimpses of the Land of Egypt* (1849). D. at sea, between Malta and Marseilles, Sept. 13, 1854.

Bartlett, WILLIAM HENRY: contemporary landscape-painter of the English school; b. in London; pupil of Bouguereau and of Tony Robert Fleury. Received a second-class medal at the Paris Exposition, 1889, for his picture *Return from the Fair*. Has exhibited at the Royal Academy and at the Grosvenor Gallery, London. Studio in London.

W. A. C.

Bartlett, WILLIAM HOLMS CHAMBERS, LL. D.: soldier and scientist; b. in Lancaster co., Pa., 1809; graduated at West Point in 1826. He served, while lieutenant of engineers, as assistant professor at the Military Academy 1827-29; in the construction of Fort Monroe, Va., and Fort Adams, R. I., 1828-32; as assistant to the chief engineer at Washington, D. C., 1832-34; and as acting Professor of Natural and Experimental Philosophy at the Military Academy 1834-36. On resigning his lieutenantcy, Apr. 20, 1836, he was appointed full Professor of Philosophy, continuing as such till retired from active service, Feb. 14, 1871. He is author of a *Treatise on Optics* (1839); of *Synthetical Mechanics* (1850-58); of *Acoustics and Optics* (1852-59); of *Analytical Mechanics* (1853-59); and of *Spherical Astronomy* (1855-58). He was a member of several scientific associations, incorporator of the National Academy of Sciences from its formation, and became in 1871 actuary of the Mutual Life Insurance Company of New York city. D. at Yonkers, N. Y., Feb. 11, 1893.

Bar'tol, CYRUS AUGUSTUS, D. D.: Unitarian preacher and author; b. in Freeport, Me., Apr. 30, 1813. He graduated in Bowdoin College in 1832, at the Cambridge Divinity School in 1835; settled as colleague pastor of West church, Boston, in 1837. A member of the famous Transcendental Club. His principal writings are *Discourses on the Christian Spirit and Life* (1850); *Discourses on the Christian Body and Form* (1854); *Pictures of Europe* (1855); *Radical Problems* (1872); and *The Rising Faith* (1873). His contributions to periodical literature are numerous and valuable, being characterized by a style at once homely and unique, and deep religious feeling. Retired from the ministry after a pastorate of fifty years. D. in Boston, Dec. 17, 1900.

Revised by JOHN W. CHADWICK.

Bartoli, baar'tō-lēē, ADOLFO: philologist and historian of Italian literature; b. in Fivizzano, Nov. 19, 1833; since 1874 Professor of Italian Literature in the Istituto di Studi Superiori in Florence. His first important work was *I primi due secoli della letteratura italiana* (Milan, 1875-80), of great influence upon the study of early Italian literature. Since this he has published *I precursori del Boccaccio* (1876); *I precursori del Rinascimento* (1876); and, chief among his works, *La storia della letteratura italiana* (7 vols., 1878-89).

A. R. MARSH.

Bartoli, TADDEO: Italian painter of the Siennese school; b. 1362; d. 1422; chief work, *Life of the Virgin*, in the Palazzo at Sienna.—**DANIELLO:** Jesuit scholar; b. in Ferrara, Nov. 12, 1608; d. Jan. 13, 1685, as rector of the Jesuit College in Rome; chief work, *History of the Society of Jesus*.—**PIETRO SANTI:** called Perugino; painter and etcher; pupil of Nicholas Poussin; b. in Baratola, Perugia, 1635; d. in Rome, Nov. 7, 1700.

Bartolini, baär-tō-lee'neē, LORENZO: an Italian sculptor; b. in Vernio, Tuscany, Jan. 7, 1777. He studied and worked in Paris, and was patronized by Napoleon, who in 1808 directed him to found a school of sculpture at Carrara. In 1815 he removed to Florence, where he worked for many years. Among his masterpieces are a colossal bust of Napoleon I., the group of *Hercules and Lichas*; *Faith in God*; and a group called *Charity*. His works are characterized by a classic repose and simplicity. He is ranked by the Italians as second only to Canova. D. in Florence, Jan. 20, 1850.

Bartolommeo, baär-tō-lom-may'ō, Fra (whose true name was BACCIO DELLE PORTA): b. in Savignano in 1475; studied under Cosimo Rosselli and Leonardo da Vinci, and had already acquired a great reputation as a painter when the condemnation and execution of his friend Savonarola caused him to give up his art and retire to a Dominican convent in 1500. In 1506, however, he again took up painting, and he subsequently visited Rome in order to study the works of Michael Angelo. Most of his life he spent in Florence, where he died Aug. 3, 1517, and here are his most celebrated pictures, the *Nativity*; *Circumcision*; *Virgin on the Throne*, in the public gallery; the *St. Mark* and the *Descent from the Cross*, in Palazzo Pitti; and *Last Judgment*,

in chapel of Santa Maria Nuova. His *St. Mark* and *St. Sebastian* were painted to prove that he did not lack power, and are his best works.

Bartolozzi, baăr-tō-lot'sēē, FRANCESCO: an Italian engraver; b. in Florence, Sept. 21, 1728; was a scholar of Ferreti and Joseph Wagner. He lived many years in London, and exerted a bad influence by spreading the stippled manner. His works are very numerous. D. in Lisbon, Portugal, about 1816.

Bar'ton: village, on railroad, Orleans co., Vt. (for location of county, see map of Vermont, ref. 2-D). The fertile soil and abundant water-power of the township make agricultural and manufacturing business profitable. The chief article of manufacture is lumber; a large factory for making underwear was built in 1892. It has graded schools, an academy, and a library. Pop. of township (1880) 2,364. Pop. of village (1880) 742; (1890) 778; (1900) 1,050.

EDITOR OF "ORLEANS COUNTY MONITOR."

Barton, BENJAMIN SMITH: physician and botanist; son of Thomas (1730-80), an Episcopal clergyman, and of a sister of David Rittenhouse; b. in Lancaster, Pa., Dec. 19, 1766; educated at York, Pa., and at what now is the University of Pennsylvania; studied medicine at Edinburgh and Göttingen; and became a practitioner in Philadelphia. He was Professor of Natural History and Botany in the college where he graduated 1789, of *Materia Medica* 1795, and succeeded Dr. Benjamin Rush in its medical school 1813. President of the Philadelphia Medical Society; promoter and officer of the American Philosophical Society, contributing to its *Transactions*. He wrote treatises on natural history, aboriginal American ethnology, and on *materia medica*. His most memorable book was *Elements of Botany* (Philadelphia, 1803), which was reprinted and for many years a standard text-book. D. in Philadelphia, Dec. 19, 1815. See *Biography*, by his nephew, W. P. C. Barton (Philadelphia, 1815).

Barton, BERNARD: known as the "Quaker poet"; b. in London, England, Jan. 31, 1784; was a member of the Society of Friends. He became a clerk in a bank at Woodbridge. He published *Poems* (1820); *Napoleon, and other Poems* (1822); *Devotional Verses* (1826); *The Reliquary* (1836); *Household Verses* (1845); and other works. Sir Robert Peel procured for him a pension of £100. D. at Woodbridge, Feb. 19, 1849. See *Memoirs and Letters of Bernard Barton*, edited by his daughter.

Barton, CLARA: b. about 1830 on a farm at Oxford, Mass.; a daughter of Capt. Stephen Barton, and educated at Clinton, N. Y. Early in life she engaged in teaching, and founded a free school at Bordentown, the first in New Jersey, which she opened with six pupils, but which numbered nearly 600 when, in 1854, she went to Washington. Here she was appointed clerk in the department of patents, but on the outbreak of the civil war she resigned her clerkship and devoted herself to the alleviation of the sufferings of the soldiers, serving not in the hospitals, but on the battle-field. She was present at several battles, and after the close of the war originated, and for some time carried on at her own expense, the search for missing soldiers. Having lectured (1866-67) on *Incidents of the War*, she went to Europe for her health, and settled in Switzerland, but on the outbreak of the Franco-German war she accepted the invitation of the Grand Duchess of Baden to aid her in the establishment of her hospitals; and she afterward followed the German army, and was decorated with the Golden Cross by the Grand Duke of Baden, and with the Iron Cross by the Emperor of Germany. In 1881 she organized the American Red Cross Society, and, becoming its president, succeeded in procuring an international treaty granting it protection. In 1883 she was appointed superintendent of the Reformatory Prison for Women at Sherborn, Mass., and in 1884 was chosen delegate to the International Peace Convention at Geneva. In 1883, at the request of a committee of Congress, she prepared a *History of the Red Cross*, which was published by the Government at Washington. In 1898 she was active in relief work in Cuba.

Barton, DAVID: b. about 1785; one of the earliest emigrants to Missouri Territory; president of the convention in 1820 to form a State constitution; Senator in Congress from Missouri 1821-31; and chairman of the committee on public lands. D. at Booneville, Mo., Sept. 28, 1837.

Barton, ELIZABETH: See MAID OF KENT.

Barton, WILLIAM: a Revolutionary general; b. in Warren, Bristol co., R. I., May 26, 1748. As lieutenant-colonel of the Rhode Island militia he captured Gen. Prescott July 10, 1777. He was wounded and disabled in 1778 at Bristol Ferry. Congress gave him a colonel's commission and a sword, and he received a grant of land in Vermont. He was many years imprisoned in Vermont for debt, but was liberated in 1825 by La Fayette, who paid the demand against him. D. at Providence, Oct. 22, 1831.

Barton, WILLIAM PAUL CRILLON, M. D.: a botanist; nephew of Dr. B. S. Barton; b. in Philadelphia, Pa., Nov. 17, 1786; graduated at Princeton in 1805; received his degree of M. D. at the University of Pennsylvania in 1808; surgeon in U. S. navy, and organizer of its bureau of medicine and surgery; Professor of Botany in University of Pennsylvania 1815, and in Jefferson Medical College. He published *Floræ Philadelphicæ* (1815-25); *Flora of North America* (3 vols., 1821-23); *Materia Medica*; *Medical Botany*; *Plan for Marine Hospitals* (1817); *Biography* of his uncle (1815); and several other works. D. in Philadelphia, Pa., Feb. 29, 1856.

Barton-on-Humber: a market-town of North Lincolnshire, England; situated on the south side of the Humber river, 6 miles S. W. of Hull, with which it has steam-communication (see map of England, ref. 7-J). It is a very ancient place, and was one of the principal ports of the Humber river before Hull was settled. It was once surrounded by a rampart and ditch to protect it against the attacks of the Danes and Saxons, and has manufactures of ropes, sacking, bricks, pottery, and whiting; also quarries of chalk and oolite. St. Mary's church is a fine building, erected in the fourteenth century. The ruins of Thornton Abbey, founded in 1139, are about 3 miles to the southeast. Pop. 5,300.

Barton's Buttons (called also **Iris Ornaments**): by means of a dividing-engine, Mr. John Barton succeeded in engraving lines on steel and other surfaces not more than from the $\frac{1}{1000}$ th to the $\frac{1}{10000}$ th of an inch apart. These, owing to the action of grooved surfaces on light, shine in the light of candles or lamps with all the colors of the spectrum. From steel dies thus prepared impressions were stamped upon buttons and other articles, forming ornaments rivaling in colors the brilliant flashes of the diamond.

Bartow, baar'tō: capital of Polk co., Fla. (for location of county, see map of Florida, ref. 6-J); in the phosphate belt, on Southern Florida and Florida Southern R. Rs., 76 miles N. E. of Punta Gorda. It has manufactories and orange groves. Pop. (1880) 77; (1890) 1,386; (1900) 1,983.

Bartow, FRANCIS STEBBINS: b. in Savannah, Ga., Sept. 6, 1816; graduated at Franklin College, Georgia, 1835; studied law at the law school, New Haven, Conn.; became a prominent member of the Savannah bar; was a member of the Georgia Legislature, of the Senate, and of the Confederate Congress. During the civil war he entered the army as captain of the Oglethorpe Light Infantry, was appointed colonel of Eighth Georgia Infantry, and brigadier-general C. S. A. Killed at Manassas, July 21, 1861.

Bartram, WILLIAM: an American botanist, who may also be classed among the earlier ornithologists; b. Feb. 9, 1739. He spent five years in the Southern States drawing and collecting specimens of natural history, and published the results of his observations in a work entitled *Travels through North and South Carolina, Georgia, etc.* (Phila., 1791). This book, which passed through several editions and was translated into French and German, is called by D. Coues "the starting-point of a distinctively American school of ornithology." It contained a catalogue of the birds of the Eastern U. S., in which many species are named as new which later on were fully described by Wilson, who was aided by Bartram in the earlier portion of his book. D. July 22, 1823.

F. A. LUCAS.

Bartsch, KARL FRIEDRICH ADOLF KONRAD: philologist; b. in Sprottau, Prussian Silesia, Feb. 25, 1832; educated at the gymnasiums of Gleiwitz and Breslau, and at the Universities of Breslau and Berlin. In 1853 he went to Paris to study the manuscripts of Provençal poetry, and also visited libraries at London and Oxford in the same year. In 1855 he received an appointment at the library of the Germanic Museum at Nuremberg; was professor at Rostock from 1858-71, and at Heidelberg from 1871-88. His untiring industry combined with natural talents obtained for him a high rank among specialists in the mediæval languages and

literatures of both Germany and France, and he displayed an astonishing activity in publishing editions of texts, and in producing investigations on metrical and literary subjects connected with them. His most important work in the Germanic field was his *Untersuchungen über das Nibelungenlied* (1865), followed by his edition of the poem *Der Nibelunge Nôt*, with the readings of all the manuscripts and a lexicon (1870-80). As a Romance scholar he is most widely known through his books for beginners in the study of Old French and Provençal, the *Chrestomathie de l'ancien français* (1st. ed. 1866) and *Chrestomathie provençale* (1st ed. 1868), both of which, however, even in the latest editions, still contain errors due to a lack of thoroughness in some details. In 1887 he published with A. Horning a work for the study of Old French on a similar plan, *La langue et la littérature française* (ninth to fourteenth centuries). He contributed many articles on various subjects to philological periodicals, and was since 1869 the editor of one of the most important, the *Germania*. Among his other publications may be mentioned: *Karl der Grosse von dem Stricker* (1857); *Albrecht von Halberstadt und Ovid im Mittelalter* (1861); *Ueber Karlmeinet* (1861); *Deutsche Liederdichter des XII. bis XIV. Jahrhunderts* (1864; 2d ed. 1879); *Kudrun* (1865); *Das Nibelungenlied* (1866); *Das Nibelungenlied* (a translation into modern German, 1867); *Herzog Ernst* (1869); *Altfranzösische Romanzen und Pastorellen* (1870); *Wolframs von Eschenbach Parzival und Titivel* (1870-71); *Grundriss zur Geschichte der provenzalischen Literatur* (1872); *Das Rolandslied* (1874); a translation of Dante's *Divina Commedia* (1877); a second edition of Diez's *Leben und Werke der Troubadours* (1882); and of Diez's *Die Poesie der Troubadours* (1883); *Die Altdeutschen Handschriften der Universitäts-Bibliothek in Heidelberg* (1886). D. in Heidelberg, Feb. 19, 1888. E. S. SHELDON.

Baruch, bay'rook: a Hebrew scribe; friend and companion of the prophet Jeremiah, whom he served as amanuensis. Shortly after 586 B. C. he accompanied Jeremiah to Egypt, Jer. xliii. 6, 7. His subsequent history is unknown. The *Book of Baruch*, which the Roman Catholics admit into the canon of the Holy Scripture, is considered apocryphal by Protestants and Jews, as it forms no part of the Hebrew canon. It was written originally in Hebrew, and was probably the joint composition of several persons. Baruch had nothing to do with it. As a whole, it dates from the third century B. C. The so-called *Epistle of Jeremiah*, of later date, appears sometimes as its sixth chapter. The *Apocalypse of Baruch* was published in a Latin translation from the Syriac by Ceriani in 1866, and the Syriac itself (by Ceriani) in 1871. Kneucker's edition appeared in 1879. The original writing was in Greek. There is a pseudepigraphic *Epistle of Baruch* in the Syriac language, probably a monastic forgery, and certainly worthless. See PSEUDEPIGRAPHIA.

Barus, CARL: See the Appendix.

Barwood, or **Camwood**: a red dyewood from the western coast of Africa. It is the wood of *Baphia nitida*, a leguminous tree. Its coloring principle is slightly soluble in boiling water, freely in alcohol and alkaline solutions.

Bary, baa'reë, HEINRICH ANTON, de: German botanist; b. in Frankfurt-on-the-Main, Jan. 26, 1831; educated in the gymnasium of his native city and in the universities of Heidelberg, Marburg, and Berlin. He was Professor of Botany successively in the universities of Freiburg, Halle, and Strassburg. His more important works are: *Die Mycetozoen* (1859); *Beiträge zur Morphologie und Physiologie der Pilze* (1864-81); *Die Morphologie und Physiologie der Pilze, Flechten und Myxomyceeten* (1866); *Vergleichende Anatomie der Vegetationsorgane der Phanerogamen und Farne* (1877); *Vergleichende Morphologie und Biologie der Pilze, Mycetozoen und Bacterien* (1884); *Vorlesungen über Bacterien* (1885). The last three have been translated into English. D. Jan. 19, 1888. CHARLES E. BESSEY.

Barycen'tric Cal'culus: an application to geometry of the mechanical theory of the center of gravity, executed in two distinct ways, according as metrical or descriptive geometrical properties are to be investigated. It was developed almost completely by Möbius in his *Der barycentrische Calcul* (1827).

Barye, baä'ree', ANTOINE LOUIS: sculptor; b. in Paris, Sept. 24, 1795; apprenticed to an engraver; served in the army 1812-14; studied drawing and modeling under Bosio and Baron Gros; began to exhibit his sculptures in 1827; achieved a great reputation, especially by his statuettes, and

groups of beasts, reptiles, etc., in vigorous action—a deer stepping high through the grass, an elephant in full charge, a jaguar devouring a gazelle, the lion and the serpent; became a member of the Academy of Fine Arts in 1868. D. in Paris, June 25, 1875. Copious collections of his works may be seen in Baltimore, in New York, and in the Corcoran Art Gallery in Washington.

Bary'ta, or **Bary'tes** [mod. from Gr. βαρύς, heavy]: the oxide of barium; an alkaline earth and a virulent poison (BaO, sp. gravity 4.5). It is an ingredient in sulphate of baryta, or heavy spar, from which it is obtained, but it is not useful for any purpose except chemical analysis. A solution of baric hydrate is used by the chemist as the best test of the presence of carbonic acid. Barium sulphate, or heavy spar, is a common crystallized mineral which is mixed with white lead and used as a pigment under the name of *permanent white*. Several mixtures of this sulphate and white lead are manufactured and known in commerce. *Venice white* contains 1 part of the sulphate and 1 part white lead. *Hamburg white* contains 2 parts of the sulphate and 1 part white lead. *Dutch white* contains 3 parts of the sulphate and 1 part white lead. The native sulphate was employed by the celebrated potter Wedgwood in the manufacture of jasper-ware and for the formation of white figures, etc., on colored jars and vessels. It is extensively used for adulterating white lead and for giving weight to paper. Baryta is produced, according to the census of 1890, as follows: Illinois, 200 tons; Missouri, 7,558 tons; North Carolina, 3,000 tons; Virginia, 10,702 tons; aggregate value, \$106,313.

Bar'ytone, written also **Baritone** [from Gr. βαρύτονος, deep-sounding; βαρύς, heavy + τόμος, tone. The spelling *baritone* represents introduction viâ Ital. *baritono*, and is the older]: the tone of a man's voice, about half-way between the bass and tenor. It generally extends in compass from low A of the bass clef to high F' above the staff, and occupies the same position as the *mezzo soprano* of the female voice. In Greek grammar, words with an unaccented final syllable are called barytones.

Basalt' [from Lat. *basaltis*]: an ancient term used by Pliny and said to be of African origin. In common usage it includes part of the fine-grained, dark-colored igneous rocks which are common in all geological horizons. In this sense it is nearly synonymous with trap (Swed. *trappa*, stairs), a term first used in Scandinavia in allusion to the step-like appearance produced by intrusive sheets of this rock in softer strata. A common feature of basalt or trap is its tendency to divide, by contraction due to cooling, into polygonal columns, whose position is in the main normal to the cooling surface. These may therefore be vertical, radiating, or, in dykes, horizontal. This columnar parting sometimes occurs in other igneous rocks, but is so characteristic of basalt that it is often called "basaltic structure." Basalt is usually compact and heavy, but it may be vesicular or amygdaloidal.

In a more restricted and scientific sense basalt is used to denote an igneous rock composed essentially of a triclinic feldspar (labradorite), augite, olivine, and magnetite, with more or less glassy base. Its silica percentage is low (45-53). Basalt was formerly applied only to rocks of tertiary age, its coarser varieties being called *dolerite*. The corresponding pretertiary rocks were known as *melaphyre* and *olivine-dabase*. Now, however, it is preferable to use the term basalt without reference to age for all the finer and partly glassy varieties, reserving the terms diabase and dolerite for those that are coarser and holocrystalline.

Basalt occurs in surface flows, intrusive sheets, and dykes. When molten it is very fluid, and often spreads over large areas in thin sheets. According to Von Riechthofen's law (see ANDESITE), basalt, in virtue of its basic character, is one of the youngest products of volcanic activity. By virtue of their durability, basalt flows protect softer rocks beneath them from erosion, and in regions undergoing rapid surface waste they frequently constitute the caps of mesas and plateaus. See GIANT'S CAUSEWAY and ROCKS.

GEORGE H. WILLIAMS.

Bas'anite: See JASPER.

Bas'com, HENRY BIDLEMAN, D. D., LL. D.: bishop of the Methodist Episcopal Church South; b. at Hancock, Delaware co., N. Y., May 27, 1796. He was licensed to preach in 1813, and in 1823 was chosen chaplain to Congress; was president of Madison College, Pa., 1827-29; Professor of Morals, Augusta College, Ky., in 1832, and in 1842 president of Transylvania University, Ky. From 1846 to 1850 he was

editor of the *Quarterly Review* of his Church. In 1850 he was made a bishop. D. in Louisville, Ky., Sept. 8, 1850. In one of his earlier years he preached 400 times, and received a salary of \$12.10. Bishop Bascom was an extremely popular speaker. His complete writings were published in 1856.

Bascom, JOHN, LL. D.: author and scholar; b. at Genoa, N. Y., May 1, 1827; graduated at Williams College in 1849; studied law and theology, the latter at Andover Theological Seminary. In 1855 he became Professor of Rhetoric in Williams College; president of the University of Wisconsin 1874-87. He has published *Political Economy for Colleges* (1859); *Æsthetics* (1862); *Elements of Psychology* (1869); *The Philosophy of English Literature* (1874); *Problems in Philosophy* (1886); *Sociology* (1887); and other works.

Base [viâ Fr. from Lat. *ba'sis*, from Gr. *βᾶσις*, step, base, pedestal, from same root as *βαλνειν*, to go]: a term having important applications in architecture, chemistry, geometry, heraldry, and music (It. *basso*). Base in general signifies the bottom of anything considered as its support, as the base of a mountain. In architecture it denotes the lower part of an architectural composition, as of a pier, column, or pilaster; and also of a complete structure, as of a whole building or one face of it. In these different senses it is often used loosely; thus a base of a wall may be understood as a bottom of the foundation or as the lowest part of the decorative structure above ground. The base of a column is the member which interposes between the shaft and that upon which the column rests as the pedestal or stylobate. In classical architecture the true Doric column of Greece had no base; the Ionic and Corinthian orders had bases of convex and concave moldings, sometimes enriched with sculpture. In European mediæval architecture the columns and piers usually had bases, and these are of endless variety.

RUSSELL STURGIS.

In chemistry it signifies a substance that has the power to neutralize acids and form salts with them. The terms *acid* and *basic* are complementary. The common bases are compounds consisting of a metal in combination with hydrogen and oxygen. Thus the base potassium hydroxide, or hydrate, or caustic potassa, or caustic potash, consists of the metal potassium in combination with hydrogen and oxygen, as expressed in the formula, KOH. So, too, sodium hydroxide, NaOH, ammonium hydroxide, NH₄OH, calcium hydroxide, Ca(OH)₂, barium hydroxide, Ba(OH)₂, cupric hydroxide, Cu(OH)₂, ferric hydroxide, Fe(OH)₃, aluminium hydroxide, Al(OH)₃, etc., are bases. In general terms, whenever a base acts upon an acid a salt is formed. Thus when potassium hydroxide acts upon nitric acid, the salt potassium nitrate or saltpeter, KNO₃, is formed. Similarly sodium hydroxide and sulphuric acid form the salt sodium sulphate.

The above refers to oxygen bases. But there are similar substances containing sulphur, and when these act upon corresponding sulphur acids, salts containing sulphur instead of oxygen, but analogous to the oxygen salts, are formed. It appears also that chlorine, bromine, iodine, and fluorine take the place of oxygen in acids, bases, and salts, and form the well-known compounds commonly called double chlorides, double iodides, double fluorides, etc.

By the expression *organic base* is meant a compound like aniline, which is related to ammonia. There are many of these substances known to chemists. See ALKALOIDS.

IRA REMSEN.

The military term *base of operations* denotes, in contradistinction to *line of operations*, the (usually) contiguous and well-guarded (by our own or allied forces) region upon which an army depends for its supplies, re-enforcements, etc., to which it sends back its sick and wounded, and upon which it (generally) would fall back in case of reverse and retreat. Much pedantry is expended upon these phrases in what were recognized as standard military treatises. The *essential* thing is that an army have a base, though it may temporarily abandon one to acquire another; or in rare cases it may so thoroughly control the hostile region in which it operates as to use it for most of the purposes of a base.

JAMES MERCUR.

Base, in music: See BASS.

Base-ball: the national out-door game of the U. S.; reputed to be a development of the English game of "rounders," but it has little about it now to suggest a kinship, except it is played with bat and ball. The game has developed from the crudest of games in 1845, when little skill was required to play it and only the simplest rules governed the

play, into one of the most scientific and exciting of the world's sports. It has brought into its development the in-born craving of youth to strike hard blows; the playing at catching ball, a pastime of primitive nations; running, in which swiftness is at a premium; throwing for distance, speed, and accuracy; individual chances for brilliant progress in making scores; and the whole combined in such a way that individual skill and judgment are closely joined with team-play.

The first real step toward progress in the development of base-ball was made by the Knickerbocker Club of New York city, which organized in 1845, and soon after prepared a code of playing rules. Up to 1858 the clubs were wholly amateur, but after that date professional clubs were formed, and the game took on new development, which culminated in its present perfected state. There are now hundreds of amateur and professional clubs throughout the U. S., separated into different leagues. First and greatest among these is the National and American Association League, which pays its players salaries varying from one to several thousand dollars for the season.

The game was introduced into Great Britain by players from the U. S. in 1874, and, although it failed at first to excite much interest, it increases steadily in favor, while the same is true of Australia, into which it was introduced in 1888.

The playing-rules regulate the size of balls and bats, as well as define the way the ground shall be laid out. A level plot of land 450 feet square will be sufficient for the best games. The bases are placed on the four corners of a square with sides 90 feet long, and are called respectively going from right to left from home base, first, second, and third base. White chalk lines running through home and first base and home and third base mark the foul lines. A back-stop for stopping pitched balls is placed 90 feet back of home base.

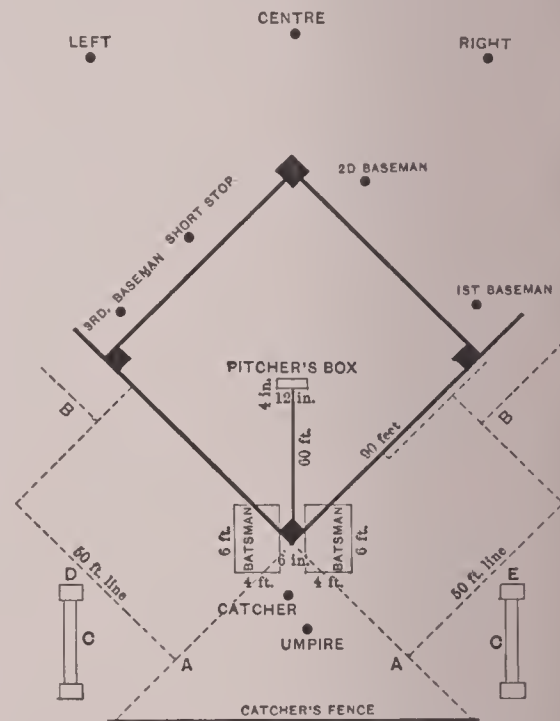
White chalk lines running through home and first base and home and third base mark the foul lines. A back-stop for stopping pitched balls is placed 90 feet back of home base.

Nine players occupy positions in this field. The catcher plays anywhere back of home base to suit his particular duty. The pitcher delivers

the ball to the batter from a defined "box" distant 60 feet from home base. The first, second, and third basemen attend to their respective bases. The short-stop plays anywhere between second and third bases. The left, center, and right fielders take positions outside the diamond and usually in the direction which their name indicates.

The players are divided into three distinct groups, the pitcher and catcher forming the "battery"; the first, second, and third basemen and short-stop composing the "infield"; and the left, center, and right fielder completing the "outfield."

These three groups have specialized duties, the players being selected and placed according to their skill in performing these. The battery attends to the work of trying to keep the batter from reaching first base, through the pitcher using every art and strategy he possesses in delivering the ball to him, and the catcher receiving and holding the ball when not struck. The pitcher is helped in his work by being allowed perfect freedom in throwing underhand or overhand, being the gradual development from a simple pitch or toss through restricted underhand throwing to the present freedom; by the discovery that a ball can be made to curve when given a revolving motion on its own axis as



A A, ground reserved for batsman, umpire, and catcher; B B, for captain and assistant; C C, players' benches; D, bat-rack for visiting players; E, for home players.

it is thrown from the hand, the direction of the curve depending on the direction and velocity of the axis twist; and by acquired muscular co-ordination and control, whereby he deceives the eyes of the batter by varying the speed of the ball without an apparent change of delivery.

The infield attends mostly to fielding balls hit along the ground and throwing the runner out at first base, but frequently at other bases. One-half to two-thirds of the twenty-seven or more put-outs in a game are made by the infield.

The outfield has mostly to do with fielding balls hit into the air. From one-fifth to one-third of the batters are caught out by the outfield.

Eighteen players in all take part in a game. A recent rule allows a change battery to exchange places with the one already playing. By toss of a coin, or by previous arrangement, one captain has the right to decide for his team to "take the bat" or "the field." Then each player takes his turn in striking at the ball until three batters are "out," when the nines exchange places. The order of strikers is previously arranged by the captain. When the other side has had a turn at the bat and been put out, one inning has been played. Nine innings constitute a game, unless at the end of that time the two nines are tied in number of runs or in failure to score any, when the game continues until one side exceeds the score of its opponents on even innings.

The batter takes a position at the home base ready to hit the ball which the pitcher throws. His limitations are that while standing within a defined position he must strike at every ball coming over the home plate between his shoulders and knees or lay himself open to having a "strike" "called" by the umpire. Three strikes put the batter out, except when there is no runner on base, or when one is on second or third base, or when two are out, the catcher has to hold the third strike or throw him out at first base. If, however, four "balls"—i. e. pitched balls not coming under the rule of a strike—have been called by the umpire while the batter is striking, the latter is given his base by forfeit. Should the batter strike the ball so that it touches the ground and remains within bounds until it passes first or third base, the ball is fair and he becomes a "base-runner." Batted ground balls outside the foul lines are "foul," and no base can be run until the base which the runner occupied when the ball was hit is touched after the ball is held by the pitcher in his box. If the ball is struck into the air and falls inside the foul lines again, the batter becomes a base-runner, unless the ball is caught by some fielder. The batter also becomes a base-runner when his person—excepting his hands and forearm, which makes the ball a "dead ball," when no bases can be run—is struck by a pitched ball, unless the umpire decides that the batter intentionally permitted himself to be hit.

The aim of a runner on base is to score a run, which is done when he touches first, second, third, and home base in their order without being put out. He is helped in this by the time given him during the delivery of a ball to the batter to make an attempt to reach the next base; by the ball sometimes being pitched wildly or passing the catcher; by being forced on to give room for some one who has been given first base by a base on balls; or by being struck by a pitched ball; by a pitcher's balk, which is a feint with all the appearances of an intention to pitch the ball, allowing a base-runner an additional base; and by safe hits between the fielders or by batted balls not fielded. All balls batted into the air and caught allow the base-runner to take a base at his risk, provided he leaves his base after the ball is caught.

Base-runners must return to their bases after a foul ball, and remain there until the pitcher receives the ball in his position (in case of a foul or fair fly ball they need remain there only until the ball is caught by the fielder); when the ball becomes dead by hitting the batter's bat or person or the umpire, or when the batter strikes when outside his position, called a foul strike; or when another runner is hit with a batted ball.

The aim of the nine in the field is to put out the batsman and base-runners. The batter is out when he has had three strikes as explained above; when he is discovered having batted out of order; when he makes a foul strike; when attempting to interfere with a catcher in fielding or throwing; when he makes an intentional foul hit after he has had two strikes.

Base-runners are declared out when hit with a batted ball while at the bat and about to run; when they attempt to hinder the catcher from fielding a muffed third strike; when

hit by a batted ball while running for a base; when a ball batted into the air is momentarily held by a fielder before touching the ground or any object other than a fielder; when after three strikes or a fair hit he be touched with the ball in the hands of a fielder, or when the ball is securely held by a fielder while touching first base before the runner reaches the base; when he runs more than 3 feet out of line to dodge a fielder trying to touch him out; when intentionally obstructing a fielder in fielding a ball; when touched by the ball in the hands of a fielder unless his person is touching a base he is entitled to occupy, except he may overrun first base if he turns to the right in returning to the base when on fair ground; when a fair or foul ball is caught and then held by a fielder on the base occupied by the runner when the ball was struck, or if the runner be touched by the ball in the hands of a fielder before he returns to the base; when a fielder holds the ball while touching a base before a runner, who is forced on by another runner, reaches the base, except in the case of a base on balls, or when a batter is hit by a pitched ball; when he fails to touch a base in regular order in running or on the return, except in the case of foul balls, provided he be touched by the ball in the hands of a fielder, or the ball be held at the base he failed to touch.

A. ALONZO STAGG.

Basedow, JOHANN BERNHARD: educational reformer; head of the so-called Philanthropin; b. Sept. 11, 1723, in Hamburg; educated at Leipzig; professor in the academy at Soroe, Denmark, 1753; transferred by the Government, on account of the opposition raised against his unorthodox writings, to the Gymnasium of Altona 1761. Inspired by Rousseau's *Émile*, he turned his attention about this time to educational reform, and soon published the *Address to Philanthropists and Men of Property on Schools and Studies, and their Influence on the Public Weal*, in which he called upon all who loved their fellow-men to contribute to aid him in publishing his book. Among those who responded were the Emperor Joseph II., the Empress Catherine II., King Christian VII. of Denmark, and numerous other celebrities. With the \$10,000 thus received he published in 1774 his *Elementary (Elementarwerk)*, in four volumes, with 100 copper-plate illustrations. In the same year he was called to Dessau by Prince Leopold to take charge of the famous Philanthropin, founded as an ideal school, to be conducted entirely upon his improved principles. While never largely attended, the school excited the greatest interest throughout Germany. Kant prophesied that quite another race of men would grow up now that the Philanthropin had introduced a new system of education. Basedow soon retired (1776) from its management, and, after an irregular life, died in 1790 at Magdeburg. The keynote of Basedow's system was *everything according to nature*. Language he would teach by the conversational method; object lessons and pictures were to be largely employed. His famous *Elementary* contains a large amount of information about various topics arranged as a dialogue, interspersed with tales and poetry, and illustrated by a set of engravings. The natural desires and inclinations of children were to be educated and directed aright, but never suppressed. The accounts of those who visited the Philanthropin are mostly favorable. The teachers used originality in their teaching, and the brightness and animation of the children were noticeable. "Children love motion and noise; here is a hint from nature," said Basedow. The development of the body was specially cared for; gymnastics were for the first time introduced into modern schools, as well as the practice of taking long excursions on foot, now so general in Germany. Kant's expectations, noted above, were generally shared by the friends of humanity throughout Europe. The Philanthropin disappointed these expectations, but it unquestionably introduced valuable new ideas and methods, and, through the teachers who had been connected with it, disseminated new doctrines which had great influence in calling attention to the neglected field of education, and stimulating thought in that direction. Basedow was a bold and fearless innovator, who lacked the personal qualities to embody successfully the ideas he struck out. His character was in many respects unlovely. (See sketch by Goethe in *Wahrheit und Dichtung*.) He had no tact, and was anything but a suitable person for the head of a model school. German education, in Kant's words, needed "not reformation, but revolution." Basedow is a notable revolutionist. See Quiek's *Educational Reformers*; Williams's *History of Modern Education*. C. H. THURBER.

Basedow's Disease, called also **Graves's Disease** and **Exophthalmic Goitre**: a disease more common among women than men, and characterized by prominent eyeballs, enlarged thyroid gland, palpitation of the heart, and generally by anæmia. Basedow's disease sometimes, though very rarely, ends in recovery. Its cause is stated by Niemeyer to be probably a paralysis of the vasomotor nerves, but others look upon it as a disease of the sympathetic nerves or a general neurosis. It is best treated by electricity, digitalis, ergot, good food, gentle exercise, and hygienic measures.

Basel, *baa'zel*, or **Bâle**, *baal* (Fr. *Bâle* or *Basle*; Germ. *Basel*; anc. *Basili'a* or *Basile'a*, i. e. royal city): an important city of Switzerland; beautifully situated on both sides of the Rhine; 65 miles by rail N. of Bern, and about 3 miles from the frontier of Alsace; lat. 47° 34' N., lon. 7° 36' E. The Rhine, here crossed by a bridge, divides it into two parts, named "Great Basel" and "Little Basel." Basel is at or near the head of navigation on the Rhine, and is the most important commercial and manufacturing city of Switzerland. It was more populous in the Middle Ages than at present. An œcumenical council was held here, opening July 23, 1431. Among its public buildings is a fine cathedral, built by the Emperor Henry II. between 1010 and 1019, with towers 218 feet high, which were not completed till 1500. The University of Basel, founded in 1459, once had a high reputation, and was one of the centers of the Protestant Reformation, Erasmus and Ecolampadius dying while in its service. Luther's writings were printed here from 1519. This city also contains a valuable museum of natural history, a botanic garden, and the university library of 160,000 volumes and 4,000 MSS. The museum of art is noteworthy for its fine collection of the works of the younger Holbein. A large majority of the inhabitants are Protestants. Basel has extensive manufactures of ribbons, printed cottons, paper, gloves, jewelry, etc. It was first mentioned in 372 A. D., was destroyed by the Huns, and rebuilt by Henry I. in 917. The city, with its 14 sq. miles, since 1833 has formed a separate part of the canton, known as "Basel-Stadt." Pop. (1897) communal, 89,687.

Basel, or **Bâle**: canton of the Swiss Confederation; confronting Alsace on the W., and Baden on the Rhine frontier. It has an irregular dumb-bell sort of shape, and comprises 177 sq. miles. The Rhine tributaries of this canton are the Birz and the Ergolz. On the northern slope of the Jura Alps, which here reach an altitude of 3,400 feet, the region is one of hills and valleys, where cattle pasture and vineyards and orchards abound. The manufactures are ribbons (large), woollens, linens, and leather-work. After union with Switzerland the city engrossed the places of influence and authority, lost its preponderance during the first French Revolution, regained supremacy in 1814; but in the civil war of 1831-32 the union troops took possession of the canton, and the Diet in 1833 divided it into independent parts—the Basel-Stadt and Basel-Landschaft. The latter division contains 163 sq. miles. Together they send seven representatives to the Nationalrath. Pop. of Basel-Landschaft, exclusive of city (1888) 61,941. The capital of Basel-Landschaft is Liesthal.

Basel (or **Bâle**), **Council of**: a memorable œcumenical council of the Church held in Bâle; summoned by Pope Martin V., who died (Feb. 21, 1431) before the appointed time of its meeting. It was opened July 23, 1431, under the pontificate of Eugenius IV. (elected Mar. 3, 1431). It was the result of the decree of the Council of Constance, and was a response to the general demand for reform in the Latin Church, and the termination of the Bohemian schism. The position it immediately took of superiority to the pope naturally excited the latter's dislike and fear. So the pope tried repeatedly to dissolve the council, but in vain. It endeavored to end the Bohemian troubles by granting the cup to the laity (Nov. 30, 1433), and its action was ratified by the pope Dec. 15, 1533. A quarrel in regard to the manner and place of holding negotiations with the Greek Church led finally to a split. Many bishops, and all the cardinals but one, went off with Julianus Cesarini, the pope's legate, first to Ferrara (Jan., 1438), and thence to Florence (Feb., 1439). Those who remained chose a new president, and went on with their work. Excommunicated by Eugenius, they elected a new pope, Felix V., Nov. 17, 1439. Very few acknowledged him. This blunder broke the moral power of the council. Its forty-fifth and last formal session was held May 16, 1443, though the council was not technically "dissolved" till May 7, 1449, when it gave in its adhesion to Nicholas V., the suc-

cessor to Eugenius IV. The Roman Catholic Church acknowledges only the first twenty-five sessions of the council, before the split. See Wessenberg, *Die Allgemeinen Concilien des 15ten and 16ten Jahrhunderts*, 2 vols. (Constance, 1770); also Hefele's *Conciliengeschichte* (vol. vii.).

Revised by JOHN J. KEANE.

Basel (or **Bâle**), **Treaty of**: the name of an important treaty of peace signed at Basel, Apr. 5, 1795, between the French republic and Prussia. The latter then agreed to abandon the coalition against France, and to give up her possessions on the left bank of the Rhine. In July, 1795, another treaty was here concluded between France and Spain.

Base Level: the level below which a stream can not erode by reason of the height of its point of discharge. When the degradation of a region has progressed so far that all its slopes are very gentle, running water has but little erosive power, and the region is said to be reduced to base level or to have become a base-level plain.

G. K. G.

Basel'la: a genus of tropical plants; order *Chenopodiaceæ*. The *Basella alba* and *rubra* have twining stems, and are commonly used as potherbs in the East Indies. In the vicinity of Paris they are raised in hotbeds, transplanted to borders, and used as a substitute for spinach. The *Basella rubra* yields a rich purple dye.

Ba'shan [Heb. *בָּשָׁן*, of disputed significance]: a district in Palestine; E. of the Jordan; most of it high table-land, extending from Mt. Hermon in the N. to Gilead in the S., the Yarnuk (Hieromax), which enters the Jordan just below the Sea of Galilee, being the boundary between Bashan and Gilead. At the time of the Exodus it was occupied by Amorites ("highlanders") whose king, Og, was slain in battle with the Israelites, his people overpowered, and the whole territory assigned to the half-tribe of Manasseh. After the Captivity, Bashan consisted of four provinces: (1) Golan (modern Jaulan); (2) Argob, or Trachonitis (modern Lejah); (3) Hauran (name unchanged); (4) Batanæa (modern Bethanyeh). Iturea (now Jedur) in the N. W. was not strictly a part of Bashan, though taken by the Israelites. The whole district was, and still is, exceedingly fertile, and was famous for its oaks and its cattle. Remarkable ruins of ancient cities are found there. See Porter's *Damascus* (1855); Wetzstein's *Reisebericht über Hauran und die Trachonen* (1860); Porter's *Giant Cities of Bashan* (1865); and Selah Merrill's *East of the Jordan* (1881). The antiquity of these ruins is disputed; recent explorers have claimed that they are not earlier than the first century A. D.

Bashaw: See PASHA.

Bashford, JAMES WHITFORD, Ph. D., D. D.: president Ohio Wesleyan University; b. at Fayette, Wis., May 25, 1849; A. B., University of Wisconsin 1873, and A. M. 1876; Ph. D., Boston University 1880; held pastorates of M. E. churches at Harrison Square, Jamaica Plains, and Anburndale, Mass., and at Portland, Me.; in present position since 1889; contributor to periodical literature and author of numerous published sermons.

Bash'i-Bazouks [Turk., head-turned]: certain irregular troopers, ununiformed and generally mounted, in the service of the Turkish sultan. They serve without pay, except maintenance, are often under the municipal governors, and are wild, turbulent men much addicted to plundering.

Bashkirs, *baash'kēerz*: a Tartar-Finnish race; a mixture of Ostyaks and Tartars, inhabiting the slopes of the Ural Mountains and neighboring plains in the governments of Orenburg, Perm, Samara, and Viatka, European Russia. They first appeared in the tenth century, and formed originally a powerful independent state, but in 1556 submitted to Russia. They still preserve some elements of independence, and are governed by their own officials. A part are settled and engaged in cattle-rearing and agriculture; the remainder are still nomads. They are usually very poor and improvident, often suffering from famine. They are lazy and predatory, yet hospitable and good-natured, strong, and muscular, capable of enduring great hardships and privations. They are professed Mohammedans. They number about 760,000.

M. W. H.

Bashkirtseff, *baash-kēert-sef*, or **Bachkirtsev**, MARIE: Russian artist; author of a diary of some celebrity; b. at Gavontsi (district of Poltava), Nov. 11, 1860; d. in Paris, Oct. 31, 1884. She was well-born and received an extended education, learning Latin and Greek, as well as all the more

important modern languages. In 1878 she went to Paris and entered the studio of Rodolphe Julian. Her talent rapidly developed, and in 1880 she was able to exhibit a picture in the Salon. From this time till her death she worked eagerly at her art, and regularly exhibited. Soon after she died her family published her diary, kept by her in French from the age of thirteen. Here she appeared as one of those vehement, sensitive, emotional natures which use themselves up in their own passionate eagerness to live. On neither art nor literature, however, has she left a permanent impression. One of her pictures, *The Meeting*, has been purchased by the French Government and placed in the Luxembourg.

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A. R. MARSH.

Basidiomyces [from *basidium* (dimin. from Gr. *βάσις*, base) + Gr. *μύκης*, a mushroom]: in fungology, a class of (mostly) saprophytic plants, related to the ASCOMYCETES (*q. v.*), from which they are apparently derived. Like the *Ascomycetes*, they produce large end-cells: these, however, do not divide internally into spores, but produce spores by means of protrusions from the surface, these becoming extended and finally enlarged at their extremities, the enlargement eventually separating as a spore. The spores thus formed are known as basidiospores, and the large end-cells from which they grew are *basidia* (sing. *basidium*). The class is naturally divided into two orders, viz.: (1) the puff-balls (*Gasteromycetæ*), and (2) the toadstools (*Hymenomycetæ*), each containing a number of families. Between 9,000 and 10,000 species of the higher fungi are known, many of which are very common. The mushroom (*Agaricus campestris*) and the larger puff-ball (*Calvatia marima*) are familiar examples.

CHARLES E. BESSEY.

Basil: an herb or shrub of the genus *Ocimum* and family *Labiata*; natives of tropical and other warm regions; generally have an aromatic smell and taste. The *Ocimum basilicum* (sweet basil) is an annual plant, a native of the East Indies, and is cultivated in Europe, where it is used to season food. The *Ocimum minimum*, or bush basil, another East Indian plant, is cultivated for the same use. The *Ocimum campechianum* is a native of Florida and of tropical America. Basil is also a common name for *Pycnanthemum*, a North American genus with numerous species, all erect, rigid herbs; also of the *Calamintha clinopodium* of Europe and North America, and other labiate herbs.

Basil, or **Basilius**, SAINT (surnamed THE GREAT): an eminent Greek Father of the Church; b. at Cæsarea, in Cappadocia, about 329 A. D. He was older by about two years than his brother, Gregory of Nyssa, and was an intimate friend of Gregory Nazianzen. From 351 to 355 he was a student at Athens. Then he traveled extensively. Afterward he spent some seven years of monastic retirement in Pontus. In 370 he succeeded Eusebius as Bishop of Cæsarea, and died there Jan. 1, 379, worn out by his ascetic habits. His works (in 3 vols., J. Garnier's ed., Paris, 1721-30; n. e. 3 vols., 1839; reprinted in Migne, *Patrologia Græca*, XXXIX.-XXXII.) consist of treatises, homilies, and letters. He excelled as a letter-writer. He was the author of monastic rules and a liturgy which bears his name, and is still used in the Russian Church. See G. Hermant, *Vie de Saint Basile* (1674); J. E. Feisser, *Dissertatio de Vita Basilii Magni* (1828); Klose, *Basilus der Grosse nach seinem Leben* (1835); Scholl, *Die Lehre des heil. Basil von der Gnade* (1881); and Hammond's *Liturgies, Eastern and Western* (1878).

Basil I. (surnamed THE MACEDONIAN): Emperor of the East; b. in Macedonia in 820 A. D. His origin was obscure. He gained the favor of the Emperor Michael III., who appointed Basil his own colleague in the empire in 866. After Michael was assassinated in 867, Basil became emperor. He obtained Asia Minor by conquest from the Saracens, whom he also drove out of Italy. He was an able ruler. D. Aug. 29, 886 A. D., and left the throne to his son, Leo VI. See G. Impaccianti, *Basilio il Macedone*, 2 vols., 1809.

Basil II.: Emperor of the East; a son of Romanus II.; b. in 958 A. D. He began to reign, in conjunction with his brother Constantine, in 975. He was an able commander, and waged war with success against the Caliph of Bagdad and the Bulgarians. He completed the conquest of Bulgaria in 1018. D. in Dec., 1025.

Basile'an Manuscript [Lat. *Codex Basilen'sis*, from *Basile'a*, the Lat. name of Basel, Switzerland]: the name of two very valuable manuscripts of the Greek New Testament, now in the library of Basel: 1. A nearly complete uncial copy of the Gospels, lacking only Luke iii. 4-15; xxiv. 47-53. It is technically known as E in the list of uncials. It is believed to belong to the eighth century, and to have been written at Constantinople. 2. A beautiful cursive manuscript of the whole New Testament except the Apocalypse. It dates from the tenth century.

Basilian Manuscript (*Codex Basilianus*): an important uncial manuscript of the Apocalypse, now in the Vatican library, technically known as B of the Apocalypse. It takes its name from the Basilian monastery at Rome, to which it once belonged. It is referred to the eighth century.

Basilian Monks, or **Monks of St. Basil**: a religious monastic order founded by St. Basil the Great in 361 A. D., and the exclusive order of the Greek Church. He composed a system of monastic discipline which was practiced by great numbers of monks both in the churches of the East and the Latin or Western Church. Spain, Italy, Asia Minor, and many other countries contain monasteries of this order at the present time. Those of Italy are chiefly of the Greek rite, and those of Spain, etc., of the Latin rite. In Asia Minor the United Melchite Greeks have many Basilian monks. There are convents of Basilians in Toronto and Sandwich, Canada. The monks of the Russo-Greek Church nearly all follow the rule of St. Basil, variously modified, even the so-called monks of St. Anthony following what is substantially the Basilian rule. The Armenian Church has also an order of Basilian monks. In 1557, at Tardon in Spain, Matteo de la Fuente established the Reformed Basilians, or Tardonites.

Basilian Nuns: founded by Maerina, the sister of St. Basil, and governed by a rule written by him, spread into the Occident, but scarcely exists there now. It is a contemplative order.

Basilica [Lat., from Gr. βασιλική (sc. *στοά*), royal, femin. of an adjec. deriv. of βασιλεύς, king]: among the ancient Greeks and Romans a public hall or court-house in which princes and magistrates administered justice. Among the Romans it attained the greatest importance, and became, besides a court of justice, a market-place and exchange. The first basilica mentioned in Roman history was the Basilica Porcia, built about 182 B. C. Great numbers were subsequently erected in Rome, and each provincial town had its basilica, which was usually adjacent to the forum. The most ancient basilicas were open to the external air, and surrounded by a peristyle of columns, for which an external wall was afterward substituted. After the reign of Constantine I. some basilicas were converted into Christian churches. The term basilica is still applied to the five great patriarchal churches in Rome and to several smaller ones, among them the cathedral in Quebec, Canada.

Basilica: a code of laws, the compilation of which was commenced by Basil I., Emperor of the East (867-886 A. D.), and completed by his son Leo. It is considered valuable for the interpretation of the Roman *corpus juris*, but a portion of it is lost. The *Basilica* was published by Heimbach (5 vols., 1833-50).

Basilica'ta (anc. *Luca'nia*): a province of Italy; bounded N. W. by Campania, N. E. and E. by Apulia, S. by the Gulf of Taranto, and S. W. by Calabria. It is also called Potenza. Area, 4,122 sq. miles. The surface is mountainous. It contains a large fertile plain next to the Gulf of Taranto. Wine, grain, tobacco, and hemp are the staple products. Capital, Potenza. Pop. (1890) 538,707.

Basil'icon Do'ron [Gr., royal gift]: the title of a work which James I. of England wrote for the instruction of his son Henry (1599). It is interesting chiefly as a literary curiosity.

Basilicon Ointment, sometimes written **Basilicum** [Gr. βασιλικόν (sc. φάρμακον, drug), royal, so named from its supreme virtue]: the *Cera'tum resi'næ* of the pharmacopœias, is composed of 5 parts of resin, 8 of lard, and 2 of yellow wax. It is much used as a stimulating application to ulcers, burns, etc.

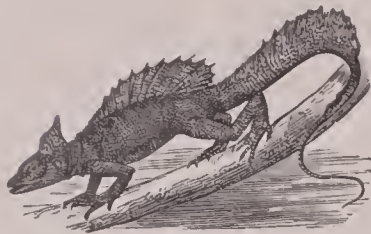
Basilides (in Gr. βασιλείδης): a Gnostic, and founder of a sect called Basilidians; lived in Egypt in the reigns of Trajan and Hadrian, about 100-140 A. D. The events of

his life are not known. Like Zoroaster, he taught the existence of two independent creative principles or powers—Good, or Light, and Evil, or Darkness. See GNOSTICS.

Basilio da Gama, baã-sec'lêe-õ da-gaa'maã, JOSÉ: Brazilian poet; b. at S. José do Rio, 1740; d. at Lisbon, July 31, 1795. He was one of the poets of Minas Geraes and one of the founders of the Arcadia Ultramarina. He studied in Rome, and in 1763 was made a member of the Roman Arcadia, with the name of Termino Sepilio. From Rome he went to Lisbon, and attracted there the attention of Pombal. When the latter fell in 1777, the *protégé* was obliged to withdraw to Brazil; but here, too, he was rendered unhappy by the persecutions of his enemies. Once more he went to Lisbon, where he died in retirement. He is chiefly known for his epic *Uruguay*, an account of the contest between the Portuguese and Spanish troops under Gomes Freyre de Andrade, and the natives of Paragnay, incited by the Jesuits (1756). He wrote also a shorter epic, *Quitubia*, and a poem entitled *Cantico aos Campos Elysios*. The *Uruguay* has been often printed, but perhaps best in Varnhagen, *Épicos brasileiros* (Lisbon, 1845). A. R. MARSH.

Basilis'cus (in Gr. βασιλίσκος): Emperor of the East; was a brother of Verina, the wife of Leo I. In 468 A. D. he commanded a large armament which Leo sent against Genseric the Vandal, by whom he was totally defeated. He usurped the throne in 474, but was defeated and deposed by Zeno in 476. D. in 477 A. D. See Gibbon, *Decline and Fall of the Roman Empire*.

Bas'ilisk [from Gr. βασιλίσκος, little king; name of a serpent, dimin. of βασιλεύς, king]: a lizard of the genus *Basiliscus* and family *Iguanidae*; natives of the tropical parts of America. The basilisks are characterized by a thin triangular fold of skin rising from the occiput and inclined backward. They also have an elevated crest along the back and tail, capable of being erected or depressed at pleasure. They are well adapted for swimming and for climbing trees, and are innocuous and inoffensive animals. The tail is much longer than the body. The *Basiliscus mitratus* is from 25 to 30 inches long, including the tail. The term basilisk was also applied



Basilisk.

to a fabulous monster by ancient and mediæval writers, who supposed that it had the form of a snake or lizard, that it infested the deserts of Africa, and that it was hatched by a toad or serpent from an egg laid by a cock. According to popular opinion, its breath poisoned the air and burned up vegetation, and the glance of its eye was fatal to men and other animals. It was sometimes called cockatrice and the king of dragons. The only creature who could face the basilisk and live was believed to be the cock; and travelers were advised to carry loud-crowing cocks with them, for the basilisk was believed to stand in great dread of his near relative, the cock, and the crowing of the cock was considered the only means of driving him away.

Ba'sin (in Fr. *bassin*): in geography, a great natural depression or concavity on the earth's surface, without reference to the stratification. The basin of a river is the whole tract of land drained by that river and its tributaries. The basin of the Mississippi, for example, is coextensive with all the country between the Rocky Mountains and the Appalachian chain. The area of this is estimated at 1,244,000 sq. miles. The basin of a lake includes, besides the space occupied by the lake, the land drained by the rivers that flow into it. The highest line between two basins is the water-parting or divide. See VALLEYS.

BASIN, in geology, is applied to depressions in the strata in which beds of a later age have been deposited. Thus the site of the city of London, called the London basin, consisting of tertiary sands and clays, occupies a hollow in the chalk, which is bounded by the North Downs on the S. and by the chalk-hills of Berks, Wilts, and Bucks on the N. The term is also applied to synclinal depressions of strata, especially in the coal-fields.

Ba'singstoke: a town in Hampshire, England; on the London and Southwestern Railway; 46 miles W. S. W. of London (see map of England, ref. 12-H). It has, in grain, malt, coal, and timber, considerable commerce, facilitated by the Basingstoke Canal. Here is a church built at the time

of Henry VIII. Basingstoke has been a market-town ever since the Norman Conquest, and was anciently of more importance than at present. Pop. (1891) 7,960.

Bas'kerville, JONX: an English printer and letter-founder; b. in Wolverley, Worcestershire, England, in 1706. He made great improvements in typography. From his press came editions highly prized of Vergil (1756), Milton, and the New Testament (1763), besides many other beautifully printed works. D. in Birmingham, Jan. 8, 1775.

Bas'ket [etymol. unknown]: a vessel made of willows, twigs, or splints interwoven. Baskets have been in use from very early ages. The monuments of ancient Egypt abound in representations of baskets. They are frequently mentioned in the Bible. The ancient Britons were remarkably expert in the manufacture of baskets, which were much prized by the Romans for their neatness and elegance. The process of basket-making is very simple, and appears to be well known among the rudest peoples—even among the aborigines of Van Dieman's Land—and many tribes of American Indians display great skill and taste in making and ornamenting them. Willow, oak, and ash are chiefly made use of in the manufacture of baskets. In the U. S. the rattan, oak, willow, and black ash are employed extensively. The Chinese export many beautiful baskets made of finely split bamboo.

Basket-fish: any species of the genus *Astrophyton*, of the order *Ophiuroidea*; a group of brittle stars in which the arms are greatly branched, in some species the subdivisions of the arms being many thousands.

Basking-shark (*Cetorhinus maximus*): the largest of the sharks and the largest of fishes; the type of a peculiar family (*Cetorhinidae*). It attains a length of nearly 40 feet, but its teeth are very small, and it feeds on small animals and is harmless to man. It is a sluggish animal, found in the northern seas, and is often captured by whalers. A large specimen will yield six or more barrels of oil from the liver. It is also known as bone-shark, elephant-shark, etc.

Basnage de Beauval, baã'naazh'de-bõ'vaãl', JACQUES: a French scholar and theologian; b. at Rouen, Aug. 8, 1653. In 1676 he became a Protestant minister at Rouen, whence he emigrated to Holland in 1685, on the Revocation of the Edict of Nantes. Among his works are a church history in reply to Bossuet (Rotterdam, 1649, 2 vols.), and a *History of the Jews*, in continuation of Josephus (1766, 5 vols.; Eng. trans. London, 1708), both of which he brought down to his own day. D. at The Hague, Dec. 22, 1723. See his life by E. A. Mailhet, Geneva, 1880.

Basque Provinces (Sp. *Vasconga'das*): a part of Spain; bounded N. by the Bay of Biscay, comprises the four provinces, Navarre, Biscay, Guipúzcoa, and Alava. These coincided with the ancient *Cantabria*. Area, 6,827 sq. miles. Pop. (1887) 814,459. The surface is mountainous and presents much picturesque scenery. The tops of the hills are mostly covered with forests of oak, chestnut, beech, etc. Among the mineral resources are copper, tin, iron, marble, and porphyry. The chief towns are Bilbao, Tolosa, and Vittoria.

Basques [Fr.]: the name of a people speaking a peculiar language and now occupying a small extent of territory in and near the Pyrenees Mountains, about the bend of the Bay of Biscay. This territory includes a small portion of southwestern France and a larger part of Spain; the provinces in which it lies are Vizcaya (Biscay), Guipúzcoa, Alava, Navarra in Spain, and Labourd, Basse-Navarre, Soule in France (in the department of the Basses-Pyrénées), the coast-line running approximately from Bilbao in Spain to Bayonne in France. The people call themselves Eskalkunac or Euskaldunac, and their language Eskara or Euskara, names which have been connected with the name (in Latin authors) *Ausei*, applied to a people of Aquitania. The name Basques is connected with *Vascones*, the Latin form of a name corresponding to the modern name Gascons, and applied to a people dwelling in Spain. The *Vascones* were probably a branch of the Iberian stock which once occupied a large part of Spain and southwestern France, and the Basques are accordingly in all probability a remnant of the old Iberians, and their language is the only surviving form of the old Iberian speech. The Basques numbered in 1875 about 620,000, of which number 500,000 were in Spanish territory. Pride and a strong local patriotism are among their marked characteristics, and they have shown repeatedly evidences of a bold and adventurous spirit. It is of in-

terest to recall the defeat of Charlemagne's rear-guard by the Basques in the valley of Roncesvalles (Roncevaux), while his army was returning from an expedition into Spain in 778; for this defeat, with the death of Hrodland (Roland), furnished the basis for the most famous work of Old French literature, the *Chanson de Roland*. The independent spirit of the Basques is further shown by the special privileges (*fueros*) which they long enjoyed in Spain, by virtue of which they held in many respects, as in matters of taxation, finance, and military service, a semi-independent position. These privileges were not finally and entirely abolished until 1876.

The Basque language, which, as said above, is probably a modern form of Iberian, is peculiar in its vocabulary and its grammatical structure, and stands in an entirely isolated position, surrounded, except on the sea side, by languages belonging to the Indo-European family, to which it is wholly unrelated, and indeed it has not yet been shown to be related to any other language now spoken in Europe or elsewhere. As no early monuments of the language have been preserved, it is impossible to tell whether it has changed much or little since the time when we first learn of Iberians in Spain, and our knowledge of ancient Iberian is practically nothing. At present the language exists in several dialects, the phonology or sound system of which appears to resemble considerably that of Spanish, though there are differences. The following features may be mentioned: There is a cerebral *s* (the letter *z* is written for the sound *s*), the sound *f* is nearly or quite confined to words of foreign origin, instead of *v* (which seems to be lacking) occurs a bilabial spirant, perhaps the same as the Spanish sound of *v*, *b*, and there are two *r* sounds (perhaps like the two recognized in Spanish), neither of which ever begins a word. Some dialects have the aspirated sounds *kh*, *th*, *ph*, pronounced like *k*, *t*, *p*, followed by *h*. There exist also palatalized *l* and *n*, presumably pronounced like Spanish *ll* and *ñ* respectively. The written *ch* is pronounced as in Spanish and English, except in dialects in France, where the sound is that of *ch* in French. The written *j* represents different sounds in different dialects; sometimes it means the sound of German *j* or English *y*, sometimes that of the modern Spanish *j*, and sometimes that of modern French *j*. The words of the language seem to be in general developed from monosyllabic roots, noun roots and verb roots being distinct. Numerous suffixes are in use, some of which correspond to declensional endings in the Indo-European languages. There is an article, developed from an older pronoun, which is suffixed to the noun (*ur*, water, *ura*, the water), or, when an adjective follows, to the adjective. The singular subject of transitive verbs often appears with a peculiar suffix *k*, which is not added to the subject of intransitive verbs. Nouns have no grammatical gender. The inflexion of verbs is the most difficult part of the grammar, on account of the perplexing combinations of pronouns and suffixes and prefixes, which produce many forms very difficult to analyze and explain. Auxiliary verbs combine with verbal adjectives or nouns and with pronominal forms, and this periphrastic conjugation is now the commonest. There exist also special forms for three moods, indicative, imperative, and optative, and two tenses, present and imperfect. A few examples (taken from Gerland) will illustrate some of these features. *Ekarri* (properly a verbal adjective), to carry; *dakart*, I carry it (the prefixed *d-* = it, the suffixed *-t* = I); *nenkarren*, I carried; *iduki* (verbal adj.), to have; *dut*, I have it; *nuen*, I had; *niz*, I am (the prefixed *n-* = I); *ethorzen niz*, I come (am in coming, the ending *-en* = in); *ethorrico niz*, I shall come (am for coming); *ethorri niz*, I have come (*ethorri* is the verbal adj.); *ethortzen nitzauk*, I come to thee (man); *ethortzen nitzaukan*, I was coming to thee (man or woman). For the vocabulary of the language it should be added that there is a considerable number of words from other languages, naturally for the most part from the adjacent Romance languages or dialects. The Basque has also contributed somewhat to the vocabulary of the neighboring languages, particularly Spanish, though the number of these words is not very large, and in some cases the borrowing is perhaps rather from the old Iberian than from the modern Basque.

The native Basque literature is naturally not very large, nor are there any monuments which can be traced farther back than the fifteenth century. The most interesting productions are proverbs, lyric poems, satirical verses, historical ballads, certain dramatic works somewhat resembling

the mediæval mystery-plays, the subjects of which are taken from the Bible or from legends, stories, or history, and comedies and farces are also found. For further information on all the subjects treated in this brief sketch, reference may be made to the following works: G. Gerland, *Die Basken und die Iberer*, in Gröber's *Grundriss der romanischen Philologie*, i. 313-334; this is the main source for the present sketch, and contains most of the needed references to authorities. See also Schuchardt's review of this in *Literaturblatt für germanische und romanische Philologie*, ix. 225-234; Larramendi, *El imposible vencido, Arte de la lengua Bascongada* (1729), and his *Diccionario del Castellano, Bascuence y Latin* (1745); W. v. Humboldt, *Berichtigungen und Zusätze zum ersten Abschnitte des zweiten Bandes des Mithridates über die Cantabrische oder Baskische Sprache* (1816), and his *Prüfung der Untersuchungen über die Urbewohner Spaniens vermittelt der Vaskischen Sprache* (1821); Francisque Michel, *Le pays basque* (1857); C. A. F. Mahn, *Denkmäler der baskischen Sprache* (1857); Prince L.-L. Bonaparte, *Carte des sept provinces basques* (1863), and his *Le verbe basque en tableaux* (1869); W. J. van Eys, *Dictionnaire basque-français* (1873), and his *Grammaire comparée des dialectes basques* (1879), and *Outlines of Basque Grammar* (1883); P. Broca, *Sur l'origine et la répartition de la langue basque* (1875); A. Luchaire, *Les origines linguistiques de l'Aquitaine* (1877); J. Vinson, *Essai sur la langue basque par François Ribáry, traduit du hongrois avec des notes complémentaires, etc.* (1877), and his *Les Basques et le pays basque* (1882), *Le folk-lore du pays basque* (1883), and *Essai d'une bibliographie de la langue basque* (1891); A. Campion, *Gramática de los cuatro dialectos literarios de la lengua euskara* (1884); Aizquibel, *Diccionario basco-español* (1882-85); Friedrich Müller, *Grundriss der Sprachwissenschaft*, iii., ii. (1887); H. Schuchardt, *Romano-baskisches* in *Zeitschrift für romanische Philologie*, xi., 474-512; and various articles in the *Revue de Linguistique* and other philological journals.

E. S. SHELDON.

Bas-relief, baa'rēe-leef', or **Basso-rilievo**, baas'sō-rēel-yā'vō [Fr. *bas-relief*, It. *basso-rilievo*, low relief]: a term applied to that kind of sculpture in which the figures have but slight projection from the background. (Compare ALTO-RILIEVO.) The slabs of alabaster which lined the halls of Assyrian palaces were covered with elaborate bas-reliefs representing deities and their worshippers and scenes of hunting and war. In Egyptian monuments bas-reliefs are common, and some of these are of a peculiar character called cavo-relievo, that is, having the whole figure in relief kept below the general surface; a groove or channel being cut all around the figure, so that the relief occupies a sunken panel of exactly its own size and shape. The most famous bas-reliefs in the world are those which formed the frieze of the cella wall of the Parthenon at Athens. The sculptors of the fifteenth and sixteenth centuries in Italy produced bas-reliefs in which the figures have but the slightest projection, and reached very great excellence in these, both in truth of modeling and in expression. The most familiar bas-reliefs are the figures on coins, which are very low indeed.

RUSSELL STURGIS.

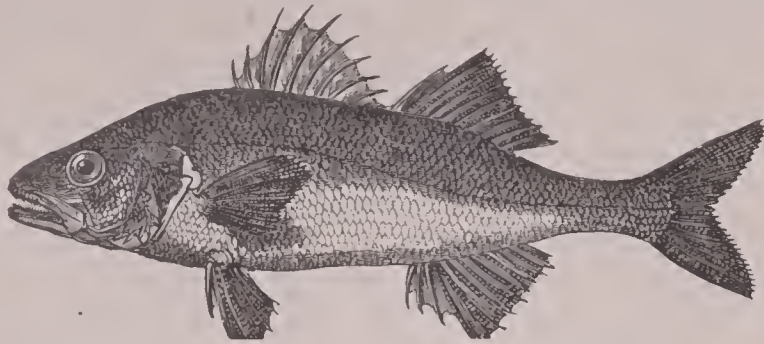
Bas-Rhin, baa'rān (Lower Rhine): a former department of France, in the northern part of Alsace, which was annexed to Germany in 1871. See ALSACE.

Bass, bāys, or **Base** [same as adj. *base*, but differentiated in spelling under infl. of Ital. *basso*; from Fr. *bas*, low]: in music, is the deepest or lowest part. In respect to harmony the base is the most important part in music, containing more frequently the fundamental notes of the chords, while on it is formed that important and effective figure in music called "organ-point." The term is also applied to the deepest and gravest quality of the human voice, the usual compass of which is from E or F below the bass staff to D or E above it. See FIGURED BASS.

Bass, bās, or **Basswood** [for *bast*, the inner bark of linden. O. E. *bæst*; Germ. *Bast*]: a tree (*Tilia americana*), also called **Linden** or **Lime-tree**. It is common in the U. S.; has serrate leaves, which are more or less heart-shaped, and bears a woody globular nut one-celled and one or two seeded. The wood is light, soft, and not of much value for fuel. It is used in carriage-building. Several species of *Tilia* are found in the U. S., one of which, the *Tilia heterophylla*, or white basswood, is found in the West and South, and sometimes grows to an immense size and height. The flowers of the basswood abound in honey of

excellent quality, and are eagerly sought by bees. The European linden (*Tilia europæa*) is planted as an ornamental tree in many cities of Europe and the U. S. This species yields the bark which is made into Russia matting. See **BAST** and **LINDEN**.

Bass, or **Bars** [also *Base*, and in dial. *Barse*; O. Eng. *bars*; Germ. *Barsch*]: the name of many species of fish of



European bass.

various genera, but appropriately belonging to the genus *Labrax*, of the perch family, and other closely allied genera. The typical species is a European sea-fish, which is prized as food, *Labrax* (or rather *Dicentrarchus*) *lupus*. The striped bass of the Eastern U. S. (*Roccus lineatus*), often called rock-fish, affords a valuable supply of food. It ascends rivers, and is caught in both salt and fresh water, and has been successfully introduced into the waters of the Pacific coast. The white bass or perch of the Great Lakes (*Roccus chrysops*), the white perch (*Morone americana*), the yellow bass (*Morone interrupta*) of the Mississippi, are examples of true bass. Equally well known are the two species known as black bass, of the rivers of America (*Micropterus dolomieu* and *Micropterus salmoides*), among our very best game-fishes. The grass bass (*Pomoxis sparoides*), the rock bass (*Ambloplites rupestris*), etc., are allied species. There are also several marine fishes known as sea bass (*Centropristis*), stone bass (*Polyprion*), etc., and the name bass is also applied to some fishes which have no claim to the name.

DAVID S. JORDAN.

Bass, EDWARD, D. D.: the first Protestant Episcopal Bishop of Massachusetts; b. at Dorchester, Mass., Nov. 23, 1726; graduated at Harvard in 1744. He was ordained in England in 1752 by Bishop Sherlock. During the Revolution, at the request of the wardens and vestry of his church (St. Paul's, Newburyport, Mass.), he saved his parish from disruption by omitting those parts of the public prayers which relate to the royal family and Government of Great Britain. He was also dismissed from his position as a missionary of the Society for Propagating the Gospel, for his supposed sympathy with the American cause. He was consecrated Bishop of Massachusetts May 7, 1797, and his episcopal authority was afterward extended over Rhode Island and New Hampshire. D. in Newburyport, Sept. 10, 1803.

Bass, EDGAR W.: soldier and scientist; b. in 1843 at Prairie du Chien, Wis. In 1862 he enlisted in the Eighth Minnesota Volunteers and as quartermaster-sergeant served against the hostile Sioux Indians until 1864, when he was appointed a cadet. Graduating at West Point in 1868, he was promoted to lieutenant of engineers. He twice served with the engineer battalion at Willets Point as lieutenant, adjutant, and commanding a company, and in the scientific work of the school of application. He was twice on duty at the Military Academy as Instructor in the Department of Natural and Experimental Philosophy. He served as assistant astronomer to observe the transit of Venus 1875, and resigned his commission as lieutenant in order to accept the professorship of mathematics at the Military Academy, to which he was appointed in Apr., 1878. Author of *Introduction to the Calculus* and *Differential Calculus*.

JAMES MERCUR.

Bassano, bãas-saa'nõ: a town of Northern Italy; province of Venice; on the river Brenta: 19 miles N. E. of Vicenza (see map of Italy, ref. 2-D). It stands on an eminence near the foot of the Alps, in a country which produces excellent wine and fruits. It is well built, has many churches and several fine palaces, also a theater, a picture-gallery, a bo-

tanic garden, and the celebrated old printing-establishment of Remondini. Bonaparte here defeated the Austrian general Wurmser, Sept. 8, 1796. Pop. 15,000.

Bassano, DUKE DE: See **MARET**.

Bassano, or **Ponte**, JACOPO, da: painter; b. in Bassano in 1510; educated by his father, Francisco (1475-1530), himself a pupil of Gio. Bellini, and in Venice. Settled in Bassano in 1510; was one of the earliest Italian genre-painters; excelled in chiaroscuro, color, and perspective; at first imitated his father, then studied the works of Titian; is said to have been prolific of paintings, but his genuine works are scarce. His latest manner is the best. He was extensively copied by two of his four artist sons, namely, Giocino (1553-1613) and Girolamo (1560-1630). His best work is an altar-piece, in Bassano, of *The Nativity*. Others of his canvases are *The Entombing of Christ*, at Padua; a *Family Concert*, in Uffizi gallery, Florence; and the *Mourning Maries*, at Chiswick, near London. D. Feb. 19, 1592.

Bas'saris [from Gr. *βασσαρις*, a fox]: the only genus of the North American family *Bassaride*, including only two species, and mostly nearly related to the raccoons. The *Bas'saris astuto*, known as civet-cat or cacomixtle, is found in Mexico, Texas, California, etc. These animals are about the size of a common cat, and very playful and easily tamed.



The ring-tailed bassaris.

They live in trees, catching rats, mice, and birds. The tail is bushy, and marked with rings like that of the raccoon.

Bassein, bãas-sayn': a city of British Burma; on an arm of the Irrawaddi, which joins the Bay of Bengal S. of Cape Negrais (see map of S. India, ref. 4-L). It is 90 miles from the sea, and large ships ascend to the city. Much rice is exported hence. Pop. (1881) 28,147.

Basselin, bãas'lân, OLIVIER: a French popular poet; b. at Vire, in the valley of the river Vire (*Val de Vire*), in Normandy, late in the fourteenth or early in the fifteenth century. He is chiefly notable as the inventor of the joyous popular song known originally from the place where it was written as *Vau de Vire*, which name was later corrupted into *Vaudeville*. Little is really known of Basselin's life. From a study of the documents, however, M. Armand Gasté thinks the following facts to be pretty well made out: Basselin was a fuller by trade; owner of a fulling-mill near Vire, in the Val, or Van, de Vire; he was a merry and dissipated fellow, the chief of a band of jolly comrades, who in time of peace composed and sang drinking and love songs of a popular kind, but in time of war campaigned it to the tune of their own patriotic songs; he was killed by the English either in the battle of Formigny (1450), or in an ambushade shortly before this battle. Several editions purporting to be of the poems of Basselin have been published in the nineteenth century (1811, 1821, 1833, 1858); but it is probable that none of the poems so printed are really by him.

The author of them was Jean le Houx, a poet of Vire belonging to the end of the sixteenth century, who wrote *Vaux de Vire nouveaux*, which he dared not sign because of the religious troubles of his time, and which were soon attributed to the great originator of such songs. Probably the only veritable remains of Basselin's works are to be found in three MSS. of the Bibliothèque Nationale in Paris, of which the first two were published by M. Armand Gasté in 1866, the third by M. Gaston, Paris (*Soc. des anc. textes fr.*, 1875).

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A. R. MARSH.

Basses-Alpes, baa'zaalp' (i. e. Lower Alps): a department in the southeast part of France; bounded N. by Hautes-Alpes, E. by Italy and Alpes-Maritimes, S. by Var, and W. by Vaucluse. Area, 2,685 sq. miles. The surface is mostly mountainous, with some fertile valleys. It is drained by the river Durance. Pop. (1881) 131,918; (1891) 124,285; (1896) 118,142. Capital, Digne.

Basses-Pyrénées, baas'pē'rāy-nāy' (i. e. Lower Pyrenees): a frontier department of France; bounded N. by Landes, E. by Hautes-Pyrénées, S. by Spain, and W. by the Atlantic. Area, 2,945 sq. miles. It is intersected by the river Gave de Pau, an affluent of the Adour, which forms its northwest boundary. The surface is partly mountainous; the soil of the lowlands is fertile. Copper, iron, and marble are found here. The chief towns are Bayonne and Pau. Pop. (1881) 434,366; (1891) 425,027; (1896) 423,572.

Basse-Terre, baas'tār (i. e. low land): a seaport; capital of the French island of Guadeloupe; on the southwest coast; lat. 15° 57' N., lon. 61° 44' W. (see map of West Indies, ref. 7-M). It is the residence of a bishop, and has a botanic garden. It has no harbor. Pop. 9,500.

Basse-Terre: a town of the British West Indies; capital of St. Christopher (or St. Kitts); on the west coast (see map of West Indies, ref. 6-L). It has a harbor and an active trade. Pop. 8,500.

Bas'set Horn (It. *cor'no di bassetto*): the richest and softest of all wind instruments; invented in Passau in 1770, and afterward improved. It is similar to a clarinet in tone and fingering, and its compass is two and a half octaves. It is, however, nearly obsolete in modern orchestration. Mozart has made fine use of two basset horns in his celebrated *Requiem*.

Bas'sett, JAMES: missionary; b. in town of Glenford, near Hamilton, Ont., Jan. 31, 1834; graduated at Lane Theological Seminary in 1859. He served in the U. S. volunteer army 1862-63; held pastorates in Presbyterian churches of Newark and Englewood, N. J., 1863-71; and the latter year became a missionary for the Presbyterian Board. He has traveled extensively in Europe; passed many years in Turkey and Persia; and, as a pioneer of missionary work in the latter country, gained an accurate knowledge of its people and languages. He was the first American to visit the tomb of Haroun al Rashid in Eastern Khorassan, and the appointment of a legation of the U. S. to Persia was largely due to his publications and efforts. He established the mission in Central and Eastern Persia, but since 1884 has resided in the U. S. Among his works are: *Among the Turcomans* (London, 1880); *Hymns in Persian* (Teheran, 1884); *Grammatical Note on the Simnuni Dialects of the Persian* (London, 1884); *Persia, the Land of the Imams* (New York, 1886).

Bassett, RICHARD: a statesman of Delaware: was a member of Congress in 1787, and of the convention of the same year which framed the U. S. Constitution. He was U. S. Senator (1789-93), Governor of the State (1798-1801), and U. S. district judge (1801-02). He was the father-in-law of Hon. James A. Bayard. D. in Sept., 1815.

Bassford, WILLIAM KIPP: See the Appendix.

Bas'sia: a genus of plants of the family *Sapotaceæ*; comprises several species of trees, natives of tropical or subtropical countries. It produces flowers remarkable for their fleshy corolla, and a pulpy fruit inclosing three or four seeds, which contain an abundance of oil or butyraceous fat, which is used as food and for other purposes. The *Bassia latifolia*, an East Indian tree called madhuca or mahowa, is valuable for timber, and bears seeds from which oil is obtained. The Galam or Shea butter, an important article of commerce in Central Africa, which is procured from the

seeds of *Bassia parkii*, is more solid and more palatable than the butter of cow's milk. It is asserted that it will keep for a year without salt.

Bassompierre, bāas'sōn'pi-ār', FRANÇOIS, Baron de: a French general; b. at Harnel, in Lorraine, 1579. He was an accomplished courtier, greatly addicted to intrigues, and gained the favor of Louis XIII., who raised him to the rank of marshal of France in 1622, and sent him on embassies to Spain and England. He fought against the Huguenots at La Rochelle. Having offended Cardinal Richelieu, he was confined in the Bastille about twelve years (1631-42). He died Oct. 12, 1646, leaving interesting *Mémoires* (2 vols., 1665), which were written in the Bastille, and are commended as attractive in style. See Puymaigre, *Vie de Bassompierre*, 1848.

Bassoon' [Fr. *basson*, deriv. of *bas*, low]: a wind instrument which consists of a perforated tube of wood in several pieces, which are fastened together, so as to bring the holes and keys within the reach of the fingers. At the end is attached a small tapering, crooked brass tube, at the termination of which is placed a reed to produce the tone. It has a compass of three octaves, from double B flat to B flat in alt.

Bassora, baas'sō-ra, or **Basra**, baas'ra: a city of Asiatic Turkey; province of Irak-Arabi, Mesopotamia; on the Euphrates (here called Shat-el-Arab); 70 miles from its mouth (see map of Turkey, ref. 8-L). It is surrounded by a brick wall nearly 8 miles in circuit, which incloses gardens, rice-fields, and groves of the date-palm. The houses are mean and the place is unhealthy. About half of the inhabitants are Arabs. Bassora has an extensive trade, being an entrepôt for the exchange of the productions of Turkey and Persia for the commodities of India. The river is navigable to this point for ships of 500 tons. Among the exports are horses, dates, raw silk, and precious metals. Bassora was founded by the Caliph Omār about 636 A. D., and was once a rich and populous city. Pop. 40,000.

Bassora Gum: a whitish or yellowish opaque substance resembling gum-arabic, but differing from it by being mostly insoluble in water. It was introduced into commerce from the vicinity of Bassora, on the Persian Gulf.

Basso-rilievo: same as BAS-RELIEF.

Bass Rock: remarkable island-rock near the mouth of the Firth of Forth, composed of volcanic material; about a mile in circumference; nearly round; 313 feet high; inaccessible on all sides except the south; cavern, accessible at low tide, tunnels the rock from east to west. St. Balthere, or Baldred, died here in a hermitage 1756; Charles II. purchased it for £4,000 in 1671, and in its dungeon many of the most eminent Covenanters were confined during his and the succeeding reign. Four young Jacobite prisoners captured and with twelve more held the rock for King James from June, 1691, till Apr., 1694, against all the force sent against them by William III., surrendering at last on honorable terms. See *Bass Rock*, by Hugh Miller and four others (1848), and *Pictorial History of England*.

Bass's Strait: separates Australia from Tasmania, and is about 140 miles wide. It was first explored in a whaling-boat by a surgeon, George Bass, in 1798, who sailed from Port Jackson, Australia. Prior to Bass's discovery Tasmania was thought to be part of Australia, and so appears in Capt. Cook's charts. The navigation of this strait is obstructed by small islands and coral reefs.

Bast, or **Bass** [O. E. *bæst*, Germ. *Bast*, inner bark of linden]: the fibrous inner bark of dicotyledonous plants (called also *liber* and *endophlæum*). consists mostly of fibers and sieve vessels. It is sometimes valuable for medicinal purposes, and is often used in the fabrication of cloths, ropes, mats, sacks, etc. The Russians apply the name bast especially to the inner bark of the linden tree (*Tilia europæa*), which is extensively used for making ropes, mats, and shoes. The trees are cut down in spring when the sap abounds. This matting is extensively imported, and used in packing furniture and other articles, for covering tender plants in gardens, etc. See FIBER.

Bast, baast, FRIEDRICH JACOB (1771-1811): Hessian ambassador in Vienna and Paris. Noted author of a work on Gregorius Corinthius, with a learned and still valuable palæographical commentary.

Bas'tard [O. Fr. *bastard*, Mod. Fr. *bâtard*, deriv. of O. Fr. *bast* (also M. Eng.), pack-saddle (used as bed by mule-

teers in inns): cf. proverb *filis de bast*, illegitimate child]: in law, a person born of parents not married to each other. It includes several distinct cases, as where the mother is unmarried, or she is a married woman, or where she was married at the time of conception, but not married at the time of birth—e. g. being then divorced from the bonds of matrimony or a widow. By the rules of the common law the fact of the marriage of the parents at the time of birth is the test of legitimacy, even though such marriage may have immediately preceded the birth. By the civil or Roman law, intermarriage after birth has a retroactive effect, and makes the child legitimate. This rule prevails in Scotland. This difference presents frequently an interesting question in private international law. Thus if a person owning both land and personal property in England should become domiciled in Scotland, and there marry the mother of his bastard child, the marriage would make the child legitimate, so that he could succeed to the personal property in England, but he would not inherit the land there situated. Some of the States in this country follow the common-law rule, while others by statute have adopted the Scotch, so that the same point may arise in our interstate jurisprudence. In the case where the mother is a married woman, and it is claimed that a child is the offspring of an adulterous connection, it will not be enough that the adulterer may have been the father. It must be proved that the husband could not have been, either by absence from the country or other sufficient reason. The presumptions of law favor legitimacy, and public policy requires that these should only be overcome by the most satisfactory proof. (For the details of this branch of the law, see Nicholas, *Law of Adulterine Bastardy*.) Public policy also requires that the mother should not be allowed, for the purpose of bastardizing the issue, to be a witness to prove want of access on the part of the husband. In the special case where the mother is at the time of the child's birth a widow, a question may arise as to the effect of the time intervening between the death of the husband and the birth of the child in raising a presumption of illegitimacy. No precise time is fixed by law, and the testimony of experts must be resorted to. Statutes sometimes fix a period after which the presumption of illegitimacy will arise. A similar question may arise after a divorce from the bonds of matrimony for the husband's fault. In the case of a divorce from bed and board, where a child is subsequently conceived it is presumed to be illegitimate, as it will be supposed that the parties have obeyed the decree of the court, and have lived apart. This presumption may be rebutted by satisfactory evidence.

By the common law, a parent is not bound to sustain an illegitimate child. By a series of statutes in England, commencing in the reign of Queen Elizabeth, the duty of support is imposed on the supposed father as well as the mother. This legislation proceeds upon the theory that it is a criminal act to bring such a child into the world and to cast its support upon the public. Accordingly, an inquiry is had before magistrates into the facts of the case, and if parentage is established an order is made for a periodical allowance for the child's support. Should the parent abscond, his or her property may be sequestered. Due provision is made for a review of the order of the magistrates. These statutes are substantially re-enacted in this country. This class of children do not have the same civil rights in all respects as those who are legitimate. They can not inherit land from either father, mother, or collateral relatives, or transmit land to them. Natural ties are, however, regarded, it being the same crime for bastard relatives to intermarry as for those who are legitimate. Such a child has no name except as it may acquire it by reputation. It is deemed to have its domicile of origin at the place of its birth. These disabilities in this country are to some extent modified by statutes in the respective States. Thus in New York an illegitimate child may inherit from its mother, in default of legitimate descendants; so the mother may in like circumstances inherit from the child. A bastard child may be made legitimate by a special act of the legislature both in England and in this country. Such an act can not, however, in the U. S. interfere with vested rights of others. It could not divest property which had been previously transmitted to legitimate relatives.

T. W. DWIGHT.

Bastia, *baäs-tee'a*: a fortified seaport of Corsica; on the northeast coast; 75 miles N. E. of Ajaccio; lat. 42° 42' N., lon. 9° 27' E. (see map of France, ref. 2-K). It is the rich-

est and most populous town in the island, of which it was formerly the capital. It is picturesquely situated on the slope of a hill which rises in the form of an amphitheater. It has a harbor which admits small vessels, and has a considerable trade in leather, wine, oil, coral, etc. Here are numerous tanneries. Bastia dates from 1383. Pop. (1891) 23,397; (1896) 22,552.

Bastian, *baas'tee-an*, ADOLF: German traveler and anthropologist; b. June 26, 1826, in Bremen; made an extensive journey to Australia, America, Asia, and West Africa 1851-59; traveled in the East 1861-65; in North and South America 1875-76; traveled through Asia, Pacific Ocean, North America, and the West Indies 1878-80; through Turkestan, Zanzibar and Australia 1889-91; professor in the University of Berlin and president of the Museum of Anthropology; president of the Geographical Society; joint editor of the *Zeitschrift für Ethnologie* 1869. His most important writings are: *Der Mensch in der Geschichte* (3 vols., 1860); *Die Völker des östlichen Asien* (6 vols., 1866-71); *Ethnologische Forschungen* (2 vols., 1871-73); *Schöpfung oder Entstehung* (1875); *Die Vorstellungen von der Seele* (1875); *Vorgeschichte der Ethnologie* (1881); *Allgemeine Grundzüge der Ethnologie* (1884); *Religionsphilosophische Probleme* (1884); *Der Fetisch an der Küste Guineas* (1885); *Indonesien oder die Inseln des Malaischen Archipels* (1884-89); *Allerlei aus Volks und Menschenkunde* (2 vols., 1888). No equally well-equipped ethnologist has ever traveled so extensively, and it is difficult to overestimate his services to science.
C. H. THURBER.

Bastian, HENRY CHARLTON, M. D., F. R. S.: b. at Truro, England, Apr. 26, 1837; was noted for a time as an advocate of the doctrine of the spontaneous generation of living organisms. He early gained fame as a pathologist. He has since his twenty-third year been officially connected with the London University, and in 1871 became Professor of Pathological Anatomy, and in 1887 of Clinical Medicine, in University College. He has published *Modes of Origin of Lowest Organisms* (1871); *The Beginnings of Life* (1872); *Evolution and the Origin of Life* (1874); *The Brain as an Organ of Mind* (1880), translated into French and German; *Paralysis* (1886); and important monographs on free and parasitic nematoids. He supplied many articles on nervous diseases to Quain's *Dictionary of Medicine*.

Bastiat, *baäs'tee-aa'*, FRÉDÉRIC: French political economist and advocate of free trade; b. at Bayonne on June 29, 1801. He wrote against the protective system in the *Journal des Économistes*. During a visit to England he became acquainted with Cobden, and on his return (1845) he produced translations of the speeches of British free-traders; was chosen a member of the Constituent and Legislative Assemblies of 1848 and 1849. His chief work is *Harmonies Économiques* (1849), in which he made unacknowledged use of the speculations of Henry C. Carey. D. Dec. 24, 1850.

Bastide, *baäs'teed'*, JULES: a French republican and journalist; b. in Paris, Nov. 22, 1800. He became chief editor of the *National* about 1836, and founded the *Revue Nationale* in 1846. He was Minister of Foreign Affairs under Cavaignac in 1848. He published important educational and historical works. D. Mar. 3, 1879.

Bastien-Lepage, *baäs'ti-ään' le-paazh'*, JULES: painter; b. at Damvillers, Meuse, France, Nov. 1, 1848; d. at Paris, Dec. 10, 1884. He was a pupil of Cabanel and one of the ablest men in the Government School of Fine Arts, but though he entered the competition for the Grand Prix de Rome, and, in the opinion of many artists and critics, was plainly the candidate with the best claim for the prize, his work was not considered quite conventional and academic enough by the classic-loving members of the Institute who made the awards, and he received only a second prize. He created a genuine sensation at the Salon of 1874 by the exhibition of the *Portrait of My Grandfather*, a picture of an elderly man painted in out-of-doors effect, and following it in succeeding Salons with such works as *The Haymakers*, *Portrait of My Parents*, *The Potato Gatherers*, and *Jeanne d'Arc*, he was soon recognized as a *chef d'école*. His influence on modern painting was far-reaching and beneficial. His methods have been imitated by a host of men. Bastien's small portraits—the marvelous one of his brother Émile, the architect, seated at a table with his drawing instruments, and those of the Prince of Wales and Sarah Bernhardt and Albert Wolf—have had the effect of stimulating this

style of portraiture, and the work of such excellent painters in this field as Chartran and Friant is directly traceable to him. In his pictures of outdoor life, those remarkable effects in *plein air*, he no doubt drew something from Courbet and from Manet; but he is decidedly original, and his work is distinguished from theirs by infinitely better drawing, and by a research for color that goes beyond Courbet and that Manet never approached. In the portrait of his parents, again, Bastien, with the most exquisitely sensitive drawing and an abundant sense of color, reaches a very high level. In the portrait of his mother, particularly, there is an exactness that is worthy of Holbein, with an unaffected sentiment that we find nowhere outside of the work of the great Dutch masters. Painted out of doors, as these portraits were, in the diffused light, there is an original side to them that is found in nobody else's work. The *Portrait of My Grandfather* is equally remarkable, and indeed says the last word in sincerity and truth in the outdoor school of painting. In *The Haymakers*, *The Potato Gatherers*, *The Woodman*, and other pictures of peasant life, while there is a different sort of sentiment from that which makes Millet's interpretations of similar themes such beautiful works of art, there is a sympathetic comprehension of the poetry of the life of the fields, and the most healthful, robust methods in representing it in pictorial form. In the picture of *Jeanne d'Arc*, where the young girl is seen standing under an apple-tree in a garden, listening to the voices of vision-like figures in armor, indicated as floating in the air behind her, Bastien attempted something more than truthful rendering of peasant character, and the figure of Jeanne d'Arc is a beautiful creation. This picture was purchased by Erwin Davis, of New York, and presented to the Metropolitan Museum in that city, where it may now be seen. It is the work of a master, and one in which the painter's surpassing qualities may be studied in one of the most complete manifestations of his talent. Bastien received medals at the Salons of 1874 and 1875 and at the Paris Exposition of 1878, and the Legion of Honor in 1879; but the full recognition of his ability did not come until the latter days of his short career. He is now considered one of the great painters of the century, and his advent really marked an important "movement" in the progress of modern art. See Theuriet's *Life* (Paris, 1892).

WILLIAM A. COFFIN.

Bastile, bäs-teel' or bäs'teel [Fr. *bastille*, from Late Lat. *bastir'e*, build]: a name at first applied to fortified buildings forming part of a system of defense, and once in general use in Paris. In 1369, by order of Charles V., Hugues Aubriot, provost of Paris, began to convert the two towers which flanked the gate of St. Antoine into a fortress of eight towers, connected by thick-curtained walls, the whole being surrounded by a moat 25 feet wide. Later alterations left the main features of the structure still dominant, and to this fortress the name "bastile" gradually became restricted. For many years its principal use was for military purposes, although state prisoners were occasionally confined here, according to a general French use of fortifications. The Frondeurs held possession of it for three years from 1649, and it was here that the great Condé took refuge when Turenne attacked Paris in 1652. Henry IV. had used the edifice as a royal treasury, and given its command to the Duc de Sully. Among the early traditions of the place is the story that its architect, Aubriot, was incarcerated for heresy within its walls. The Duc de Nemours was confined here thirteen years in an iron cage. During the reign of Louis XIII. it became the receptacle for state prisoners. It had accommodations for about eighty persons in its cells and dungeons, and it was often overcrowded during the reigns of Louis XIV. and XV. The stories of the cruelties practiced here are not well borne out by recent investigation. There were two classes of prisoners committed here by summary process: those detained as a precaution or for discipline in loyalty, and those against whom specific but untried

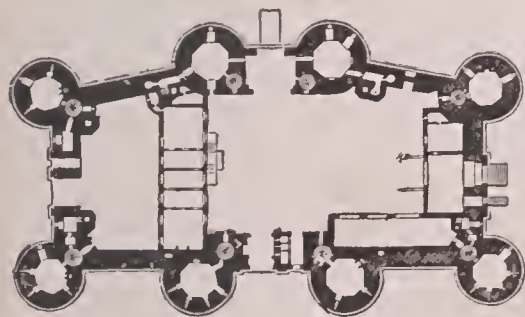


FIG. 1.—Plan of Bastille.

charges were laid. The term of incarceration which might elapse before a prisoner was released, either by royal command or by trial and acquittal, was undetermined, and occasionally some poor fellows grew old in the cells without learn-

ing why they were detained. Convicts were treated with the strictness and brutality of the times. The better class of prisoners, except in cases of state importance, had considerable comfort, could receive visitors under certain regulations, played games, and had open air exercise on the galleries and in the courts of the building. Among the famous inmates of this prison during the reigns of the two Louises named were the "Man of the Iron Mask," Fouquet, the Marshal Richelieu, De Sacy, Voltaire, Labourdonnais, Cardinal Rohan, and La Chalotais. There were incarcerations of able and upright men under arbitrary rule which were cruel and unjust, and in this way the Bastille became a symbol of despotic government in the revolutionary year of 1789. It was attacked by the Paris insurgents July 14, who killed Delaunay, the governor, and several officers, and captured the place. Three unknown prisoners and four forgers were set free. The next day the demolition of the fortress by the mob began. A bronze column on the site commemorates the destruction, while the day of its fall has become a national *fête* day. The historical documents of the prison which escaped destruction were stored in the Arsenal library, and have to some extent been elucidated by François Ravaisson in *Les Archives de la Bastille* (Paris, 6 vols., 1866-73). Carlyle has graphically described the downfall of this prison in his *French Revolution*.

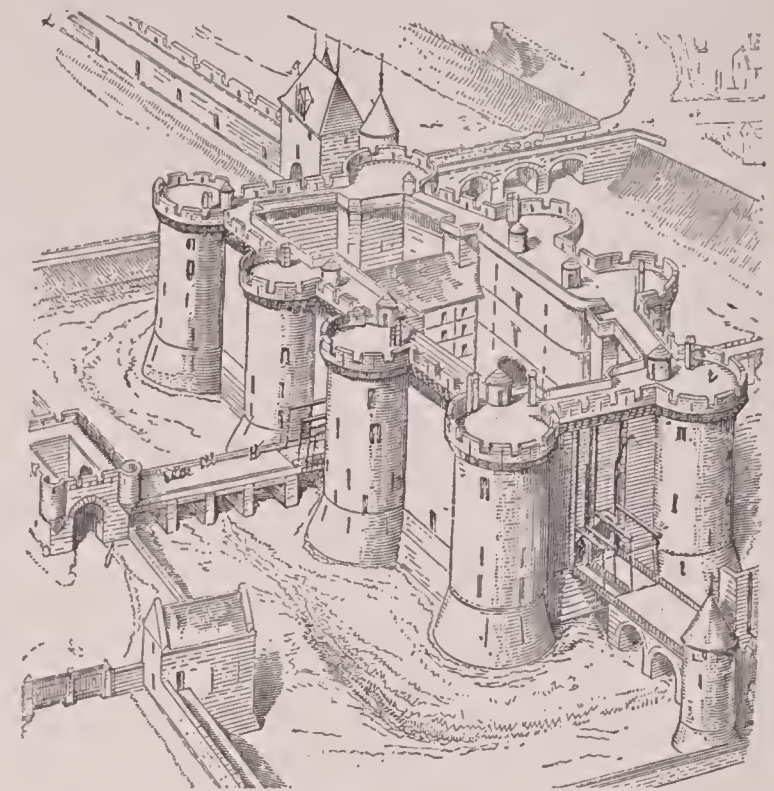


FIG. 2.—The Bastille.

Bastina'do [from Span. *bastonado*, deriv. of Span. *baston*: Ital. *bastone*: Fr. *bâton*, stick]: a name given by Europeans to a form of punishment which is common in Turkey and several Oriental countries, and was practiced by the ancient Egyptians. It consists of blows inflicted with a stick on the soles of the feet.

Bas'tion [Fr. deriv. of *bastir*, *bâtir*, build]: a bulwark; a projecting tower erected to defend the wall of a town or fortification. An unbroken wall enveloping a city or other place for its defense would be unseen at its foot; hence during ancient times and the Middle Ages towers of various kinds projected at intervals, from which the intermediate portions of the wall could be observed and reached by defensive projectiles (i. e. flanked). The invention of gunpowder made it necessary to cover enveloping walls (the *enceinte*) by earth in the form of a glacis in front of the ditch, and to enlarge these flanking towers to receive artillery. Thus enlarged, their own walls would have been undefended had not their outline been so contrived that they should *flank* each other. Hence arises the *bastion*, the two faces of which, directed upon the inner extremities of the flanks of the adjoining bastions, are *flanked* (that is, defended) by them; hence a bastion has two faces and two

flanks; the fifth side of the figure, called the *gorge* (between the extremities of the *curtain* and toward the interior of the place), is usually open. That portion of the enceinte which fills the interval between two bastions, uniting with the inner extremities of their flanks, is called the *curtain*. The *ensemble* of a curtain and two half-bastions is called a *bastioned front*. See FORTIFICATION.

Bastrop: town; capital of Bastrop co., Tex. (for location of county, see map of Texas, ref. 5-11); on Colorado river: 35 miles E. S. E. of Austin City. It is in a corn and cotton growing district. Pop. (1880) 1,546; (1890) 1,634; (1900) 2,145.

Basutoland, ba-soo'tō-land: a British crown colony near the east coast of South Africa; on the N. E. of Cape Colony. It is an irregular oval, about 160 miles long by 100 broad, on both sides of the Maluti Mountains, inclosing the head-waters of the south branch of the Orange river, with Orange Free State on the W. and N. W., Natal on the N. E., Kaffraria on the S. E., and Cape Colony on the S. W. Area, 9,720 sq. miles. The country is elevated and rough, has a fine climate, is well watered, produces abundant grass for its immense herds of cattle, and is capable of great production of grain. The productions are wool, wheat, mealies, and Kaffre corn. Coal is produced for local supply. The colony was annexed to Cape Colony in 1871, but placed directly under authority of the crown in 1884. The revenue in 1890-91 was \$208,000, the expenditure about \$5,000 less. Pop. (1891) European, 578; native, 218,324. European settlement is now prohibited. In 1891 the colony possessed 81,000 horses, 321,000 cattle, 10,000 plows and 800 wagons.

M. W. H.

Bas'yle [from Gr. *βάσις*, base + *ύλη*, wood, stuff (as in benzoyl)]: the name given by Graham to a substance, whether simple or compound, which can unite with oxygen to produce a base. Thus all the metals are examples of simple basyles, while ammonium, ethyl, methyl, etc., are compound basyles.

Bat (in Lat. *vespertilio*): an animal belonging to the order *Cheiroptera*, mammals possessing a fold of skin which commences at the neck and extends on each side between the fore legs or arms and the posterior limbs, serving as wings which enable the animal to fly. Bats are the only mammals which have the power of flight. The anterior extremities and digits are usually very long, the eyes small, ears large, thumbs short and armed with a hook-like nail, as are each of the toes of the hind feet. The clavicle is generally long. Some species have a spur on the heel. Bats fly for the most part only in the night, living by day in hollow trees, caves, and



Flying fox bat.

dark buildings. Even when their eyes have been destroyed they can fly through narrow and tortuous passages without hitting. This is probably owing to their delicate sense of hearing and touch. Except in tropical climates they hibernate in cold weather.



Vampire bat.

Bats are divided into two groups: the so-called frugivorous and the insectivorous bats. The former are found only in the Old World tropical regions. They feed chiefly on fruits, but also eat birds, small mammals, etc. They number forty or more species, and include the rousettes, kalongs, "flying foxes," etc. Some of them can spread their wings 5 feet from tip to tip. The principal genus is *Pteropus*, and its species are remarkable as having only twenty-four vertebrae, a smaller number than any other known mammal possesses. The insectivorous bats are by far the most numerous, some 300 species being described. The most formidable of these are the vampires—tropical American bats of the genus *Desmodus*, having a leaf-like membrane



Long-eared bat.

on the end of the nose. They are famous for their habit of fastening upon sleeping animals and men for the purpose of sucking their blood. Such witnesses as D'Azara, Tschudi, Waterton, and Darwin confirm this disputed statement. The bats of the U. S. are not very numerous in species, though abundant in individuals. They are of the genera *Vespertilio*, *Atalapha*, *Plecotus*, etc. Europe is much more rich in species, the "long-eared bat," *Plecotus communis*, being one of the most common. Bats are extremely useful in destroying insects, and their excrement so accumulates in certain caves, as in Farther India, in Tennessee, Arkansas, etc., as to promise to become an important source of guano. See VESPERTILIONIDÆ.

DAVID S. JORDAN.

Batabano': See the Appendix.

Bata'vi: an ancient German tribe or nation who inhabited the country now called Holland, especially an island called *Batavia* or *Insula Batavorum*, which was inclosed by the Rhine, the Waal (Vahalis), the Meuse (Mosa), and the ocean. They were conquered by Germanicus, and became loyal subjects of the Roman empire. They were exempted from the payment of taxes. The Batavian cavalry served in the Roman armies, and had a high reputation.

Bata'via (formerly *Jacatra*): a city in the province of that name, and a seaport of Java: capital of the Dutch possessions in the East Indies; on the northern coast of the island and on the Java Sea: lat. 6° 8' S., lon. 106° 50' E. (see map of East Indies, ref. 8-C). It consists of the old and new towns. The latter is about 2 miles inland, and contains the government offices and residences of the merchants, and is beautifully and healthfully situated among groves and avenues of trees. The former is flat and marshy, intersected by canals, and was formerly very unhealthy, but has been improved by draining. The temperature is almost uniform throughout the year, the average being 78° F. It has a fair harbor, and is the greatest commercial emporium of the Malay Archipelago, though Singapore is a powerful rival. It has a stadt-house, an exchange, numerous churches, several Chinese temples, banks, a school of arts and sciences, and a botanic garden. A telegraphic cable connects it with Singapore, about 600 miles distant. The chief articles of export are coffee, sugar, pepper, indigo, hides, cloves, nutmegs, mace, tin, rice, and rattans. Among the imports are various articles of European manufacture. Pop. 96,000, of whom 8,000 are Europeans. This city was founded by the Dutch in 1619.

Batavia: town; Kane co., Ill. (for location of county, see map of Illinois, ref. 2-F); on branch lines of Chicago and Northwestern and Chicago, Burlington and Quincy R. Rs., and on Fox river; 38 miles W. of Chicago. Batavia has 8 churches, 6 public schools, an institute for the insane, city-hall, windmill-factories, wagon-factories, stone-quarries, and electric lights. Founded in 1834; incorporated as a village in 1856. Pop. (1880) 2,639; (1890) 3,543; (1900) 3,871.

EDITOR OF "NEWS."

Batavia: railroad center and capital of Genesee co., N. Y. (for location of county, see map of New York, ref. 4-D); on the Tonawanda creek, 36 miles E. of Buffalo and 32 miles W. of Rochester; on the main line of the New York Central and Hudson River R. R. The Lehigh Valley and New York, Lake Erie and Western R. Rs. also pass through Batavia, while it is the terminus of the Canandaigua, Niagara Falls, and Attica branches of the Central. It contains several important manufactories, including harvester-works, gun-works, carriage-wheel and wood-working factories, shoe-factories, plow-works, and a canning-factory, and has a high school, four handsome ward schools, public library, the building for which was donated by the widow of the late Dean Richmond, and the State institution for the blind. Pop. (1870) 3,890; (1880) 4,845; (1890) 7,221; (1900) 9,180.

EDITOR OF "THE DAILY NEWS."

Batavian Republic: Holland having been conquered by the French in 1795, the Prince of Orange was deposed and a new government was established, with the title of the Batavian Republic. This was an ally or tributary to the French republic, and as such was involved in a war against the British, who nearly ruined the Dutch navy. In June, 1806, this republic was converted into a kingdom, of which Louis Bonaparte became king.

Bate'man, KATE JOSEPHINE: actress; b. in Baltimore, Md., Oct. 7, 1842; daughter of H. L. Bateman and Mrs. Bateman, both well known in theatrical circles. Her sister Ellen (Mrs. Greppo) was also an actress before her marriage. The sisters were brought up almost from infancy upon the

stage. In 1862 Kate Bateman appeared at Boston as Leah, her greatest character, and won great applause in the U. S. and Great Britain. In 1866 she was married to George Crowe, a former editor of the *London News*.

Revised by B. B. VALLENTINE.

Bateman, NEWTON, LL. D.: b. July 27, 1822, in Fairfield, N. J.; removed to Illinois with his parents in 1833; entered Illinois College in 1840, and graduated in 1843; studied at Lane Theological Seminary a short time; traveled extensively in the U. S.; taught private school in St. Louis; Professor of Mathematics 1847-51 in St. Charles College, Missouri, and then became principal of public free school of Jacksonville, Ill.; was at the same time superintendent of schools for the city and commissioner of schools for the county; became principal of Jacksonville Female Academy in 1858, and before the close of the year was elected State superintendent of public instruction. He served five terms of two years each, and was actively engaged in establishing the Normal University. In 1862-64 he had charge of the correspondence of the provost-marshal-general of the State, and then resumed the State superintendency of public instruction. From 1875 to 1892 he was president of Knox College, Illinois. D. in Galesburg, Ill., Oct. 21, 1897.

Bates, ARLO: author; b. in East Machias, Me., Dec. 16, 1850; graduated at Bowdoin College 1876; editor *Boston Sunday Courier* (1880); author of *Patty's Perversities* (1881); *The Pagans* (1884); *A Wheel of Fire* (1885); *Berries of the Brier* (poems, 1886); *A Lad's Love* (1887); *Sonnets in Shadow* (poems, 1887); *The Philistines* (1888); *Prince Vance* (with Eleanor Putnam, 1888); *Albrecht* (1890); *A Book o' Nine Tales* (1891); *The Poet and His Self* (poems, 1891); *Told in the Gate* (1892), Oriental stories in verse.

Bates, CYRUS STEARNS, D. D.: clergyman and educator; b. at Chester, O., Dec. 31, 1840; graduated at Cincinnati Law College 1865, and at the Theological Seminary of the Diocese of Ohio at Gambier 1873; ordained 1873, and became rector Newark, O., 1873; Professor of Systematic Divinity in the Theological Seminary of the Diocese of Ohio 1878-84; rector St. Paul's, Cleveland, 1884.

Bates, EDWARD, LL. D.: lawyer and attorney-general of the U. S.; b. at Belmont, Goochland co., Va., Sept. 4, 1793; emigrated to Missouri in his youth. He became a political friend of Henry Clay, and was elected a member of Congress in 1827. He presided at the national convention of the friends of internal improvement in Chicago in 1847; opposed the repeal of the Missouri Compromise in 1854; was a candidate for the nomination in the Republican Convention of 1860; Mar., 1861, President Lincoln appointed him Attorney-General of the U. S.; resigned in 1864. D. in St. Louis, Mar. 25, 1869.

Bates, JOSHUA: b. in Weymouth, Mass., in 1788. He removed to London in 1826, and became a partner and eventually the head of the banking-house of Baring Brothers & Co.; was umpire in the contested international claims arbitration growing out of the war of 1812-15. He was the principal founder of the Boston Free Library, to establish which he gave \$50,000, on the condition that it should be "perfectly free to all, with no other restrictions than may be necessary for the preservation of the books." Bates Hall in the library perpetuates his name. He afterward contributed books to the value of \$50,000. D. Sept. 24, 1864. See *Memorial of Joshua Bates* (1865).

Bates, JOSHUA, D. D.: b. at Cohasset, Mass., Mar. 20, 1776; graduated at Harvard in 1800; was ordained pastor of the Congregational church at Dedham, Mass., in 1803; was president of Middlebury College, Vt. (1818-39); was for a time chaplain of the U. S. Senate; and pastor in Dudley, Mass. (1843-54). He published various discourses, sermons, and other writings. D. in Dudley, Mass., Jan. 14, 1854.

Bates, SAMUEL PENNIMAN, LL. D.: b. at Mendon, Mass., Jan. 29, 1827; graduated at Brown University in 1851; principal of Meadville Academy, Pa. (1852-57), where he did much to stimulate the cause of education. In 1857 he became superintendent of schools in Crawford co., Pa.; in 1860 deputy State superintendent; in 1866 State historian of Pennsylvania. He has published various works, among which are a *History of Pennsylvania Volunteers* (5 vols., 1873); *History of the Colleges of Pennsylvania*; *School Laws of Pennsylvania*. He also prepared *Armor's Lives of the Governors of Pennsylvania* (1873); *Battle of Gettysburg* (1878); *Life of Gen. O. B. Knowles* (1878); *Battle of Chancellorsville* (1882).

Bates, WILLIAM, D. D.: one of the most ornate and learned of the English Nonconformist writers; was b. Nov., 1625, and d. in Hackney, July 14, 1699. He assisted at the Savoy Conference for reviewing the Liturgy. Soon after the restoration of Charles II. he was made one of His Majesty's chaplains, and but for his Nonconformity might have become a bishop. His contemporaries called him the "silver-tongued." In 1681 he published (anonymously) *Vitæ Selectorum Aliquot Virorum*. His most valuable treatise is *The Harmony of the Divine Attributes in the Contrivance and Accomplishment of Man's Redemption*. His collected works were published in 1700, again in 1723, and again in 1815, the last time by Farmer, in 4 vols. 8vo.

Batesville: capital of Independence co., Ark. (for location of county, see map of Arkansas, ref. 2-E); on railroad and White river; 90 miles N. N. E. of Little Rock. It is the seat of Arkansas College. The river is navigable for steamboats to this point, and part of the year for 200 miles above. Batesville has woolen manufactures, flouring-mills, furniture-factory, and lumber-mills. Pop. (1880) 1,264; (1890) 2,150; (1900) 2,327.

EDITOR OF "GUARD."

Batesville: town: Ripley co., Ind. (for location of county, see map of Indiana, ref. 8-G); on C., C., C. and St. L. R. R.; 50 miles W. of Cincinnati, O.; has a graded school and 2 parochial schools, 7 furniture-factories, and a candy-factory. Pop. (1890) 1,169; (1900) 1,384.

EDITOR OF "INDEPENDENT RECORD."

Batfish (*Malthe vespertilio*): a fish of the West Indies and Florida waters, remarkable for its peculiar shape. Its pectoral and ventral fins resemble the legs of a frog. Its mouth is small, and its skin rough, with bony tubercles. It is of no value.

Bath: the application of water or other liquid, or of spray or vapor, to the body for the purpose of cleansing the surface or of preserving or restoring health. Water employed in the bath is an important agent in the treatment and prevention of disease. In ancient Greece, Rome, Germany, and Judea, in Mohammedan lands (by religious precept), as in modern Finland and some other countries, bathing may be regarded as almost universal, though in desert countries the Moslems use sand instead of the water which is there so precious. Some of the American Indians, though not otherwise remarkably clean, practiced bathing in water or steam even to excess. Surf-bathing is a nearly universal pastime on many islands of the Pacific. The ancient Romans had extensive public baths—institutions which of late have been revived in Europe and America on a smaller scale, but in a manner not liable to the serious abuses which disgraced the Roman baths. See ROMAN ARCHÆOLOGY.

The "hot" bath and vapor bath are above 99° F., the normal heat of the blood; warm, tepid, and cold baths being of lower temperature. The vapor bath of water or alcohol accelerates the heart's action, softens the skin, and produces profuse sweating, and is useful in various skin diseases, in chronic rheumatism, and in some diseases of the kidneys, etc. The hot bath is also stimulant. Locally applied, it relieves pain and allays inflammation. The hot bath is often employed in the convulsive diseases of children, but its effect may be a profound one; and the tepid or warm bath is much safer, since the skin of a child is extremely sensitive to heat and cold. The hot bath sometimes causes a sense as of choking, and a degree of giddiness or headache. When its action is favorable, profuse sweating results, and on this account it is sometimes a most valuable adjunct in the treatment of kidney disease when the excretion of urine fails. The warm bath is a sedative, usually inclining one to inactivity or sleep. It is useful in feverish or restless conditions and in eruptive diseases, but is not to be recommended in acute diseases of the chest, which may be aggravated by it. The cold and tepid baths are those most generally to be employed. Cold bathing ought never to be practiced while the person is exhausted or perspiring freely; and there are many nervous, thin, and sensitive persons who can not safely endure the shock and loss of heat which it occasions. It is also dangerous in old people, in whom the sudden shock with revulsion of the blood to the interior from contraction of the blood-vessels of the skin may cause rupture of fragile vessels of the brain. In a healthy person with good powers of reaction, and followed by vigorous friction, there is probably no greater general stimulant to healthy nutrition, no better tonic than the cold bath. In disease it has in recent years assumed a place of most positive value, and especially is this true of typhoid fever. Its general tonic influence, its effect

on temperature and on the nutritive processes, rob this disease of many of its untoward symptoms and of much of its danger. The mortality from this disease has been reduced from 15 to 20 per cent. to 5 per cent., and in one series of over a thousand cases less than 1 per cent. died. The apparent cruelty of plunging a fevered patient in a cold bath, and the involuntary groaning of the patient while being bathed, have militated against the acceptance of the bath by the public and some physicians; but those who have compared the method with the old plan of treatment, and statistics, give evidence to the relief of bad symptoms and the great decrease of mortality secured. Ten per cent. of all cases of typhoid fever now die who might be saved could physicians have the entire co-operation of the public in instituting this plan of treatment with cold baths. What has been said of typhoid fever applies also to other fevers, not excepting pneumonia. In cases of great prostration or other conditions rendering cold baths impracticable, cold sponging or the "cold pack" may be employed. The "cold pack" is given by wrapping the patient in wet sheets, and then covering him with a blanket.

Hip baths, foot baths, and other local baths are occasionally required. The hot foot bath especially has received popular and scientific sanction in "colds." Various sulphur and other springs have a direct effect in skin diseases, and useful saline and other principles are no doubt capable of absorption into the system by the skin. Various drugs are used in vapor baths, and act upon the patient after absorption. Sea-bathing has a peculiar tonic effect upon some patients. Besides the above, the "Turkish" and "Russian" baths have been devised, which combine a thorough and direct detergent effect upon the skin with the various advantages of the warm and tepid bath, adding thereto the often invaluable results of manipulation or "kneading" the patient, a process the importance of which in selected cases can hardly be overestimated. "Wine baths," "mud baths," and other devices have been tried in different diseases, often with more or less benefit to the patient.

Revised by WILLIAM PEPPER.

Bath (anc. *Aquæ Solis*): a city of England; capital of Somersetshire; beautifully situated in a valley on the river Avon; 20 miles from its mouth and 102 miles by rail W. S. W. of London; lat. 51° 23' N., lon. 2° 22' W. (see map of England, ref. 12-G). The houses are mostly built of white freestone, "Bath oölite," quarried in the vicinity. Bath presents perhaps a finer appearance than any other city of England, which is partly a consequence of the configuration of its site. This is in the form of an amphitheater, on the declivity of which the finest streets extend in successive terraces. The principal public buildings are the Abbey church, in the latest Gothic style, 210 feet long; St. Michael's church, the guild-hall, an elegant theater, a masonic temple, and the assembly and concert rooms. The beauty of the situation, the mildness of the climate, and the curative efficacy of its hot saline springs render Bath a fashionable place of resort. The temperature of the springs, four in number, varies from 97° to 117° F. They rise on the bank of the river, and discharge 184,320 gal. daily. This water is recommended for scrofula, palsy, gout, cutaneous diseases, etc. This city sends two members to Parliament. The Romans erected baths at this place in the first century, and called it *Aquæ Solis*. Numerous Roman antiquities have been found in and near Bath. Pop. (1891) 51,843; (1901) 49,817.

Bath: city and railroad center; capital of Sagadahoc co., Me. (for location of county, see map of Maine, ref. 10-C); on the right (west) bank of the Kennebec river; 12 miles from the ocean, 30 miles S. of Augusta, and 36 miles N. E. of Portland. It is built on uneven ground, is lighted with gas and electricity, is advantageously situated for navigation, and has steamboat communication with Boston and Portland. The principal business of Bath is ship-building, and a large iron ship-building plant has been established and has received several Government contracts. There are also many extensive manufactories of lumber, a large one of oil-cloth, a large iron-foundry, brass-foundry, cordage-factory, and machine and boiler shops. Bath has long been noted for the excellence of its schools, and has a fine system of water-works. Pop. (1890) 8,723; (1900) 10,477. EDITOR OF "TIMES."

Bath: railroad junction and capital of Steuben co., N. Y. (for location of county, see map of New York, ref. 6-E); on the Cohocton creek, and the main line of the D., L. and W. R. R.; on the Rochester branch of the N. Y., L. E. and W. R. R.; 99 miles E. of Buffalo, 74 miles S. S. E. of Rochester, 36 miles W.

of Elmira, and 310 miles from New York. It has a jail and court-house, six churches, a free library and reading-room, a soldiers' home, an orphan asylum, and shoe, sash, blind, door, harness, and other factories. Pop. (1880) 3,183; (1890) 3,261; (1900) 4,994. EDITOR OF "FARMERS' ADVOCATE."

Bath Brick: See BRISTOL BRICK.

Bath, Knights of the: a military order in Great Britain deriving its name from the ceremony of bathing which was performed at the initiation of the knights. The earliest authentic instance of this ceremony was at the coronation of Henry IV. (1399). The last occasion on which this ceremony was used was the coronation of Charles II. in 1660, after which the order fell into oblivion until it was revived by George I. in 1725. It is second in rank among the orders of England, the order of the Garter being first.

Bathometer [from Gr. βάθος, depth + μέτρον, measure]: any apparatus for the measurement of depths of water. In many cases it consists of a very elaborate system of sounding machinery and apparatus, and depths in the Pacific Ocean of 4,655 fathoms and over have been determined by such instruments with what is thought to be very considerable precision. The depth is indicated in some cases by the compression of a mass of air within a closed chamber, reached only by the pressure of the surrounding water through a narrow passage filled with oil, mercury, or water; in other instances by the use of other equivalent devices. The pressure-gauge thus made is sunk to the bottom by a sounding-line, and is again brought to the surface either by the line by which it is let down or it is detached at the bottom by contact with the earth and floats to the surface by its own levity. For considerable depths the sounding-line is of fine steel wire, and a steam-engine is employed to drive the windlass by means of which it is lowered and raised. See DEEP-SEA EXPLORATION.

Bathori, baa'tō-rē: name of a noble family of Hungary. —ELIZABETH, wife of Count Nádasdy, is infamous on account of her cruelty. She was shown to have murdered no less than 650 maidens for the purpose of renewing her youth from time to time by bathing in their warm blood. She was condemned in 1610 to imprisonment for life, and shut up in her fortress of Csej, where she died 1614. See Baring-Gould's *Book of Werewolves* (1865).

Bathurst: a thriving town of New South Wales; capital of Bathurst County; on the Macquarie river; 98 miles W. N. W. of Sydney (see map of Australia, ref. 7-I). It is connected with Sydney by a fine road leading over the mountains. It is in a mining as well as a pastoral district of New South Wales. Mr. Hargreaves, a California digger, first discovered gold on Bathurst Plains, Feb. 12, 1851. The diocese includes 120,000 sq. miles of New South Wales. Pop. (1891) 9,069.

Baths: See THERMÆ.

Bathurst: a port of entry; capital of Gloucester co., New Brunswick; on the Bay of Chaleurs; 175 miles N. by E. of St. John; has a good harbor and an extensive trade in lumber, trout, and salmon. Pop. 3,000.

Bathyl'ius [mod. from Gr. βαθύς, deep + βίος, life]: a name given by Huxley to a granular gelatinous substance of supposed albuminous or protoplasmic nature, which is believed to cover large areas of the ocean's bed, and to represent a very low form of animal life. Its existence is now generally denied.

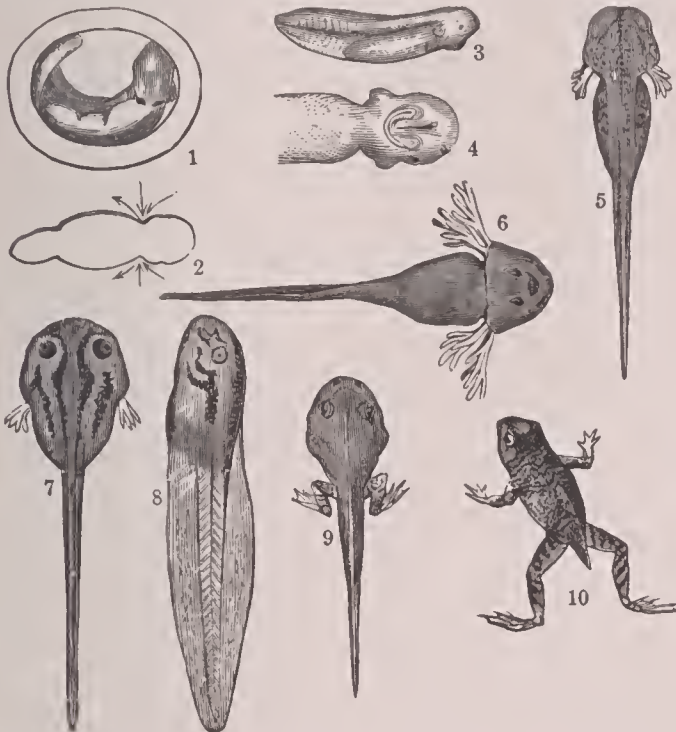
Baton Rouge, băt'ūn-roozh: capital of Louisiana and of the parish of East Baton Rouge (for location of county, see map of Louisiana, ref. 10-E); on the left (east) bank of the Mississippi, 120 miles above New Orleans by river (89 by rail and 72 as the crow flies); on the Louisville, New Orleans and Texas and the Texas and Pacific R. Rs.; lat. 30° 28' N., lon. 91° 11' W. It stands on a bluff which rises about 25 feet above the highest inundations. The river below the city is bordered by plantations of sugar-cane, groves of tropical fruit-trees, and handsome villas and gardens. The seat of government was established here in 1847. The Capitol was completed in 1852 at a cost of \$246,000. It contains a State-house, which was burned by Federal troops during the civil war, but rebuilt in 1882 and now occupied by the officers of the State government, a State university, a collegiate institute, a seminary for young ladies, public and private schools, an institute for the deaf and dumb, a school and industrial home for the blind, two orphan's homes, a Catholic academy for young ladies, and a penitentiary, in which are about 800 convicts. A convention,

which met here Jan. 21, 1861, on the 26th adopted the ordinance of secession. The city was taken by the U. S. forces May 7, 1862. On Aug. 5, 1862, a Confederate force, numbering 5,000, under Gen. John C. Breckenridge, attacked the garrison under Gen. Thomas Williams, but was repulsed after a fierce contest of two hours' duration, in which Gen. Williams was killed. The place was shortly after evacuated by the Union forces, but about a month afterward was re-occupied, and held by Federal troops to the close of the war. The arsenal has been broken up. For several years from the close of the civil war New Orleans was the seat of the State government. Pop. (1870) 6,498; (1880) 7,197; (1890) 10,478; (1900) 11,269. EDITOR "CAPITOLIAN-ADVOCATE."

Batoo Khan: See **BATU**.

Batoom, or Batoum: See **BATUM**.

Batra'chia [from Gr. *βάτραχος*, frog]: one of the classes of vertebrate animals, including salamanders, frogs, toads,



Hatching and progress of the frog (from 1 to 10).

etc. Used in this sense, the name is synonymous with *Amphibia* (*q. v.*). Batrachians are cold-blooded and oviparous, and in most living species are without scales, and the blood is partly aerated through the skin. The young, for the most part, breathe by gills like those of fishes. They generally have limbs, but not always. The young assume a fish-like form (as the tadpole), and finally, when adult, with few exceptions, lose their gills and commence breathing by lungs.

Revised by D. S. JORDAN.

Batrachidæ: See **TOAD-FISH**.

Bat'rachomyoma'chia [from Gr. *βάτραχος*, frog + *μῦς*, mouse + *μάχη*, battle]: the name of a mock-heroic poem, the subject of which was the battles of the frogs and mice.

Battaks, called also **Battas**: a native race in the interior of Northern Sumatra. They are only partly subjugated by the Dutch, an independent territory still remaining between the parallels 2° N. and 4° N. They claim to be the aborigines, are brave but peaceful, and number in all about 300,000. They are cannibals, but those under the Dutch are easily dissuaded from this practice. They have little knowledge of the arts, but can usually read and write and have a literature. The books are written on bark or bamboo staves, are generally in prose, and relate to witchcraft and incantations, or consist of stories, riddles, etc. The language is poor in general terms but very rich in inflections, and it is doubtful whether most nearly related to the old Javanese or to the Malay. M. W. H.

Battal'ion (Fr. *bataillon*): a tactical unit of infantry; a body of infantry amounting to nearly 1,000 men. In the American cavalry and artillery service eight (in infantry ten) companies constitute a battalion. The full complement of a battalion of British troops is usually ten companies. The British infantry regiments in time of peace have each one battalion, but the regiment of the continental powers is mostly so large as to comprise several battalions. In the U. S. army an infantry regiment has one battalion, while regiments in the other arms of the service have two. A de-

tachment of infantry of more than one company, and less than one regiment, is sometimes called a battalion.

Bat'tel [orthographical variant of *battle*]: an ancient mode of trial by single combat, usually called "wager of battle." It had its origin among the German tribes, and was introduced into England by William the Conqueror at the time of the Norman Conquest. It was used, however, in only three cases—in the court of chivalry, in appeals of felony, and in the issue joined in a writ of right to determine the title to real property. In criminal cases the accuser and the accused fought in person; in civil cases, by champions. The leading reason for requiring a champion in civil cases was that if the parties should engage in combat, and one of them should be killed, the proceeding would terminate by his death, and the object of the contest would be frustrated. This barbarous mode of trial, which was based on the idea that heaven would give the victory to the injured or innocent party, though for a long time practically disused, continued to be recognized as part of the law of England till the year 1819, when it was abolished by statute. The details of the method of proceeding in the case of a writ of right will be found in the third book of Blackstone's *Commentaries*, p. 337.

Battering-ram (in Lat. *a'ries*): an engine of war used by the ancient Greeks and Romans to make a breach in the wall of a town or fortress. It consisted of a heavy beam of wood nearly 100 feet long, one end of which was armed with a mass of iron or bronze in the form of a ram's head. It was suspended by a chain or rope from a crane or trivet, and was made to swing backward and forward in a direction nearly horizontal. Sometimes a huge mass of stone, armed with a ram's head and placed on wheels, was driven against the walls with great force. About 100 men were employed in impelling it against the wall. To protect these men a wooden roof (*testudo*) was constructed, and the whole machine was mounted on wheels. The blows of the ram were directed against the same point with gradually increasing momentum, which, if continued long, hardly any wall could resist. These engines continued to be used in the Middle Ages until superseded by cannon.

Bat'tershall, JESSE PARK, Ph. D.: b. in Troy, N. Y., May 26, 1851; began his chemical education 1867 at School of Mines, Columbia College, New York; studied under Prof. Wöhler at the University of Göttingen, Germany, for a year, passed a semester at the University of Leipzig with Prof. Kolbe; spent two years under Prof. Fittig at the University of Tübingen, Würtemberg, where he received the degree of doctor of natural sciences; his inaugural dissertation is a description of several new derivatives of naphthalene, including the aldehyde of isonaphthoic acid (C₁₁H₈O), its amido-compound, hydroisonaphthamide (C₁₁H₈N₂), sulpho-naphthoic and isosulphonaphthoic acids (C₁₁H₇O₂S) and salts, and several isomeric oxynaphthoic acids (C₁₁H₈O₃). After attending the chemical course of Prof. Marignac in Geneva he returned to the U. S., where he was engaged as analytic and consulting chemist; an English translation by him of Naquet's *Legal Chemistry* has been published. D. Jan. 12, 1891.

Batterson, HERMON GRISWOLD, D. D.: b. at Marbledale, Conn., May 28, 1827; ordained 1861; has held charges in Texas, Minnesota, Pennsylvania, and New York; published *The Missionary Tune-book* (1867; 10th ed. 1870); *The Churchman's Hymn-book* (1870); *Sketch-book of the American Episcopate* (1878; 3d ed., enlarged, 1891); *Christmas Carols, and other Verses* (1878); *The Pathway of Faith* (1885; 2d ed. 1886).

Battery [Fr. *batterie*; from *battre*, beat, from L. *batu'ere*, beat]: a military term used in various senses. A battery employed in the defense of a fortress is a row of heavy guns mounted on an earthwork or other platform; any one of the lines of a fortress which is armed with siege-guns. If they have a bomb-proof cover, they are casemated batteries. A battery used in attacking a fortified place is a number of siege-guns or mortars placed in a line and covered with a parapet. These batteries receive various names, expressing their design, position, etc. In field operations a battery is a number of guns, with the necessary horses, gun-carriages, artillerymen, and officers to manage the guns. The Austrians and Italians have eight pieces to a battery, and so likewise do the Russians, except for their horse-batteries, in which six are used. All other nations have six pieces to a battery. In reference to the weight of the ordnance,

they are divided into *heavy batteries* and *light batteries*. The term battery is also applied in a narrower sense to the *personnel* or complement of men and officers who serve a set of guns.

Battery, in law: See ASSAULT AND BATTERY.

Battery, VOLTAIC OR GALVANIC: a device for the generation of the electric current by chemical action. The essential parts of the voltaic cell are: (1) A liquid capable of electrolytic conduction; (2) two metal terminals, submerged in the liquid and not in contact with each other below the surface. One of the metals must be acted upon chemically by the liquid.

Under these conditions there will be a difference of potential between the metals, and when they are connected with each other a current will flow through the circuit thus formed. In spite of this flow of electricity, the difference of potential between the terminals of the cell will be maintained by the chemical action going on within the cell, the activity of which will continue until the materials are exhausted.

A typical case is that of zinc and copper in dilute sulphuric acid. When the external circuit of a cell of which these are the active parts is closed, the following reactions occur:



The zinc is thus converted into zinc sulphate, and hydrogen is set free at the copper pole. The result of this reaction is to give the copper a positive charge, with respect to the zinc, and to send a current through the outside circuit from copper to zinc. This is the simplest of voltaic cell reactions. In practice it is necessary to modify it. On the one hand, the zinc must be protected from attack during such times as the cell is resting. This is done by amalgamating it. On the other hand, the presence of free hydrogen at the copper pole creates a counter electro-motive force, which soon overcomes the proper voltaic action. To prevent this "polarization of the cell" some substance rich in oxygen and capable of giving up its oxygen to the nascent hydrogen is introduced. Nitric and chromic acids are excellent "depolarizers." Dioxide of manganese and the black oxide of copper are also used. The depolarizer is frequently placed in a porous cup, with the positive terminal of the cell surrounded by it or submerged in it. Platinum or carbon is substituted for copper whenever the latter metal is liable to be attacked by the depolarizer. The number of combinations in use for the production of voltaic electricity are too numerous to be mentioned in detail here.

Voltaic cells are divided into three groups: (1) Open-circuit cells, which are designed to furnish a current for a moment only at a time, as in ringing electric bells, etc., but which should remain in working condition for a long time without attention or replenishing; (2) closed circuit cells, which are intended to furnish a current continuously for long intervals of time; (3) standard cells, which are not constructed for the generation of appreciable currents, but are used as standards of electro-motive force. Accumulators or storage batteries are "secondary" voltaic batteries, in which the chemical conditions necessary to the production of current have been obtained by previous electrolytic action within the cell itself. See ACCUMULATOR.

Strictly speaking, the term battery should not be applied to a single voltaic cell, but to a number of such cells used in combination. See ELECTRICITY AND ELECTROLYSIS; also Carhart, *Primary Batteries* (Boston, 1891).

E. L. NICHOLS.

Bat'tey, ROBERT, M. D.: b. in Augusta, Ga., Nov. 26, 1828; took his degree in medicine at the Jefferson Medical College; practiced his profession in Rome, Ga., and by his contributions to the journals (one to the London *Lancet* on vesico-vaginal fistula) soon acquired reputation; was called to the chair of Obstetrics in the Atlanta Medical College; claimed to have first performed strict ovariectomy or oöphorectomy (1872), an operation confined to ovarian tissue. D. at Rome, Ga., Nov. 8, 1895.

Batthyányi, báat'yaan-yeé, LOUIS, Count: a Hungarian patriot; b. at Presburg in 1806. He favored the liberal cause, and was appointed president of the ministry formed in Mar., 1848. Finding his position untenable, he resigned about six months later. After his friends had been defeated in battle by the Austrians, he was tried by a court martial, and, though his conduct had been moderate, he was shot Oct. 6, 1849. See Horvath, *Louis Batthyányi, ein politischer Martyrer* (1850).

Battle: See TACTICS.

Battle: a town of Sussex, England; about 7 miles N. W. of Hastings (see map of England, ref. 13-K); in a valley enclosed on three sides by wooded hills. It is noted for the manufacture of gunpowder. Pop. 3,500. It derived its name from the great battle (usually called the battle of Hastings, and sometimes the battle of Senlac) which was fought near it on Oct. 14, 1066, between William the Conqueror and the Saxon King Harold. The victorious Norman erected here a large abbey, called Battle Abbey, now in ruins.

Battle-axe: weapon used in warfare from the earliest times, but not by all peoples or at all epochs. The early Greeks used a double-axe (bipennis), which they seem to have borrowed from the Asiatics. Among the northern nations of Europe the single-bladed axe was used from the earliest times; this was at first made with a stone head, then with one of bronze, and finally with a head of iron or steel; the weapon being, in fact, merely the utensil modified. The battle-axe as used by foot-soldiers had naturally a long handle of wood, and was called pole-axe; that used by horsemen, requiring to be swayed by one hand alone, was, later, shorter and sometimes made entirely of metal.

RUSSELL STURGIS.

Battle Creek: city and railroad center; Calhoun co., Mich. (for location of county, see map of Michigan, ref. 8-I); at the confluence of the Kalamazoo and Battle Creek rivers, 120 miles W. of Detroit. It contains Battle Creek College, controlled by the Seventh-day Adventists, whose headquarters are here. It has also a large sanitarium, and its manufactures are extensive, especially in threshing-machines and farm implements. It has good water-power and several flouring-mills, etc. Pop. (1880) 7,063; (1890) 13,197; (1900) 18,563. EDITOR OF "DAILY MOON."

Battledoor, or **Battledore** [probably from Sp. *batidor*, an instrument of the same shape used in beating clothes in washing]: an instrument with a handle and a flat board, or piece of leather or network stretched tightly on a frame, and used to strike a ball or shuttlecock. Battledoor and shuttlecock, played with the above instrument, has been a favorite amusement in Europe since the fourteenth century or earlier.

Battleford: important trading-post in Saskatchewan, Northwest Territories of Canada; at the junction of the Battle river with the Saskatchewan; 70 miles N. of the Canadian Pacific Railway (see map of Canada, ref. 8-F); 1876-83, capital Northwest Territory. The insurrection of 1885, headed by Louis Riel, who was executed for his part in it, occurred near Battleford.

Battle-ground: on railroad, Tippecanoe co., Ind. (for location of county, see map of Indiana, ref. 5-C); where the celebrated battle of Tippecanoe was fought between Gen. Harrison and the Indians under Tecumseh and his brother, the "Prophet," Nov. 7, 1811. See TIPPECANOE RIVER.

Batu (**Batou** or **Batoo**) **Khan**, baä-too'kaän: nephew of Ogdai Khan and grandson of Gengis Khan; a Mongolian chief and governor in Kipchak. He was put in command, 1235, of the Mongol army ordered to advance into Europe. Crossing the Volga river, he appeared before Riazan, took it by assault, Dec. 21, 1237, and sacked it with savage slaughter; then he laid waste Moscow; at Kozelsk, near Kaluga, he held a "carnival of death"; razed Kieff to the ground. He now led his troops into Hungary as far as Pesth and Gran, inflicting a terrible defeat on the Hungarians near Tokay, Dec., 1241. Here he was recalled by the death of his uncle into Mongolia. He was rewarded with the government of the vast plains from the Carpathian Mountains to Balkash Lake. He established his headquarters on the Volga, and from his embroidered and gilded tent arose the Golden Horde. D. in 1255.

Bat'tue [Fr. femin. of partie. of *battre*; used subst., a beating]: a mode of hunting wild animals or killing game on a large scale. A number of men, arranged at equal distances, by beating the bushes drive the animals toward a stationary party of hunters, who are waiting to shoot them. Sometimes the array of beaters is circular, and they drive the game from different parts of a large tract of forest to a common center. Battues in Great Britain are chiefly practiced in extensive preserves of pheasants, rabbits, and hares.

Batum, baä-toom', or **Batoum**: important seaport on the southeast coast of the Black Sea; 110 miles N. E. of

Trebizond, 4 miles N. of the mouth of the Tchouk river (see map of Russia, ref. 12-E). It formerly belonged to Asiatic Turkey, but by the treaty of Berlin, July 13, 1878, it became a free Russian port. It was closed by Russia in 1886. It has considerable trade and the best harbor on the east coast of the Black Sea. Immense quantities of Russian petroleum are exported. It is the terminus of a railway to the Caspian, and is provided with enormous storage accommodations for the oil. Pop. (1897) 26,417.

Baudelaire, bōd'lār', CHARLES PIERRE: French poet; b. in Paris, Apr. 9, 1821. In 1857 his volume of poems *Fleurs du Mal* caused a commotion by its entire disregard of moral distinctions and its extreme frankness of style. In the second edition (1861) several poems had to be suppressed. Other productions were *Théophile Gautier* (1859); *Les paradis artificiels, opium et haschich* (1860); *Richard Wagner et Tannhäuser* (1861), etc. His translation of the works of Edgar Allan Poe into French (3 t., 1856-58) introduced this American author to his now numerous circle of French admirers. He is at his best in *Petits Poèmes en Prose*, while his *L'Art romantique* is a collection of essays in subtle and raffiné criticism. Since Baudelaire's death, his *Souvenirs Correspondances, etc.* (1872), and his *Œuvres complètes* (4 t., 1869) have appeared. He is still worshiped by the so-called naturalist and decadent schools of French writers. D. in Paris, Aug. 31, 1867. See Ch. Asselineau, *Charles Baudelaire, sa vie et son œuvre*, Paris, 1869. A. R. MARSH.

Baudelocque, bōd'lok', JEAN LOUIS: a skillful French surgeon; b. in Heilly, Picardy, in 1746. He was selected by Napoleon to attend the Empress Marie Louise as first accoucheur. He wrote an able work on the *Art des Accouchements* (2 vols., 1781). D. in Paris, May 1, 1810.

Baudissiu, bow'dis-sin, WOLF HEINRICH FRIEDRICH KARL, Count: German author; b. in Rantzau, Jan. 30, 1789. He translated, together with Tieck, a number of Shakspeare's works. Under the title of *Ben Jonson und seine Schule* (2 vols., 1836) he published translations of the works of other English authors. He also made translations of Molière's comedies (1865-67). D. in Dresden, Apr. 4, 1878.

Baudissin, WOLF WILHELM FRIEDRICH, Graf von: German theologian; b. in Sophienhof, Holstein, Sept. 26, 1847; studied at Erlangen, Berlin, Leipzig, and Kiel; became professor extraordinary in the theological faculty at Strassburg 1876; ordinary 1880; at Marburg 1881; known chiefly by his *Studien zur semitischen Religionsgeschichte* (Leipzig, 2 vols., 1876-78); and *Die Geschichte des Alttestamentlichen Priestertums untersucht* (1889). A. R. MARSH.

Baudrillart, bō'drē'laär', HENRI JOSEPH LÉON: French political economist; b. in Paris, Nov. 28, 1821; became professor in Collège de France 1852; Professor of the History of Political Economy 1866; editor *Journal des Économistes* 1855-92; d. Jan. 24, 1892. Author (in French) of *Philosophy of Political Economy* (2d ed. 1883); *History of Private and Public Luxury* (1878-80); *The Agricultural Population of France* (1880-88).

Baudry, bō'drē', PAUL JACQUES AIMÉ: b. at La Roche-sur-Yon, France, Nov. 7, 1828; d. in Paris, Jan. 17, 1886; one of the great artists of the modern French school; pupil of Drölling; Grand Prix de Rome 1850; first-class medal, Salon 1857; commander of Legion of Honor 1875; medal of honor, Salon 1881; member of the Institute 1870. Baudry is pre-eminently a stylist, and his work shows his love of the classic. It may be said of him that he was inspired chiefly by the great masters of the Italian Renaissance, and was faithful to the precepts upheld by M. Ingres, though, like most artists of his time, he also felt the influence of Delacroix. His greatest decorative works are those in the foyer of the Grand Opera-house in Paris, on which he spent some of the best years of his life (1866-74). He painted a number of beautiful pictures of nude figures and compositions, one of the finest (1857) of which is *Fortune and the Child*, in the Luxembourg Gallery. *St. John* (1861) and *The Wave and the Pearl* (1863) are two of his most beautiful works. His ceiling *Glorification of the Law* is in the Palae of Justice, Paris. Baudry was a portrait-painter of elegant taste and a technician of wonderful brilliancy. His full-length portrait of Gen. Cousin Montauban, Count of Palikao (1877), standing beside his horse, with his right arm resting on the saddle and his sword held with the butt of the scabbard resting on the ground, is such a work as can only be compared with the masterpieces of Velasquez or Van

Dyke. Baudry was a colorist of great distinction, and his drawing is subtle and refined. WILLIAM A. COFFIN.

Bauer, bow'er, BRUNO: a German rationalistic theologian and biblical critic; b. in Eisenberg in Saxe-Altenberg, Sept. 6, 1809; was the son of a painter on porcelain, and studied theology and philosophy in the University of Berlin, in whose theological faculty he became privat-doeent 1834; professor extraordinary at Bonn 1839. He was a pupil of Hegel, and at first belonged to the right wing of the Hegelians, holding to the idea that science and revelation, philosophy and theology, could be brought into perfect harmony with each other. His *Kritische Darstellung der Religion des alten Testaments* (Berlin, 1838, 2 vols.) was based on this view. But his critical studies of the Bible led rapidly to a rupture, as shown by his *Die evangelische Landeskirche Preussens und die Wissenschaft* (Leipzig, 1840); *Kritik der evangelischen Geschichte Johannes* (Bremen, 1840); and *Kritik der evangelischen Geschichte der Synoptiker* (Leipzig, 1841-42, 3 vols.). Then followed an equally boisterous breaking away from Hegel: *Posaune des jüngsten Gerichts über Hegel, den Atheisten* (1841), and *Hegel's Lehre von Kunst und Religion* (1842). The personal result of his extremely free biblical criticism was his deposition from his professorship in 1842. He then removed to Berlin, and produced book after book full of learning and full of speculation, but those on religious matters are almost worthless. He became a by-word for learned trifling carried to the verge of insanity. In 1843 he wrote *Das entdeckte Christenthum*, which was suppressed before its publication, and published a general critical review of the German radicalism of the period. In connection with Jungwitz and his brother Edgar he published *Geschichte Deutschlands und der Französischen Revolution unter der Herrschaft Napoleons* (Charlottenburg, 1846, 2 vols.). But after spending several years on political and historical researches, producing, beside the book named, *Geschichte der Politik, Cultur und Aufklärung des 18 Jahrhunderts* (1843-45, 4 vols.); *Die bürgerliche Revolution* (Berlin, 1849); *Der Untergang des Frankfurter Parlements* (1849), etc., he returned to the field of biblical criticism; if possible, still more antagonistic to the reigning views than formerly he had been. In his *Kritik der paulinischen Briefe* (Berlin, 1850), he attempted to show that the four leading Epistles, which had never before been questioned, were the production of the second century. According to his later works (e. g. *Christus und die Cæsaren*, Berlin, 1877; 2d ed. 1879, etc.) Seneca was the real founder of Christianity! D. in Rixdorf, near Berlin, Apr. 13, 1882. Revised by S. M. JACKSON.

Bauer, GEORG LORENZ: a German theologian and linguist; b. in Hilpoltstein, near Nuremberg, Aug. 14, 1755. He became Professor of Oriental Languages at Altdorf in 1789, and in Heidelberg in 1805. Among his works are *Hermeneutica Sacra Veteris Testamenti* (Leipzig, 1797), and *Biblische Theologie des neuen Testaments* (4 vols., 1800-02). He was a rationalist, and maintained that the Bible should be interpreted by grammatical and historical principles, as the ancient classics are. D. in Heidelberg, Jan. 12, 1806.

Bauer, WILHELM: a German inventor; b. at Dillingen, Dec. 23, 1822. He constructed a diving-boat for submarine operations, with which several successful experiments have been made. He also made improvements in torpedoes for the destruction of ships and in the firing of guns under water. Bauer served with distinction in the Schleswig-Holstein war of 1850, and afterward engaged in the service of Russia. D. in Munich, June 18, 1875.

Bauernfeld, bow'ern-felt, EDUARD, von: Austrian poet and dramatist; b. in Vienna, Jan. 13, 1802; perhaps the most prolific playwright of modern Germany. As a young man he took part in the political agitations, culminating in 1848, for a reform of the Austrian administration. Of his works we may cite *Vermischte Gedichte* (1852); *Gesammelten Schriften* (12 vols., 1871-73); *Die Verlassenen*, a romance (1875). D. in Vienna, Aug. 9, 1890. A. R. MARSH.

Bau'gher, HENRY LOUIS, D. D.: Lutheran divine; b. at Abbotstown, Pa., about 1803; Professor of Greek and Belles-Lettres (1832-50) at Pennsylvania College, Gettysburg, and its president (1850-68). D. in Gettysburg, Apr. 14, 1868.

Baugher, HENRY LOUIS, Jr., D. D.: Lutheran divine; b. in Gettysburg, Pa., Aug. 6, 1840; educated at Pennsylvania College, and its seminary in Gettysburg, Pa., and at Andover, Mass.; pastor in Wheeling, West Va., Norristown, Pa., Indianapolis, Ind., and Omaha, Neb.; Professor of Greek

Language and Literature in Pennsylvania College 1869 to the present, with the exception of three years in the pastorate, and as Professor of the Greek Language in Howard University, Washington, D. C. He supplied temporarily the chairs of Greek Exegesis (1870-74) and of Systematic Theology (1883-84) in the seminary at Gettysburg. Member of international committee on Sunday-school lessons since 1879, and from 1875 to the present has been editor of *The Augsburg Teacher*, Philadelphia. HENRY E. JACOBS.

Bauhin, bō'ān', GASPARD: a Swiss botanist and anatomist; b. in Basel, Jan. 17, 1560. He became Professor of Anatomy and Botany in his native city in 1588. He wrote valuable medical and botanical works, among which were *Prodromus Theatri Botanici* (1620), and *Pinax Theatri Botanici* (1623). D. in 1624. His brother John was co-laborator with him, and the *Bauhinia* genus of plants with its two-lobed leaves was named for them.

Baum, HENRY MASON, D. C. L.: editor of *The Church Review* since 1881; b. at Earl Schuyler, Herkimer co., N. Y., Feb. 24, 1848; ordained 1870; held pastoral charges in Western New York, Wyoming, New Jersey, Central Pennsylvania; published *The Rights and Duties of Rectors, Churchwardens, and Vestrymen in the American Church* (1879); editor of *Church Reunion Discussed on the Basis of the Lambeth Propositions of 1888*. Reprinted from the *Church Review* for Apr. and Oct., 1890.

Baumé, bō'may', ANTOINE: French chemist; b. at Senlis, Feb. 26, 1728. He improved the manufacture of porcelain, made several inventions, and simplified several processes in industrial chemistry. Baumé's hydrometer is in general use among chemists. Among his works is a *Manual of Chemistry* (1763). D. Oct. 15, 1804. See Cadet de Gassicourt, *Éloge de Baumé*, 1806.

Baumgarten, bowm'gāar-ten, ALEXANDER GOTTLIEB: a German philosopher; b. in Berlin, July 17, 1714; a disciple of Wolf. He became Professor of Philosophy at Frankfurt-on-the-Oder in 1740; was one of the first of moderns to give scientific form and place to aesthetics. He published, besides other works, *Metaphysica* (1739) and *Æsthetica* (2 vols., 1750, unfinished). D. in Frankfurt-on-the-Oder, May 26, 1762. See G. F. Meyer, *Leben A. G. Baumgarten's* (Halle, 1763), and J. Schmidt, *Leibnitz und Baumgarten* (Halle, 1875).

Baumgarten, MICHAEL: a German theologian; b. in Haseldorf, Holstein, Mar. 25, 1812; became Professor of Theology in Rostock in 1850. He published many books and periodicals in opposition to the State Church of Mecklenburg, in consequence of which he was removed from his professorship in 1858, and, afterward continuing his attacks, was imprisoned and fined. He was a founder of the Protestantverein (1865), which, however, he left in 1877, and an earnest advocate of disestablishment. He sat in the Reichstag in 1874, 1877, and 1878. He published many polemical writings and popular appeals in behalf of a people's Church; but of more account are his *Apostelgeschichte* (Halle, 1852, 2 vols.; 2d ed. Brunswick, 1859; Eng. trans. *The Acts of the Apostles*, Edinburgh, 1854, 3 vols.), and *Schleiermacher als Theologe für die Gemeinde der Gegenwart* (Berlin, 1862). D. at Rostock, July 21, 1889. See his *Life*, by H. H. Studt, Kiel, 1891.

Baumgartner, ANDREAS, von: a German savant and minister of state; b. at Friedberg, in Bohemia, Nov. 23, 1793. He became Professor of Physics at Vienna in 1823, and Austrian minister of trade and public works in 1851. About this date he was chosen president of the Academy of Sciences in Vienna. He published a work called *Naturlehre* (1823). D. near Vienna, July 30, 1865.

Baumgartner, GALLUS JACOB: a Swiss politician of the liberal party; b. in Altstätten, Zurich, Oct. 18, 1797. He took part in the revision of the constitution of St. Gall, and promoted the separation of the canton into Basel country and Basel city. He founded, Oct., 1842, the *Neue Schweizer Zeitung*, and published, among other works, *Die Schweiz in ihren Kämpfen und Umgestaltungen, 1830-50* (4 vols., 1853). D. in St. Gall, July 12, 1869.

Baumgarten-Crusius, LUDWIG FRIEDRICH OTTO: a German theologian; b. in Merseburg, July 31, 1788; became Professor Extraordinary of Theology at Jena 1812, and ordinary 1817. He played a prominent part as the defender of Schleiermacher's supernaturalism. Of his books may be mentioned *Lehrbuch der christlichen Sittenlehre* (Leipzig, 1827); *Lehrbuch der Dogmengeschichte* (Jena,

1831-32, 2 vols.), and *Kompendium der christlichen Dogmengeschichte* (ed. by Hase, Leipzig, 1840-46, 2 vols.). D. in Jena, May 31, 1843.

Baur, bowt, FERDINAND CHRISTIAN: Protestant theologian and historian; b. in Schmiden, near Cannstadt, Württemberg, June 21, 1792. He studied theology in the Blaubeuren Theological Seminary 1805-09, and in the University of Tübingen 1809-17; became Professor of Theology in the former 1817, and in the latter 1826. With the latter institution his fame is bound up, for there he produced those works in New Testament interpretation which for a time produced consternation in the conservative ranks, and created the Tübingen school of destructive criticism, which had its day. He had been a disciple of Schleiermacher, but became a Hegelian and applied Hegel's philosophy to Church history. The most striking statement of the school is that in the primitive Christian Church there was a feud between the followers of Peter (Judaic Christianity) and those of Paul (progressive Christianity), but it was not till the second century that there arose the Catholic Church, the resultant of the opposing forces. The New Testament, he claimed, bears witness to this struggle. The only portions of it produced before 70 A. D. were the four chief Pauline Epistles (Romans, 1 and 2 Corinthians, and Galatians)—the only ones whose Pauline origin he granted—and the Revelation, in which this alleged antagonism showed itself. The rest of the New Testament dates from the second century, and is "tendency-writing"—i. e. intended to promote unity. To this end the Acts and the Gospel of John especially were written. Even Matthew and Luke betray, he claims, the hand of partisans, while Mark is the bridge between them in the interest of peace. This theory is worked out with great learning and acuteness in Baur's *Paul* (Stuttgart, 1845; 2d ed. Leipzig, 1866-67, 2 vols.; Eng. trans. Lond., 1873-75, 2 vols.) and *Church History* (Eng. trans. covers only the first three centuries, 1878-79, 2 vols.; the orig., Tübingen, 1853-62, 5 vols., goes down to 1848). Of his untranslated works the chief are *Die christliche Lehre von der Dreieinigkeit und Menschwerdung Gottes* (Tübingen, 1841-43, 3 vols.); *Lehrbuch der christlichen Dogmengeschichte* (Stuttgart, 1847; 3d ed. Leipzig, 1867); and the posthumous *Vorlesungen über die christlichen Dogmengeschichte* (1865-67, 3 vols.). See Baur himself, *Die Tübingen Schule* (Leipzig, 1859); R. W. Mackay, *The Tübingen School* (London, 1863). D. at Tübingen, Dec. 2, 1860.

S. M. JACKSON.

Bantain, bō'tāin', LOUIS EUGÈNE MARIE: a Roman Catholic philosopher and theologian; b. in Paris, Feb. 17, 1796. He became Professor of Philosophy at Strassburg 1819; suspended in 1822 on account of his advocacy of Fichte's views; turned priest 1828; ultimately was a popular preacher at Paris; became director of the College of Juilly in 1849, and Professor of Moral Theology in the Sorbonne 1853. He published numerous discourses and *Philosophie du christianisme* (Paris, 1835, 2 vols.); *La philosophie morale* (1840, 2 vols.); and especially *Étude sur l'art de parler en public* (1856; 2d ed. 1863; Eng. trans., *The Art of Extempore Speaking*, London, 1858; 6th ed. 1878; repr. New York, 1859; London ed. 1874). D. in Viroflay, near Versailles, Oct. 18, 1867.

Bautzen, bowt'sen, or **Budissin**, boo'dis-sin: a town of Saxony; on the Spree; and on the railway from Dresden to Görlitz; 35 miles E. N. E. of Dresden (see map of German Empire, ref. 5-G). It has a royal palace, a cathedral, two public libraries; also manufactures of woollens, linens, leather, hosiery, paper, etc. Pop. (1895) 23,678. Here occurred a great battle (May 20 and 21, 1813) between Napoleon and the allies, who finally retreated. The loss of the allies is estimated at 13,000, and that of Napoleon at 20,000 men.

Bava'ria [New Lat. from Med. Lat. *Boiaria*, i. e. the country of the *Bo'i* or *Boia'rii*; in Ger. *Bay'ern* or *Bai'ern*]: a kingdom forming part of the German empire. It is, next to Prussia, the largest German state.

Geography.—It consists of two isolated portions: the eastern and larger portion is bounded N. by Prussia, Saxe-Meiningen, Saxe-Coburg-Gotha, Reuss, and Saxony; E. and S. by Austria; W. by Württemberg, Baden, and Hesse-Darmstadt; the western and smaller portion, known as Rhenish Bavaria or the Palatinate, is bounded by Prussia, Alsace, Hesse-Darmstadt, and Baden. Area, 29,282 sq. miles. The larger portion of the country is mountainous, the principal mountains being the Algäu and Bavarian Alps in the S., the former of which reach an elevation of 9,000 feet; the Bohemian and Bavarian

Mountain forests on the eastern frontier; the Fichtel Mountains in the N. E.; the Franconia, Jura, and the Hardt. The main rivers are the Danube, which receives in Bavaria thirty-nine affluents, and the Main in the N. The Rhine forms part of the frontier of the Palatinate. The Danube and the Main are connected by the Ludwig's Canal. The number of lakes, most of which are alpine, amounts to about fifty. The climate is, on the whole, temperate and healthy, but rough and severe in the mountains. The soil is fertile and rich in products, particularly in corn and cattle. There are celebrated mineral springs in Lower Franconia and Upper Bavaria (Kissingen and Brückenau).

Population.—The total population, according to census of Dec., 1895, was 5,818,544, of whom rather more than seven-tenths are Roman Catholics, and about one-fourth are Protestants. The Jews numbered 53,697 in 1885. It is divided into eight provinces, which, according to census of 1890, had the following population: Upper Bavaria, 1,102,027; Lower Bavaria, 664,131; Palatinate, 728,422; Upper Palatinate, 537,217; Upper Franconia, 572,189; Middle Franconia, 699,928; Lower Franconia, 617,680; Suabia, 667,788. As regards the descent of the inhabitants, about 1,820,000 are Bavarians (Old Bavarians or Bavarians proper), 2,330,000 Franconians, and 650,000 Suabians.

Education.—Bavaria has 3 universities—at Munich, Würzburg, and Erlangen—9 lyceums, 28 gymnasia (colleges), 10 normal schools, polytechnical institutions at Munich and Nuremberg, and about 7,200 public schools (school attendance is compulsory here from six to fourteen); also Latin, technical, and special schools. All the Kings of Bavaria have been liberal patrons of science and art. There is an academy of science and an academy of plastic arts in Munich, which is also celebrated for its rich collections of works of art.

Industries.—The principal occupations of the inhabitants are agriculture and the breeding of cattle; the latter chiefly in the mountainous districts, the former in the plains. Among Bavaria's chief products are cereals, fodder, potatoes, hops, tobacco, wine (in the Palatinate and in the region of the Main). About 10,000 sq. miles are covered with wood, one-half of which belongs either to the state or to the communities. The culture of the forests is well regulated and profitable. The most active industry is found in the provinces of Middle Franconia, Suabia, and the Palatinate. Prominent among the industrial cities are Augsburg, Kempten, Nuremberg, Fürth, Schwabach, Baireuth, Würzburg, Bamberg, Erlangen, and Hof. The most celebrated branch of Bavarian industry is the brewing of beer. The average quantity manufactured annually is 278,000,000 gal.; of this, however, only about 27,000,000 gal. are exported. Bavaria has also flourishing manufactures of linen, woolen, iron, and wooden ware, numerous glass-works, manufactories of paper, chinaware, and guns, and celebrated melting-houses at Oberzell. The manufactories of tobacco produce annually large quantities of tobacco and cigars. The total value of its leading mining products in 1889 was 6,548,577 marks.

Commerce.—The most important commercial cities are Nuremberg and Augsburg (bills of exchange), Hof, Bamberg, Schweinfurt, Würzburg, Speier, Munich, Ratisbon, Passau (navigation of the Danube). Bavaria in 1891 had 3,485 miles of railroad, of which 2,982 miles belonged to the state. The navigation of the Danube, the Rhine, and the Inn employs large numbers of vessels, including numerous steamboats, especially on the Danube and the Rhine. The chief articles of export are beer, corn, wood, cattle, wine, and hops.

Weights and Measures.—The metric system has been established in Bavaria, as in other parts of Germany, since Jan. 1, 1872.

Government.—Bavaria is a constitutional monarchy, the fundamental law of the state bearing date of May 26, 1818, and the electoral law now in force having been adopted on June 4, 1848. The crown is hereditary in the male line only, according to the right of primogeniture. The king exercises the administrative power; the legislative he shares with a legislature consisting of two chambers. The upper chamber, or chamber of the Reichsräthe (counselors of the empire), had, in 1889, 71 members, of whom 49 were entitled to a seat as being chiefs of noble families, and 7 by their office, while 15 were life-members appointed by the crown. The lower chamber, or chamber of representatives, had, in 1889, 159 members, who are elected for a term of six years. The chambers must be convoked at least once every three years. There are eight courts of appeal, and one supreme court of appeal in Munich. The receipts and expenditures of the state amounted in 1891 to 280,291,642 marks; the public debt to 1,333,-

189,690 marks; the civil list and appanages to 5,404,850 marks. The Bavarian army, according to the treaty of Nov. 23, 1870, forms two army-corps of the imperial army of Germany under the independent military administration of the King of Bavaria, though under the chief command of the emperor. The capital is Munich; the most important towns next to it are Nuremberg, Augsburg, Würzburg, Ratisbon, and Bamberg.

History.—Old Bavaria, or Bavaria proper, was originally inhabited by the Boii, a Celtic tribe. Under Augustus it constituted the Roman province of Noricum. During the great migration of nations in the fourth and fifth centuries the country was occupied by Germanic tribes, from which the confederation of the Boioari arose, which, though governed by its own princes, was dependent upon the Kings of Austrasia. At the head of the confederation was the family of Agilolfingians, who are mentioned for the first time in 556, and were deprived of the ducal dignity by Charlemagne in 777. From this time until 911, when the Carolingian house died out, Bavaria belonged to the Franconian empire. During the following 250 years Bavaria was disturbed by endless civil wars. In 1180 the Count Palatine, Otto von Wittelsbach, was invested with Bavaria. His descendants, with but short interruptions, have remained the rulers of the country to this day. Two of them were elected German emperors—Louis the Bavarian (as Emperor Louis IV., 1314–47) and the Elector Charles (as Emperor Charles VII., 1742–45). From 1255 the country was generally divided between two lines—the Counts of the Rhenish Palatinate and the Dukes of Bavaria. The electoral dignity repeatedly passed from one branch to the other, until the peace of Westphalia (1648) conferred the fifth electoral dignity permanently upon the Dukes of Bavaria, while an eighth electoral dignity was expressly created for the Palatine line. In 1777 the line of the electors of Bavaria became extinct, and the elector of the Rhenish Palatinate, Charles Theodore, became ruler of Bavaria. Austria, however, claimed a large portion of the country, and the weak elector was willing to concede this claim; but Frederick the Great supported the protest of the next agnate the Duke Charles of Zweibrücken, against this arrangement, and thus the bloodless “war of the Bavarian succession” arose, which was ended May 13, 1779, by the treaty of Teschen, which gave to Austria the region of the Inn, with the town of Braunau, and guaranteed the succession in the remainder of the dominions of Charles Theodore to the Duke Charles of Zweibrücken. In 1784 the Emperor Joseph I. made a new attempt to obtain the whole of Bavaria, by offering to the Elector Charles Theodore, in exchange for Bavaria, the Austrian Netherlands, with the title of king; but again the plan was foiled by the opposition of the Duke of Zweibrücken and Frederick the Great. Charles Theodore died Feb. 16, 1799, and, as in the meanwhile the Duke Charles of Zweibrücken had died childless, his brother (Maximilian IV.) Joseph, Duke of the Palatinate-Zweibrücken, became Elector of Bavaria and the Palatinate. In the history of Germany the Dukes of Bavaria are chiefly noted for the leading part which they took in the defense of the Catholic Church against the Reformation. Throughout the sixteenth, seventeenth, and eighteenth centuries they were the heads of the Catholic party among the princes and states of the empire. The Elector Maximilian lost in the peace of Lunéville the Zweibrücken Palatinate, but in place of these districts received a number of secularized bishoprics, the change adding to his dominions 2,100 sq. miles, with nearly 200,000 inhabitants. In the war of 1805 the elector joined France against the Emperor of Germany, and received a further increase of about 8,000 sq. miles and 800,000 inhabitants. On Jan. 1, 1806, the elector assumed the title of king, and in July of the same year he joined the Rhenish Confederation, which he left again in 1813, in order to unite with the allies against Napoleon. The peace of Paris and that of Vienna regulated the territory of Bavaria as it has remained since, with the exception of a very small district which in 1866 was ceded to Prussia. In 1818 the constitutional form of government was introduced. Louis I. (1825–48), the successor of Maximilian, was a liberal patron of the arts, and at the same time greatly favored the interests of the Catholic Church. His relation to the notorious Lola Montez led in 1848 to disturbances, in consequence of which he abdicated. The support which he had given to the insurrection of the Greeks against the rule of the Turks had secured the election of his second son, Otho, as King of Greece. In Bavaria he was succeeded by his eldest son, Maximilian II. (1848–64), who, like his father, liberally patronized science and art, but in politics had throughout his reign anti-liberal cabi-

nets. In the Schleswig-Holstein question the Bavarian Government acted as an ardent champion of the cause of German nationality. Maximilian, who died Mar. 10, 1864, was succeeded by his son, Louis II., who in 1866, in the war between Austria and Prussia, sided with Austria, and at the conclusion of peace had to pay 30,000,000 florins as expenses of war, and to cede a small district to Prussia. At the same time an offensive and defensive alliance was concluded with Prussia. The Catholic party was greatly opposed to the foreign policy of the Prime Minister, Prince Hohenlohe (appointed at the close of 1866), and still more to the educational and other reforms which he endeavored to introduce. When the new elections in 1869 gave to the Catholic party (the "Patriots") a majority in the second chamber, Prince Hohenlohe resigned (Jan., 1870). The new Prime Minister, Bray, remained, however, faithful to the treaties with Prussia, and after the outbreak of the war between France and Prussia, Bavaria at once joined Prussia, and placed two army-corps under the command of the Crown Prince of Prussia. In Nov., 1870, the Bavarian Government concluded a treaty providing for the entrance of Bavaria into the German empire, and in Jan., 1871, the treaty was ratified by both chambers. King Louis II. died June 13, 1886. Prince Luitpold was made regent during the occupation of the throne by King Otto, the insane successor of Louis II. Revised by C. K. ADAMS.

Bax'ter, DE WITT CLINTON: volunteer soldier; b. in Dorchester, Mass., Mar. 9, 1829; entered the army in 1861 as lieutenant, and passed through the successive grades to that of colonel of "Baxter's Fire Zouaves" (brevet brigadier-general U. S. volunteers). Wrote *Baxter's Manual and Company Tactics*, and was naval officer of the port of Philadelphia 1869-71. D. May 9, 1881.

Baxter, RICHARD: Nonconformist theologian; b. in Rowton, Shropshire, England, Nov. 12, 1615. He was not educated at any college. Having been ordained in 1638, he became Vicar of Kidderminster in 1641, and gained distinction as an eloquent preacher. He was the means of working there a moral reformation of a most thorough and permanent character. He was neutral or moderate in the civil war, being friendly to the Puritans, but favorable to a monarchy. In 1650 he produced the *Saint's Everlasting Rest*, which is highly esteemed. He took up his residence in London in 1660, just prior to the Restoration. Charles II. appointed him one of his chaplains, and Clarendon offered him the bishopric of Hereford, but he declined it. In consequence of the passage of the Act of Uniformity, 1662, he seceded from the Anglican Church. He continued to preach to the Nonconformists, and several times was persecuted and arrested. The notorious Judge Jeffries in 1685 fined him 500 marks on a charge of sedition, which was founded on a passage in his writings, which was construed into a libel on the Church of England. For failure to pay the fine he was imprisoned nearly eighteen months. D. in London, Dec. 8, 1691. He was a voluminous writer, having published 168 treatises. Among his numerous works are a *Call to the Unconverted* (1669); *Methodus Theologiae* (1674); and *Catholic Theology*. See his *Autobiography*; *Reliquiae Baxterianae* (London, 1696); and the biographies by E. Calamy (1713); W. Orme (1830); G. D. Boyle (1883). Revised by S. M. JACKSON.

Baxte'rians: the term formerly applied to the adherents of Baxter's theological system, the doctrines of which were—1, that though Christ died in a special sense for the elect, yet he also died in a general sense for all; 2, the rejection of the dogma of reprobation; 3, that it is possible for even saints to fall away from saving grace. Dr. Isaac Watts and Dr. Philip Doddridge were noted Baxterians.

Baxter Springs: city; on railroad; Cherokee co., Kan. (for location, see map of Kansas, ref. 8-K); 159 miles S. of Kansas City, Mo.; 1½ miles from the State line. It has lead-smelting works, and is a shipping-point for Texas cattle. The principal minerals are lead, zinc, and coal. On Oct. 6, 1863, Quantrell, with 600 guerillas, attacked a U. S. escort and encampment of three companies at this place. The escort was dispersed and all the wounded murdered; the attack on the encampment was repulsed. Pop. (1880) 1,177; (1890) 1,248; (1900) 1,641. EDITOR OF "NEWS."

Bay (Fr. *baie*): in geography, an inlet of the sea, or a portion of the sea extending into the land. The terms *bay* and *gulf* are vaguely and promiscuously applied to bodies of water of various forms and dimensions. Hudson's Bay, for example, might properly be called a gulf. The word *bay* is generally applied to smaller portions than *gulf*.

Bay, or **Bay-tree**: the laurel-tree (*Laurus nobilis*); sometimes called sweet bay. The *Prunus laurocerasus* is sometimes called bay-laurel. Several other trees are popularly called *bay*. The "sweet bay" of the U. S. is the *Magnolia glauca*, which has fragrant flowers. The "red bay" of the South is the *Persea carolinensis*, an evergreen laurel-tree with fine red timber. The "loblolly bay" (*Gordonia lasianthus*) is a fine tree of the Southern States, with mahogany-colored wood. A smaller species (*Gordonia pubescens*) is cultivated at the North as a shrub, and has large and fragrant white blossoms. Some of the rhododendrons and azaleas are called rose bays. The leaves of the bay have long been subjects of popular superstition, and have been used with other evergreens to decorate churches at Christmas. *Bays* in the plural signifies an honorary garland or crown, bestowed as a prize for victory or meritorious action. It is not known what kind of tree is meant by the word in the Bible translated "bay-tree."

Ba'ya (*Ploceus philippinus*): a small East Indian bird of the family of *Ploceidae*, and allied to the weaver-bird. It has a large conical beak. Its color is yellow, spotted with brown. It builds a curious nest, shaped like a Florence flask, and suspended from a small twig of a high branch. The entrance is in the lower part of the nest. The baya can be easily tamed and trained to obey commands.

Bayadere' [Fr. from Port. *bailadeira*, danseuse, from *bailar*, dance; akin to E. *ball*, a dance]: a name given to the dancing-girls of India. The nauteh (Sanskrit *nāṭya*, pantomimic dance), as an adjunct of social entertainment, is of great antiquity, being mentioned in the early legends of Buddha. The nauteh-girls go about in small troupes from place to place. Their "dance" consists in slow, legato movements of hands, arms, head, body, and feet, which are said to require great technical skill and suppleness of joint, and remind one somewhat of the results of the modern Delsarte system, but whose general effect is, to Occidental taste, very dull indeed. Their pantomime, and the accompanying songs, portray despondent or exultant love and the like. In Southern India especially are found *Deva-dāsīs* (slaves of the god), who are regularly attached to some temple to sing and dance before the idol, and who correspond to the temple prostitutes of antiquity, Phœnician *Kedeshoth* and Greek *Hierodules*. C. R. LANMAN.

Bayard, bī'ard, Gen. GEORGE DASHIELL: b. in Seneca Falls, N. Y., Dec. 18, 1835; removed in boyhood to Iowa; graduated at West Point in 1856. He entered the U. S. cavalry, and became, after the civil war broke out, colonel of the First Pennsylvania Cavalry. In 1862 he was made brigadier-general of volunteers. He served with the highest honor in the Army of the Potomac, and was killed at the battle of Fredericksburg, Dec. 14, 1862, where he fought with the left wing, under Franklin. See his *Life* by Samuel J. Bayard (1874).

Bayard, JAMES ASHETON: U. S. Senator and lawyer; b. in Philadelphia, July 28, 1767; graduated at Princeton in 1784. He began to practice law in Delaware, and in 1796 became a Federalist member of Congress, in which he attained eminence as an orator. The contest between Jefferson and Burr in 1801 was decided in favor of the former by the votes of the Federalists, acting under the influence of Mr. Bayard. He was elected U. S. Senator for Delaware in 1804, and remained in that body until 1813. He was one of the commissioners that negotiated the treaty of Ghent in 1814. D. in Wilmington, Del., Aug. 6, 1815.

Bayard, JAMES ASHETON, second: b. in Wilmington, Del., Nov. 15, 1799; graduated at Princeton; was U. S. Senator from Delaware (1851-64 and 1867-69), twice resigning this office, to which he was four times elected, and once appointed to fill a vacancy. D. at Wilmington, Del., June 13, 1880.

Bayard, ba'yaar', JEAN FRANÇOIS ALFRED: French *littérateur*; b. in Charolles, Mar. 17, 1796; wrote over 200 popular comedies and vaudevilles, among which were *La reine de seize ans*, and *Les gamins de Paris*, which was performed with great success 463 times in succession. D. Feb. 19, 1853.

Bayard, PIERRE DU TERRAIL, Chevalier: an heroic French knight; called "le chevalier sans peur et sans reproche" (the knight without fear and without reproach); was b. at Castle Bayard, near Grenoble, in 1475. He was remarkable for his modesty, piety, magnanimity, and his various accomplishments. He served under Charles VIII. in his expedition against Naples in 1494, and distinguished himself at

the battle of Tornovo. After the accession of Louis XII. of France, Bayard performed several remarkable exploits in war against the Spaniards and English. In the service of Francis I. he took Prosper Colonna prisoner, and gained a victory at Marignano in 1515. He defended Mézières with success against the invading army of the Emperor Charles V. in 1522, and for this important service was saluted as the saviour of the country. He was killed in battle at the river Sesia, Apr. 30, 1524, having won the reputation of being a model of nearly every virtue. See Symphorien Champier, *La Vie et les Gestes de Bayard* (1525); W. Gilmore Simms, *Life of Chevalier Bayard* (New York, 1847).

Bayard, bī'ard, RICHARD HENRY: son of James A. Bayard; b. at Wilmington, Del., in 1796; graduated at Princeton in 1814, became a lawyer, was U. S. Senator from Delaware (1836-39 and 1841-45), and U. S. *chargé d'affaires* at Brussels in 1850. D. in Philadelphia, Mar. 4, 1868.

Bayard, THOMAS FRANCIS, LL. D.: b. in Wilmington, Del., Oct. 29, 1828; in 1869 succeeded his father (J. A. Bayard) in the U. S. Senate, and was re-elected for a second and a third term; and in 1876-77 was one of the Electoral Commission to determine who was elected President. Was elected president *pro tem.* of U. S. Senate Oct., 1881. He was Secretary of State during Cleveland's first administration, 1885-89, and was one of the commissioners appointed by the President to confer with a commission sent to Washington for the settlement of the Canadian fisheries dispute. In 1893 he was appointed first ambassador to Great Britain. D. in Dedham, Mass., Sept. 28, 1898.

Bayazid, bāā-yāā-zeed' (often called **Bajazet'**) I.: Sultan of the Turks or Ottomans, surnamed ILDERİM (i. e. the lightning); b. in 1347. He succeeded his father, Amurath (or Murad) I., in 1389, and soon conquered Bulgaria, the greater part of Asia Minor, and part of Greece. In 1396 he gained a victory at Nicopolis over Sigismund, King of Hungary (afterward emperor), and his allies, the Poles and French. His career of conquest was arrested by Tamerlane (or Timur), who invaded Asia Minor, and defeated Bayazid near Angora in June, 1402. Bayazid was taken prisoner here, and confined until he died, Mar. 9, 1403. See Von Hammer, *Geschichte des osmanischen Reichs*.

Bayazid II.: Sultan of the Turks; b. in 1447. He ascended the Ottoman throne on the death of his father, Mahomet II., in 1481. He built many mosques in Constantinople, his capital. He was involved in almost continual war against the Hungarians, Poles, Persians, and Venetians. D. near Adrianople, May 26, 1512.

Bayberry: the fruit of the bay tree; also the fruit of the wax-myrtle (*Myrica cerifera*), a shrub which produces a kind of wax, sometimes called "bayberry tallow," and used in pharmacy. It is also called candleberry, as it has also been employed in making candles. The bayberry grows chiefly along the U. S. Atlantic coast, becoming an evergreen tree in the South. It has active medicinal qualities. The wax is found on the outside of the berries, and is obtained by boiling.

Bay Bulls: a port of entry and post-town of Newfoundland; 19 miles S. of St. John's; lat. 47° 18' N., lon. 52° 47' W. (see map of Canada, ref. 8-0). It has an excellent harbor, which is much frequented as a port of refuge. Fishing and agriculture are carried on. Pop. 734.

Bay City: an important railroad center; capital of Bay co., Mich. (for location of county, see map of Michigan, ref. 5-J); on the right (east) bank of the Saginaw river; 4 miles from its mouth, and at the head of navigation. Its principal trade is in lumber and salt, immense quantities of which are produced. It has excellent schools, four parks, Holly water-works, and important manufacturing interests. Several lines of steamers connect it with all lake points. The census of 1890 showed 299 manufactories; capital, \$8,993,879; average number of persons employed, 4,356; wages paid during the year, \$1,870,036; value of products, \$8,600,385. Pop. (1880) 20,693; (1890) 27,839; (1900) 27,628.

EDITOR OF "TIMES."

Bayer, bī'er, JOHANN: b. in Rhain, Bavaria, 1572; a zealous Protestant pastor, but chiefly noted as the author of the excellent work *Uranometria*, containing fifty-one astronomical charts, and followed by explanations in his *Explicatio Characterum Aeneis Tabulis Insculptorum*. He introduced the method of designating the stars of a constellation by means of letters, naming the largest star of the constellation by the first letter of the Greek alphabet, and the others, in

the order of their brilliancy, by the succeeding letters. D. in Augsburg, 1660.

Bayeux, baa'yö' (anc. *Baicas'sæ*): a city of France; in Normandy, and in the department of Calvados; is on the river Aure, 21 miles by rail W. N. W. of Caen (see map of France, ref. 3-D). It has manufactures of porcelain, lace, damasks, calico, and leather. Pop. (1896) 7,912. Here is a majestic cathedral which is said to be the oldest in Normandy, in which was preserved for a long time the famous Bayeux tapestry.

Bayeux Tapestry: a web of canvas or linen cloth 214 feet long by 20 inches wide, on which is embroidered, with woolen threads of various colors, a representation of the invasion and conquest of England by the Normans. According to tradition, it was embroidered by Matilda, the wife of William the Conqueror. Some persons believe that she directed the work, which was performed by her maids or the ladies of her court. It is considered a valuable historical document, as it gives a correct and minute portraiture of the manners and customs of that age and of the Norman costumes. It contains the figures of 625 men, 200 horses, 55 dogs, 40 ships and boats, and numerous quadrupeds, birds, etc. The tapestry was discovered in the cathedral of Bayeux about 1730, and is now preserved in the hôtel de ville of that place. See Bruce, *Bayeux Tapestry Elucidated* (London, 1855); Ducarel, *Anglo-Norman Antiquities* (1767).

Bayfield: city and township; formerly capital of Bayfield co., Wis. (for location of county, see map of Wisconsin, ref. 2-C); on an arm of Lake Superior, 200 miles N. E. of St. Paul, Minn., and 281 miles N. N. W. of Madison, Wis.; is terminus of Chicago, St. Paul, Minneapolis, and Omaha and Bayfield Harbor, and Great Western R. Rs. It has one of the best harbors on the Great Lakes. Pop. of city (1880) 495; (1890) 1,373; (1900) 1,689.

EDITOR OF "BAYFIELD COUNTY PRESS."

Bayfield, HENRY WOOLSEY: rear-admiral of the British navy; entered the service in 1806; served against the U. S. in 1814 on the Great Lakes; surveyed the lakes, the St. Lawrence river and gulf (1815-27), of which he published valuable charts. D. in England, Feb. 12, 1885.

Bay Islands: a group of small islands in the Bay of Honduras. Ruatan, the largest, is about 30 miles from the north coast of Honduras. The other islands are named Bonacca, Utila, Barbaretta, and Helena. This group became a British colony in 1854, but in consequence of a protest of the U. S. they were restored to Honduras in 1856.

Bayle, bayl, PIERRE: a celebrated French philosopher and critic; b. at Carlat, now in Ariège, Nov. 18, 1647; son of a Protestant preacher. He studied at the College of Toulouse, and was employed for some years as a private tutor at Geneva and Rouen. In 1675 he obtained the chair of Philosophy in the Protestant College of Sedan, which was closed or suppressed by the Government in 1681. He then became Professor of Philosophy and History at Rotterdam, and commenced in 1684 a critical monthly review called *Nouvelles de la République des Lettres*, which he continued to edit until 1687. Instigated by Jurieu, who accused Bayle of heretical or unsound opinions, and of being a secret agent of France, the magistrates of Rotterdam deprived him of his professorship in 1693, and even of his right to teach privately. Bayle was a skeptic, an eloquent advocate of religious liberty, and a very independent thinker. His most important work is a *Dictionary, Historical and Critical* (*Dictionnaire historique et critique*, Rotterdam, 2 vols. folio, 1696; 11th ed. Paris, 1820-24, 16 vols.; Eng. trans. London, 1710, 4 vols.; 3d ed. 1734-38, 5 vols.), which exercised a great influence over literature and philosophy, and had a European reputation. Bayle was fond of paradox, was a subtle reasoner, a witty writer, and an excellent dialectician. He was amiable, courageous, and disinterested. According to Warburton, he had "a soul superior to the sharpest attacks of fortune, and a heart practiced to the best philosophy." D. in Rotterdam, Dec. 28, 1706.

Baylen, bī-len', or **Bailen'**: a town of Spain; province of Jaen; 22 miles N. N. E. of Jaen (see map of Spain, ref. 18-F). It has manufactures of linen, glass, soap, bricks, etc. The Spanish general De Castaños here gained a victory in July, 1808, over the French general Dupont, and took 18,000 prisoners. Pop. (1887) 8,580.

Bayley, Most Rev. JAMES ROOSEVELT, D. D.: a grandson of Dr. Richard Bayley and nephew of Mother Seton (who

founded the original American Congregation of Sisters of Charity); b. in New York city, Aug. 23, 1814; graduated at Trinity College, Hartford, Conn., in 1835; was for a short time a clergyman of the Protestant Episcopal Church, but became a Roman Catholic 1842; studied theology in Paris and Rome, and was ordained a priest in 1844. He became Professor of Belles-Lettres at St. John's College, Fordham, and was its president (1845-46). In 1853 he became Bishop of Newark, N. J., and in 1872 Archbishop of Baltimore, Md. He published *Sketch of the History of the Catholic Church on the Island of New York* (New York, 1853; rev. ed. 1869); *Memoirs of Bishop Bruté* (1860); and other works. D. in Newark, N. J., Oct. 3, 1877.

Bayley, RICHARD: physician; b. in Fairfield, Conn., in 1745; began the practice of medicine in 1772. He introduced a new method of treating the croup, which was extensively used. He became in 1793 Professor of Surgery in Columbia College, New York, and was the first health officer of New York. D. on Staten Island, N. Y., Aug. 17, 1801.

Baylies, WILLIAM, M. D.: b. in Uxbridge, Mass., Dec. 5, 1743; graduated at Harvard in 1760; practiced medicine many years at Dighton, Mass., of which town he was a representative in the General Court; member of the three Provincial Congresses of Massachusetts and of the State convention which adopted the Federal Constitution; State Senator 1783; was for a number of years a judge of the court of common pleas for Bristol co., Mass., and register of probate for that county; member of Congress 1805-09; member of Academy of Arts and Sciences, of Massachusetts Historical Society, and one of the founders of the Massachusetts Medical Society. D. at Dighton, Mass., June 17, 1826.

Bayliss, JEREMIAH HENRY, A. M., D. D., LL. D.: minister of the M. E. Church; b. at Wednesbury, England, Dec. 20, 1835; educated at Genesee College, New York; served with distinguished success in pastorates at Park Avenue and Trinity churches, Chicago; Roberts Park and Trinity churches, Indianapolis; Central church, Detroit; and Walnut Hills church, Cincinnati; elected editor of *Western Christian Advocate* in 1884 and 1888. D. at Bay View, Mich., Aug. 14, 1889.

Baylor University: chartered by the republic of Texas in 1845; named in honor of Hon. Robert Emmett Bledsoe Baylor, LL. D. (1793-1874), former member of Congress from Alabama and for twenty-five years a judge in Texas. It was situated in Independence, Tex. A university curriculum and classes were established in 1851 by Rev. Rufus C. Burleson, D. D., who presided over it from 1851 to 1861, when he and the entire faculty resigned and inaugurated Waco University at Waco, Tex. In 1882 the two universities were consolidated at Waco under the name Baylor University, with Dr. Burleson as president. The university is under the auspices of the Baptist denomination. The total number of students is (1900) about 747, and of instructors 39. Large additions have recently been made to the endowment.

Bayly, Miss ADA ELLEN: See LYALL, EDNA.

Bayly, LEWIS: Bishop of Bangor in Wales; worthy of mention as the author of *The Practice of Piety*, one of the most popular religious books ever written. It is mentioned by Bunyan as one of the books owned by his wife. In 1714 it had passed through fifty-one editions in England, besides several translations published in foreign lands. Eliot, the Indian apostle of Natick, Mass., translated *The Practice of Piety* into the Indian language, and it was published for circulation among his converts. Bayly was born at Caermarthen; educated at Oxford, and consecrated as bishop in 1616. D. in Bangor, Oct. 26, 1631. He must not be confounded with Thomas Bayly, Anglican Bishop of Killala in Ireland, who died in 1670.—Bishop Lewis Bayly had a son THOMAS, who became a zealous Roman Catholic, and published *The End of Controversy* (Douai, 1654), besides other works.

Bayly, THOMAS HAYNES: *littérateur*; b. near Bath, England, Oct. 13, 1797; was the son of a wealthy solicitor, and was educated at Oxford. He is best known by his very numerous songs, some of which will always be popular, though few are of a very high literary order. Among them are *Oh no, we Never Mention Her*, *The Soldier's Tear*, *Why Don't the Men Propose?* and *I'd be a Butterfly*. D. Apr. 22, 1839. See his *Songs, Ballads, and Other Poems*, with a memoir, London, 1844.

Bayne, PETER, LL. D.: journalist and author; b. at Foderty, Ross-shire, Scotland, Oct. 19, 1830; educated at Marischal College, Aberdeen; was successively editor of the *Glasgow Commonwealth*, *Edinburgh Witness*, *London Dial*, and *Weekly Review*; author of *The Christian Life in the Present Time* (1855); *Life and Letters of Hugh Miller* (1871); *The Chief Actors in the Puritan Revolution* (1878); *Life of Martin Luther* (1887); besides numerous contributions to current periodicals. D. at Upper Norwood, London, Feb. 10, 1896.

Baynes, ROBERT HALL: b. in Wellington, Somersetshire, England, Mar. 10, 1831. He was educated at Bath and at St. Edmond's Hall, Oxford, where he took his master's degree in 1859. He received a number of English church preferments. He is the author of numerous religious works, among which are *Lyra Anglicana* (1862); *Autumn Memories and Other Verses* (1868), etc.

Baynes, THOMAS SPENCER, LL. D.: b. in Wellington, Somersetshire, England, Mar. 24, 1823. He was educated at a private school in Bath, at Bristol College, and at the University of Edinburgh; was Professor of Logic in the latter institution 1851-55; assistant editor of the *London Daily News* 1857-64; contributed many articles on the civil war in the U. S. to the *Daily News*, and was also a contributor to the *Literary Gazette*, the *Athenæum*, etc.; became Professor of Logic, Rhetoric, and Metaphysics in the University of St. Andrews 1864; published a translation of *Port Royal Logic* in 1851, and an *Essay on the New Analytic of Logical Forms* (1852). He was editor of the ninth edition of the *Encyclopædia Britannica*, for which he wrote the article on Shakspeare. He contributed regularly to the *Edinburgh Review* (1869-75), and was also a contributor to the *North British Review*, *Fraser's Magazine*, *Pall Mall Gazette*, and the *Saturday Review*. D. at St. Andrews, May 29, 1887.

Bay of Islands: a large bay on the west coast of Newfoundland. It abounds in islands, and its scenery is very fine. Good timber, gypsum, and marble abound. About 30,000 barrels of herring are annually taken here, besides cod and other fish. Agriculture is pursued to some extent. Pop. of settlements, 947.

Bayonet [Fr. *baïonnette*, also formerly *bayonnette*; so called, it is said, because invented or first used at Bayonne, in France, about the middle of the seventeenth century]: a thrusting weapon attached to the muzzle of a musket or rifle. The bayonet, first used in France, A. D. 1671, had a solid handle which was inserted in the bore of the gun. This was succeeded by that with a hollow handle fitting over the barrel, and which allowed the gun to be fired without removing it. The introduction of the bayonet enabled the musket to be used as a pike also, and led to the abandonment of the latter. The blade of the common bayonet is of triangular cross section, and about 16 to 20 inches long; but various other forms have been and are now used, such as the "sword" or "saber bayonet," in the form of a short, straight sword, effective either as a sword or bayonet; the "trowel bayonet," designed to be used as a bayonet when fixed, and as an intrenching tool when unfixed; the "ramrod bayonet" or "rod bayonet," made by sharpening the end of the wiping-rod of the modern breech-loader, and fitting it with a catch which holds it in place when drawn out so as to project 8 to 10 inches. Many modern military writers have recommended the entire abandonment of the bayonet, considering it a useless addition to the modern rifle; but the great moral effect of a bayonet charge (which is still looked forward to as the culmination of an infantry attack) is urged by its advocates as sufficient reason for its retention, and it is an important feature in the arms of those nations which have been involved in the most recent great wars. See PIKE.

JAS. MERCUR.

Bayonne, bǎä'yün' [Basque *bayon, bayona*, a port]: a fortified city of France (anc. *Lapurdum*), near its southwest extremity; department of Basses-Pyrénées; on the river Adour; about 3 miles from the Bay of Biscay and 66 miles W. N. W. of Pau; lat. 43° 29' N., lon. 1° 29' W. (see map of France, ref. 9-C). It is pleasantly situated near the foot of the Pyrenees, at the mouth of the river Nive, and is well built. It has an old cathedral, a citadel built by Vanban, a mint, a theater, and schools of commerce and navigation. Here are shipyards, glass-works, sugar-refineries, and distilleries. The chief articles of export are timber, tar, corks, liqueurs, hams, etc. Here occurred an interview between

Charles IV. of Spain and Napoleon I., who extorted from the former and his son a renunciation of the crown in 1808. Pop. (1896) 26,918.

Bayonne, bā-yon': city; on railroad, Hudson co., N. J. (for location of county, see map of New Jersey, ref. 3-E); formed by the consolidation of the villages S. of Jersey City on the peninsula between the Raritan and New York upper bays; has large Standard oil refineries on New York Bay, with pipe-lines to New York, Philadelphia, Baltimore, Pittsburgh, Cleveland, etc. Pop. (1885) 13,080; (1890) 19,033; (1900) 32,722.

EDITOR OF "HERALD."

Bayou, bī'oo [corrup. of Fr. *boyau*, gut]: strictly, a stream which is not fed by springs, but flows from a lake or other stream. It is very often used in the Southern U. S. as synonymous with "creek," and for tidal channels.

Bayreuth: See BAIREUTH.

Bay Roberts: a port of entry of Newfoundland; 8 miles S. of Harbor Grace, on Conception Bay. Its inhabitants are chiefly engaged in the Labrador fisheries. It is visited by regular lines of coasting steamers, and has considerable imports. Pop. 2,600.

Bay Rum [*Spiritus myrciæ* of U. S. Pharmacopœia]: a fragrant liquid obtained by distilling with rum the leaves of the *Myrcia aeris*, and probably of other trees of the genus. These are large trees growing in Jamaica and other West India islands, and belonging to the *Myrtaceæ*. Bay rum is imported in large quantities, and is used as a perfume and as a cosmetic.

Bay Saint Louis: capital of Hancock co., Miss. (for location of county, see map of Mississippi, ref. 10-G); on L. and N. R. R., and on Mississippi Sound, Gulf of Mexico: 52 miles from New Orleans; has an academy and a business college, three churches, custom-house, oyster and shrimp canning factory, woolen-factory, and fruit and vegetable farms. The city is a popular summer resort, and has a shell road on the beach 8 miles long. It was founded about 1790 by the French. Pop. (1880) 1,978; (1890) 1,974; (1900) 2,872; summer population about 8,000.

EDITOR OF "GULF COAST PROGRESS."

Bay Shore, or **Bayshore**: village; Suffolk co., Long Island, N. Y. (for location of county, see map of New York, ref. 8-D; on Montauk Div. of L. I. R. R., and on Great South Bay; 41 miles from New York city; has graded schools, five churches, large hotels, a bank, electric lights, and water-works. Here are the South Side Field Club (athletic), Bay Shore Yacht Club, Great South Bay Yacht Club, and the Olympic Club. Bay Shore is a summer resort, and is the nearest village to Fire island and its fishing-grounds for bluefish. Pop. (1880) 1,615; (1890) 2,290; (1900) 3,135 (estimated).

EDITOR OF "BAY SHORE JOURNAL."

Baza, baā'thāā (medieval *Bastiana*): a city of Spain; province of Granada; about 52 miles N. E. of Granada; in a fertile plain (see map of Spain, ref. 19-G). It is famous for its red wine. In 1489 it was taken from the Moors by the Spaniards after a long siege. The French marshal Soult here defeated the Spaniards, Aug. 10, 1810. The principal trade of the place at present is in hemp. Under the Moors it was an important city with a population of 50,000—now 13,000.

Bazaar, or **Bazar** [Pers. *bāzār*, market]: an Oriental market-place, either open or covered with a roof; an Oriental assemblage of shops in which goods of various kinds are exposed to sale. Each bazaar is occupied by a number of retail traders, and is often divided into streets or passages having on each side a row of small shops, stands, or counters. The term is also applied in European and Western cities to a hall or suite of rooms fitted up with counters or stands for the sale of goods (mostly fancy articles).

Bazaine, baā'zayn', FRANÇOIS ACHILLE: b. in Versailles, Feb. 13, 1811; and, after passing through all the intermediate grades, marshal of France, Sept. 5, 1864. The son of a prominent and wealthy officer, he could have readily obtained an officer's commission, but he declared it his pride to seek his marshal's bâton from the knapsack, in which for "every French soldier" the proverb potentially places one; and that bâton, when found, bore the inscription "Simple soldat en 1831, Maréchal de France en 1864."

He served with distinction in Algeria, Spain, the Crimea, Italy, and in setting up the Maximilian empire in Mexico. He received the cross of the Legion of Honor in 1836; was promoted to commander of the Legion in 1856; received

the Grand Cross in 1863; and in 1869 became commander-in-chief of the imperial guard.

On the breaking out of the war with Prussia, Marshal Bazaine was at first in command of a single corps, but after the disasters of Woerth and Forbach, compelling the emperor to relinquish the command, he succeeded to the command of the Army of the Rhine. Reorganization and concentration compelled a falling back upon Metz, and thence upon Verdun, where the shattered commands of MacMahon's corps and the reserves of France were concentrating. His army was delayed in its movements by the battles of Borny (Aug. 14, 1870) and Mars-la-Tour (Aug. 16), and finally, in the battle of Gravelotte (Aug. 18) suffered a serious defeat, and was obliged to retire to Metz, which was immediately invested by the Germans under Prince Frederick Charles. Failing in all attempts to break the line of the besiegers, the marshal surrendered, on Oct. 27, 1870, an army of 160,000 men, Metz, "la Pucelle," and its fortifications, and 1,800 pieces of artillery.

He was arraigned Oct. 10, 1873, before a court consisting of the Duc d'Aumale (president), General de la Motte Rouge, Baron de Chabaud-Latour, Generals Tripier, Martimprey, Princeteau, and Martinez-Dechesnez, charged:

First—With having capitulated to the enemy, and surrendered the fortress of Metz, of which he had the superior command, without having exhausted all the means of defense.

Second—With having, as the head of the army before Metz, signed a capitulation in the open field, the result of which was to cause his troops to lay down their arms; and with not having done everything which he was bound by duty and honor to do before treating verbally and by writing—offenses punishable by articles 209 and 210 of the Code of Military Justice.

After a trial of two months' duration he was unanimously pronounced guilty, sentenced to be degraded and shot. His sentence was promptly commuted by President MacMahon to twenty years' imprisonment in a fortress, without military degradation.

On Aug. 9, 1874, Bazaine, aided by his wife, escaped from his fortress prison, Île Ste. Marguerite, pleading in justification (*Letter addressed to the Minister of War*), while alleging that "respect for the military uniform which he has very honorably worn for nearly half a century," would have deterred him from this step but for the "humiliating régime to which he was subjected, from which his past career ought to have saved him," that maxim of public law, that "no sentence is legal unless pronounced by the peers of the accused." Gen. Bazaine resided in Madrid, Spain, from Nov., 1874, till his death, Sept. 23, 1888.

That his conduct of the military operations from Aug. 13 to Aug. 18 was inefficient; that his so-called sorties had scarce the energy in them to reveal a serious intention to go out; that he allowed himself to waste the last precious days of his army's efficiency in what were futile—and some would call treasonable—attempts to negotiate with the empress; and finally crushed the rising and the last hopes of France by a premature surrender at the very moment when a protraction might have modified the history of the war, must be the conviction of all who have impartially studied his career.

Bazalgette, Sir JOSEPH WILLIAM, C. B.: an English civil engineer of French descent; b. in Enfield, Middlesex, 1819. He won great fame in the construction of sewers, street alterations, and other departments of city engineering. As engineer-in-chief to the Metropolitan Board of Works, London, he constructed many hundreds of miles of sewers and river embankments, and introduced subterranean passages for the carrying of gas and water pipes and telegraph wires, so that it is not necessary to break up the pavements for repairs. He planned and executed the Thames embankments of London, and bridged that river in three places with granite or iron structures. D. in London, Mar. 1, 1891.

Bazan, EMILIA PARDO: See PARDO-BAZAN, EMILIA.

Bazancourt, baā'zāān'koor', CÉSAR, Baron de: a French historian; b. in 1810; wrote a *History of Sicily under the Norman Rule* (2 vols., 1846); histories of the Crimean, Italian, Chinese, and Cochinchinese wars of Napoleon III. Under Louis Philippe, De Bazancourt was a director of the library of Compiègne, and under Napoleon III. he was official historiographer. D. at Paris, Jan. 25, 1865.

Bazard, SAINT-AMAND: founder of French Carbonarism; b. in Paris, Sept. 19, 1791. He organized societies of Carbonari about 1820, and afterward became a disciple of Saint-

Simon the Socialist, and editor of the *Producteur*, a Saint-Simonian journal. After the death of Saint-Simon (1825) Bazard and Enfantin were the chief priests of the sect, and they published an *Exposition of the Doctrine of Saint-Simon* (1828-30). Bazard became disgusted with the extreme innovations of Enfantin (who advocated a community of wives), and he seceded from the sect in 1831. D. in Country, near Montfermeil, July 29, 1832. See Michaud et Villenave, *Histoire du Saint-Simonisme* (1847).

Bazigars, baā-zē'garz: the gypsies of India; usually nomadic, and clearly distinct from the Hindus, with whom they do not intermix. They are scattered throughout the whole of India. Their chief occupation is the performance of feats of address and agility to amuse the public, the men as athletes, the women as dancers. Many are Mohammedans, some profess no religious faith, and a particular association among them has the fame of making human sacrifices. Their reputation is generally bad. They present many features analogous to the Western gypsies. Keeping themselves distinct from the people among whom they dwell, they have their own chiefs or kings, and a peculiar language which has a decided analogy to that of the gypsies. There are several groups of them known under different names, but the Bazigars are the best known and most civilized.

M. W. H.

Bazin, ANTOINE PIERRE LOUIS: b. Mar. 26, 1799; was a professor of the Chinese language, and published in 1856 a grammar of the Mandarin dialect. He also made many translations from the Chinese. D. in Jan., 1863.

Bazin, HENRI: inspector-general of bridges and roads, officer of the Legion of Honor; b. Oct. 20, 1829; graduated from the School of Bridges and Roads in 1851; was assigned to the railway from Tours to Bordeaux, in the department of Charente. In 1856 he was engineer in the department of Côte d'Or, on the Burgundy Canal, and matters connected with the inundations of the Saône, and in the same year was made assistant to Darcy in his experiments upon the flow of water in open channels. Henri Darcy first, in the water-works of Dijon, discovered and published the fact that the velocity of flowing water was affected by the degree of roughness of the bed and sides of the channel, which up to that time had not been admitted. Extensive experiments were made by him upon the water-pipes of Paris, and published by him in 1854. Those upon the flow of water in open channels were commenced in 1856, with Bazin as his assistant. The preparations were made, the channels constructed, and some experiments commenced when in 1858 Darcy died. The work was continued by Bazin, and completed by an analysis and discussion of the experiments in a memoir presented to the Academy, and published in 1865 with a *résumé* by Gen. Morin, who characterizes it as most valuable to the engineer, and which can not fail to be appreciated by the Academy. It is, indeed, the most valuable contribution to the science of the flow of water. The second part of the *Experiments* was published by the Academy in 1865. It treats of the "propagation of waves." Since 1886 he has been inspector-general of the fifth inspection department and a member of the Council of Bridges and Roads.

His published works are *Expériences sur l'écoulement des eaux dans les canaux découverts*; *Sur la propagation des ondes*; and numerous papers on kindred subjects in the *Annales des Ponts et Chaussées*. W. R. HUTTON.

Bazley, Sir THOMAS, Bart.: b. at Gilnow, Lancashire, England, in 1797. He learned cotton-spinning in his youth; went into business on his own account at Bolton in 1818; removed in 1826 to Manchester, where his manufactory of fine cotton and lace thread was the largest in the world, employing more than 1,000 persons, for whom he established schools, free lectures, and reading-rooms. An early anti-corn-law man and free-trader, he became a prominent Liberal politician, first entering Parliament in 1858. In 1862 he retired from business, and in 1869 became a baronet. D. Mar. 18, 1885.

Bdelium (Gr. βδέλλιον): a gum-resin resembling myrrh, but weaker and more acrid; esteemed by the ancients for its supposed medicinal virtues. It is not often used by modern physicians. Two varieties of bdellium are obtained from the *Amyris commiphora* of India and the *Heudelotia africana*, a tree or shrub of Senegal. It is used in both human and veterinary pharmacy in India, and for incense in temples.

Beach: the sloping surface of the land above low-water mark; covered with stones and sand brought by waves and

currents from neighboring cliffs or ledges, or from the bottom off-shore. A beach begins on a wave-cut bench under a cliff or ledge and extends along shore in the direction of the controlling current, often swinging in a smooth curve around the head of a bay or cove between two rocky points. As a headland is cut back into an even line, its beach may be prolonged as an embankment across the adjoining bay, thus simplifying the shore-line, as on the south side of Martha's Vineyard. The embankment is called a spit, or bar. Beach is also applied to the long off-shore bars or barriers now used as summer resorts on the coast of New Jersey, built of sand raised by storm waves from the shallow bottom, and now receiving additions on the outer side, while the inclosed lagoons and mainland are protected from the sea. Bars of the same kind on the coast of Carolina are locally called "banks." See COAST, DUNE.

W. M. DAVIS.

Beach, ABRAHAM, D. D.: a Protestant Episcopal divine; b. at Cheshire, Conn., Sept. 9, 1740; graduated at Yale College in 1757, and ordained by the Bishop of London in 1767. He was until 1783 rector of a church at New Brunswick, N. J., and afterward an assistant minister of Trinity church, New York (1783-1813). D. Sept. 14, 1828.

Beach, Mrs. H. H. A.: See the Appendix.

Beach, JOHN: Protestant Episcopal divine; b. in 1700; graduated at Yale in 1721; and was for some years Congregational minister of Newtown, Conn. He joined the Anglican Church in 1732; was ordained by the Bishop of London, and was for fifty years a minister of the Church of England, at Newtown and Reading, in Connecticut. He published sermons and polemical tracts. D. Mar. 8, 1782. In the church recently erected at Newtown a handsome tablet commemorates his half-century's service.

Beach, JOHN WESLEY, D. D., LL. D.: preacher of the Methodist Episcopal Church; b. at Trumbull, Conn., Dec. 26, 1825; graduated in 1845 at Wesleyan University, Middletown, Conn.; was for nine years a teacher; and in 1854 entered the ministry. His labors have been mostly in New York city and vicinity. In 1872 he received the degree of D. D. from his *alma mater*; in 1873 became pastor of a church in New Haven, Conn.; and was president of the Wesleyan University, Connecticut, 1880-87.

Beach, MOSES YALE: an inventor and publisher; b. at Wallingford, Conn., Jan. 7, 1800. He learned the trade of a cabinet-maker in youth, and afterward experimented in machines for propelling balloons. He invented a rag-cutting machine, now in general use in paper-mills. In 1835 he became interested in the *New York Sun*, and is regarded as a pioneer in the penny newspaper business. In 1857 he left his profession and retired to his native town, where he died July 18, 1868.

Beach Plum: See PLUM.

Beachy Head: the highest headland on the south coast of England; $2\frac{1}{2}$ miles S. S. W. of Eastbourne, Sussex. It consists of perpendicular chalk cliffs 564 feet high, forming the east end of the South Downs. Here is a lighthouse 285 feet high. The French fleet defeated the Dutch and English near this point in 1690.

Beacon [M. Eng. *bekene* < O. Eng. *bēacn*, a sign; akin to Eng. *beckon*]: Before other means of rapid telegraphy were invented, fires, kindled on the tops of mountains or prominent points of the coast, were an obvious resort as alarm-signals, giving warning of the approach of hostile fleets or armies. So, too, as a guide to mariners, for whom the dangers of a contiguous coast are enhanced by darkness, blazing fires or "lights" of some kind (see LIGHTHOUSE) were ever the most obvious beacons; hence a "fiery signal" is associated with the classic signification of the word. The word *beacon* (in a special signification) is now almost exclusively restricted to the last mentioned uses, denoting a mark or sign erected on coasts for guiding and preserving vessels at sea by night or by day. Practically, it is still further restricted by being divested, almost entirely, of reference to "light" or "fire," and applied to fixed structures or material marks erected on rocks or shoals in harbors or narrow channels; nevertheless, a small light-tower erected for no other than this limited purpose is sometimes called a *beacon-light* (as distinct from the lighthouse proper); while fixed un-illuminated signal structures are called "day-beacons."

Beaconsfield, bek'ūnz-fēld: small town in Buckinghamshire; 10 miles N. of Windsor (see map of England, ref.

12-I); notable as the home and burial-place of the poet Walter and of Edmund Burke, and as having given his earl's title to Benjamin Disraeli. Pop. about 1,500.

Beaconsfield, LORD: See DISRAELI.

Bead [M. Eng. *bede*, prayer, prayer-bead; O. Eng. *bed-, gebed*, prayer]: in Old English, a prayer, and hence one of the small perforated balls, of whatever material, used for keeping an account of the number of prayers repeated. Beads are small perforated globular bodies worn as ornaments by women and children around the neck and on other parts of the person, for which purpose they are arranged on strings. They are made of various materials—gold, amber, coral, pearl, crystal, glass, etc. More beads are made of glass than of any other material. They are often used in the ornamentation of slippers, purses, and other articles. The ancient Egyptians understood the art of making glass beads, which are now extensively manufactured at Murano, near Venice, and in China.

Bea'dle, WILLIAM H. H., LL. D.: b. at Liberty, Parke co., Ind., Jan. 1, 1838; educated at Rockville and in University of Michigan; entered the army in 1861 as first lieutenant of the Thirty-first regiment of Indiana infantry; served throughout the whole war, and was in 1864 brevetted a brigadier-general. After the war he studied law and began to practice in Wisconsin, when, in 1869, he was appointed U. S. surveyor-general over the Territory of Dakota. From that time he devoted his whole energy to the development, material as well as moral, of the Territory, as a member of the Legislature, and more especially as superintendent-general of public instruction (1879-85), in which last position he succeeded in organizing the whole school system of the Territory.

Bead-tree: See CHINA, PRIDE OF.

Bea'gle: a small variety of hound, formerly employed in Great Britain for hunting hares, but now nearly supplanted by the harrier. The beagle is about 10 inches high at the shoulder, is compactly formed, and has long pendulous ears and smooth hair. It is remarkable for its keenness of scent and perseverance. During the chase it utters a musical cry. A small variety is used as a lap-dog.

Beak, or Rostrum [from Fr. *bec*: Ital. *becco*, a word of Celtic origin, *bacc-*, hook]: the bill of a bird; in other words, the hard, horny mouth of a bird, consisting of two parts, called the upper and lower mandible. (See BILL.) The term is also applied to the sharp projecting part of the bow of modern ships of war used for ramming, and to the similar construction on the prows of ancient war-galleys.

Beal, WILLIAM JAMES, M. A., Ph. D.: botanist; b. in Adrian, Mich., Mar. 11, 1833; educated in University of Michigan and Harvard University. He was for two years Professor of Natural History in Chicago University, until he became Professor of Botany (in 1870) in the Michigan Agricultural College. He has written many papers on economic botany. His principal publications are *The New Botany* (1881) and *The Grasses of North America* (vol. i., 1887).

CHARLES E. BESSEY.

Beale, LIONEL SMITH, F. R. S.: an accomplished microscopist and physiologist; b. in London, 1828; graduated M. B. at the University of London in 1851, in which institution he was afterward appointed professor. Many remarkable books and monographs upon histology and biology have been published by Dr. Beale. His papers, written against the Darwinian hypothesis (1870), have attracted much attention. Among his numerous works are *How to Work with the Microscope* (1858); *The Structure of the Tissues of the Body* (1861); *Protoplasm* (1870); *Life Theories, their Influence on Religious Thought* (1871); *Our Morality and the Moral Question* (1887); in collaboration with others *The Physiological Anatomy and the Physiology of Man*, besides treatises on urinary and hepatic disorders.

Beam: any large piece of timber; the principal piece of timber in a building, that lies across the walls and serves to support the rafters; also a collection of luminous rays emitted from the sun or other luminary. The word has several technical applications. The part of a balance from the ends of which the scales are suspended is called a beam; a weaver's beam is a wooden cylinder on which the web is wound. The term is also applied to the part of a steam-engine to which the piston is sometimes attached to transfer motion to the crank shaft. In ships, a beam is a great main cross-timber, extending across the hull, supporting the deck, and preventing the sides from collapsing. Each of

these beams is made of one solid piece of good timber, if possible, and is upheld at or near the middle by a pillar or pillars. In large steamships iron beams are often used instead of wood. A ship is said to be "on her beam ends" when so much inclined to one side that the beams become nearly vertical. The word also occurs in the phrase "on the starboard beam," which is applied to the position of an object at sea which is seen toward the right by a person whose face is turned toward the bow. See FLEXURE and BRIDGES.

Beamsville: a post-village of Clinton township; Lincoln co., Ontario, Canada; on the Great Western Railway; 11 miles W. of St. Catharines (see map of Ontario, ref. 5-E); has manufactures of farming tools, carriages, etc. Pop. 1,000.

Beam-tree, White (*Py'rus a'ria*): a tree which is a native of Europe and Asia, and grows to the height of from 25 to 40 feet. It has ovate and serrate leaves, which are white and downy beneath, flowers in terminal corymbs, and bears a scarlet fruit about as large as a pea. This fruit, which is sometimes called sorb or service-berry, is acid and astringent, and is used to make beer. The hard, fine-grained wood is useful for cog-wheels.

Bean: a plant of the family *Leguminosæ*. The true bean of Europe is an upright plant with stiff and nearly straight stems, white black-eyed flowers in thick clusters and large broad pods. The beans are large and more or less flattened, often angular or even nearly square. This plant is the *Vicia faba* (or *Faba vulgaris*). It is sometimes grown in this country under the name of English bean, most frequently as the Broad Windsor and Mazagan varieties. It does not succeed in the hot and dry summers of America. The common garden and field beans of America belong to the species *Phaseolus vulga'ris*, although some botanists think that they represent several confused species. In Europe they are known as kidney-beans or haricots. About 150 varieties of these beans are now grown in this country, a few being grown for field crop and the product sold as dry beans, but the greater part being grown in the garden for "string" or "shell" beans. Beans demand a warm loose soil, and they are very susceptible to injury from frost. In 1890 12,607 acres were devoted to beans in the U. S. as a truck-garden crop, and 12,905 acres were devoted to beans for seed. The original home of the common bean is unknown. It has been cultivated from remote times. The Lima bean (*Phaseolus luna'tus*) is a climbing species which is sparingly cultivated in the northernmost States, but which succeeds well from New Jersey southward, and is grown in great quantities in California, whence most of the seed now comes. The species is supposed to be native to South America. The soy-bean (*Soja hispida*) is the popular bean of China and Japan, and is somewhat known in the U. S., especially in some parts of the Southern States. See SOY-BEAN.

Several beans are grown for ornament, as the scarlet-runner (*Phaseolus multifo'rus*) and species of dolichos, especially *Dolichos lablab*. Some species of dolichos are grown for culinary uses, especially the asparagus-bean (*Dolichos sesquipedal'is*). The cow-pea also belongs to this genus (*D. chinensis*). See LEGUMINOSÆ.

L. H. BAILEY.

Bean, TARLETON HOFFMAN, M. D., M. S.: ichthyologist; b. at Bainbridge, Lancaster co., Pa., Oct. 8, 1846; graduated at Columbian University, Washington, D. C.; was principal of Smyrna Seminary, Del., and of the high school of Wilkes-barre, Pa. In 1874 he accepted a position in the U. S. Fish Commission, and has been actively associated with its work ever since. In 1884 visited Alaska to investigate the shore fisheries, and again in 1889 to study and report on the salmon fishery. Dr. Bean is curator of the department of fishes, U. S. National Museum, ichthyologist and assistant in charge of the division of fish culture, U. S. Fish Commission, and editor of its publications. He has published numerous papers on fishes in the publications of the U. S. Fish Commission and U. S. National Museum; a *Report on the Fishes of Pennsylvania*; and, in conjunction with Dr. G. Brown Goode, an important memoir on the *Deep-sea Fishes of the Atlantic Basin*. He has also contributed many articles to *Forest and Stream*, of which he is editor of sea and river fishing.

FREDERIC A. LUCAS.

Bear [in Lat. *ur'sus*, female *ur'sa*]: a quadruped of the genus *Ursus* and order *Carnivora*; the type of the family of *Ursidae*. Bears walk on the soles of their feet, have five toes on each foot, and have claws which are not retractile, but are

adapted for digging in the earth or climbing trees. Their tails are very short. They have six cutting teeth in each jaw, and one canine tooth on each side in each jaw. Bears are found both in warm and cold climates in Europe, Asia, and America, but are scarce in Africa. The *Helarctos crowtheri* occurs in the Atlas Mountains. The species that inhabit cold climates are generally more fierce and carnivorous than those of tropical regions. Some species pass the winter in a state of torpidity and hibernation, during which they eat nothing and remain stationary in hollow trees or holes in the ground.

The brown bear (*Ursus arctos*) is widely distributed over the continents of Europe and Asia, but it has been extirpated from the British islands. It is generally believed to be the only European species. It is solitary, infests mountains and forests, eats fish and other animals, and subsists partly on fruits and vegetable food. The flesh of this bear is eaten by the people of Kamtchatka and other regions.

The black bear (*Ursus americanus*) is found in all parts of North America. Its total length is about 5 feet. It prefers vegetable food, but when pressed by hunger will kill and eat small animals. It kills its prey by hugging or squeezing with its fore paws. Great numbers of black bears are killed for their skins, which have a smooth, glossy fur, and are valuable for cloaks, caps, etc. This animal is an expert climber, is very fond of honey and green corn (maize), and is less fierce and dangerous to man than the brown bear.

The Rocky Mountains and adjacent parts of North America are infested by the grizzly bear (*Ursus horribilis*), which



Grizzly bear.

is much larger and more carnivorous than the black bear. It sometimes measures 9 feet from the nose to the tail, which is very short. The hair is long, and its color is a mixture of brown, white, and black. This bear, which is very tenacious of life, is the most formidable beast of prey on the continent of America. It is able to master a bison and carry away its



Polar bear.

huge carcass. It is stated that it hunts for prey both by day and night. It can run swiftly, but does not climb trees.

The largest of all the family of *Ursidæ* is the polar bear (*Thalarctos maritimus*), called also the white bear, the fur of which is an impure white. It sometimes measures nearly 10 feet long and 5 feet high. It is strictly marine in its habits, is never found far from the sea, and inhabits the most northern shores of Greenland, Asia, etc. It subsists chiefly on animal food, and pursues seals and fishes both on the ice and in the water. These bears display a remarkable affection for their cubs.

The bear mentioned in the Bible was probably the Syrian bear (*Ursus syriacus*), which resembles the brown bear in its habits, and has a stiff mane of erect hairs between the shoulders. The color of its hair is mostly dingy white or brown. Among the other species is the *Ursus labiatus*, or long-lipped bear of the East Indies, an inoffensive and gentle animal, which is often led about by Indian jugglers for exhibition. Among the Andes of Chili occurs the *Ursus ornatus*, called spectacled bear, which is black except two semi-circular yellow marks above its eyes. Remains of several extinct species of bears have been found in caves in England and Germany. Of these, *Ursus spelæus*, the cave-bear, is the best known. See the Appendix. Revised by D. S. JORDAN.

Bear-baiting: A custom was formerly prevalent in many countries of baiting bears with dogs. The place in which the bears were kept was called a "bear-garden." Bear-baiting was a favorite sport in England, not only for the common people, but also for the higher classes. Queen Elizabeth is said to have enjoyed it. It was hated by the Puritans, Macaulay wittily says, "not because it gave pain to the bear, but because it gave pleasure to the spectators." This coarse and inhuman entertainment gradually died out, and was finally prohibited by act of Parliament, Sept. 9, 1835.

Bear'berry (*Arctostaphylos uva-ursi*): a trailing shrub, with elliptical, evergreen leaves and red berries, found in the Northern U. S., Europe, and Asia. It is a member of the heath family, and is closely related to the madroña and still more closely to the manzanita of California.

CHARLES E. BESSEY.

Beard: a name applied to the hair which grows upon the lower part of the face of a man, and in exceptional cases upon the faces of women, or even children. The wearing of the beard is universal in the East, where it has long been regarded as a mark of honor and dignity. Some races of men, like the American Indians, carefully pluck out the beard, which with them and others, such as the Mongolians and Bedouins, is scanty. Most white races have beards with hairs differing decidedly in structure and appearance from those of the scalp. The wearing of beards in European nations has been regulated partly by fashion and partly by legal enactments for or against the practice. The beard is believed to protect the throat and chest from colds.

Beard, CHARLES, B. A., LL. D.: Unitarian minister and scholar; b. in Manchester, England, July 27, 1827; educated at Manchester New College and Berlin University; minister of Gee Cross chapel, Cheshire, and Renshaw Street chapel, Liverpool; editor of *The Theological Review* 1864-79; author of *Outlines of Christian Doctrine* (1859); *The Soul's Way to God* (1875); *The Hibbert Lectures* (1883); *The Universal Christ* (1888); *Martin Luther* (1889). His *Hibbert Lectures* are one of the most important courses given on a foundation that has been productive of the highest things. D. in Liverpool, Apr. 9, 1888.

Beard, GEORGE MILLER, M. D.: physician; b. at Montville, Conn., May 8, 1839; was educated at Phillips Academy, Andover, and at Yale, where he graduated 1862; attended one year at medical department of Yale, and, coming to New York, graduated from College of Physicians and Surgeons 1866, having for eighteen months (1863-64) been assistant-surgeon on the gunboat New London in the Western Gulf blockading squadron; commenced practice at once in New York, and with Dr. A. D. Rockwell made electrotherapeutics and nervous diseases his specialty; wrote many works, among them *American Nervousness, with its Causes and Consequences*; *The Scientific Basis of Delusions, being a New Theory of Trance and its Bearing on Human Testimony*; *Clinical Researches in Electro-surgery* (together with Dr. Rockwell); *Medical Uses of Electricity*; and *The Physiology of Mind-reading*; 1863-64 was acting assistant-surgeon in U. S. navy; in 1868 became lecturer in New York University on nervous diseases; gave special attention to mesmerism, and lectured in 1881 on *Artificial Trance*. D. in New York, Jan. 23, 1883.

Beard, JAMES HENRY: animal, genre, and portrait painter; b. in Buffalo, N. Y., in 1814; settled in Cincinnati and painted portraits in the earlier part of his career, including those of Henry Clay, John Quincy Adams, and Presidents W. H. Harrison and Taylor. National Academician 1872. D. in Flushing, N. Y., Apr. 4, 1893.

W. A. C.

Beard, RICHARD, D. D.: a clergyman of the Cumberland Presbyterian Church; b. in Sumner co., Tenn., Nov. 27, 1799. His early education was not without care, yet limited. His education preparatory to the ministry was conducted better than usual for the time in his church. He was licensed and commenced preaching in 1820, and was several years exclusively devoted to the work of the ministry. His health failing, he spent two or three years teaching. He was two and a half years at Cumberland College, Princeton, Ky., and graduated (1832). He was immediately appointed Professor of Languages in that college. He afterward spent five years at Sharon, Miss., in connection with Sharon College (1838-43). In 1843 he became president of Cumberland College, Ky., and remained there ten years and a half, giving a great impetus to the classic training of young men, especially those seeking the ministry. In 1854, when the Cumberland Presbyterian Church established a chair of Systematic Theology in Cumberland University, Lebanon, Tenn., his high character as a scholar and educator at once called him to that position, which he held till his death. He gave to the Church an able and standard work on *Systematic Theology*, in 3 vols. 8vo. It is regarded as the crystallization of Cumberland Presbyterian thought and faith. He published two octavo volumes of biographical sketches of ministers. Also *Why am I a Cumberland Presbyterian?* (1 vol.). His contributions to the *Quarterly* and general literature of the Church were constant and most valuable. He was the leading theologian of the denomination. His great dignity, purity, and gentleness of character marked him as a representative man, calling him frequently to the moderator's chair. His books were published at Nashville, Tenn. D. at Lebanon, Tenn., Dec. 2, 1880.

Beard, WILLIAM HOLBROOK: animal-painter; b. at Painesville, O., Apr. 13, 1825. He visited Europe in 1857 and studied and painted in Germany, Italy, and France. National Academician 1862. His work is principally of a humorous character representing animals, such as bears, rabbits, and monkeys dressed as men and women, and depicted as acting under human impulses. D. in New York city, Feb. 20, 1900.

WILLIAM A. COFFIN.

Beards'ley, EBEN EDWARDS, D. D., LL. D.: b. in Fairfield co., Conn., 1808; graduated at Trinity College, Hartford, in 1832, where he was for two years a tutor. He was for a time principal of the academy at Cheshire, Conn.; took orders in the Protestant Episcopal Church in 1835, and became rector of a church in New Haven in 1848. He was the author of a *History of the Episcopal Church in Connecticut*; a *Life of Samuel Johnson, D. D.*; a *Life of Samuel Seabury, D. D., First Bishop of Connecticut*; and a *Life of William Samuel Johnson, LL. D., Oxon.*, all valuable works. D. in New Haven, Conn., Dec. 21, 1891.

Beardsley, SAMUEL, LL. D.: jurist; b. in Hoosac, Rensselaer co., N. Y., Feb. 9, 1790; practiced law in Rome and Utica, N. Y.; held various State offices, as district-attorney of Oneida County 1821-25, as State Senator 1823, as U. S. district-attorney for the northern district of New York; was a member of Congress from New York (1831-36 and 1843-45); attorney-general of the State (1837); became a judge of the State Supreme Court in 1844, and its chief justice in 1847. D. in Utica, May 6, 1860.

Beardsley, SIDNEY BURR: jurist; b. in Monroe, Conn., Aug. 20, 1822. In 1874 he became a judge of the Superior Court of Connecticut, and in 1877 a judge of the Supreme Court of Errors of that State, resigning in 1889 on account of ill health. D. in Bridgeport, Conn., Apr. 24, 1890.

HENRY WADE ROGERS.

Beards'town: city; Cass co., Ill. (for location of county, see map of Illinois, ref. 6-C); situated on the bank of the Illinois river; 90 miles S. of Peoria, and 111 miles N. of St. Louis; is the official headquarters of St. Louis Div. of C., B. and Q. R. R., and terminus of O. and M. R. R.; has 6 churches, 3 large schools, including a high school, 2 banks, 2 flouring-mills, saw-mill, cooperage-works, baking-powder factory, screen-factory, feed-cutter factory, large machine-shops, shops of St. L. Div. of C., B. and Q. R. R., and water-works. The celebrated "Lithia Springs" are here.

There is a fine park near the business portion of the city. A railroad-bridge, with iron piers, crosses the river at this point, and is a fine structure, costing some \$300,000. Pop. (1880) 3,135; (1890) 4,226; (1900) 4,827.

EDITOR OF "ILLINOIAN."

Bear River: a port of entry of Digby co. and township, Nova Scotia; at the head of navigation (for location of county, see map of Quebec, ref. 3-A); has quite extensive manufactures of lumber, leather, etc.; ship-building is also carried on. It has a large trade in firewood and lumber, which are sent to the U. S. and West Indies. Pop. about 900.

Bear River: a river of the U. S.; rises in the N. part of Utah, flows northward into Idaho, and changes its course abruptly toward the S. Having again crossed the south boundary of Idaho into Utah, it flows southwestward, and enters Great Salt Lake about 25 miles N. W. of Ogden. The total length is about 400 miles.

Bears and Bulls: a phrase often used in connection with the purchase and sale of stocks; and applied to persons who speculate in Government securities and in the stocks of railroads and other corporations. The "bears" are those who wish to depress the value of stocks, and the "bulls" are those whose interest prompts them to act in the other direction. If two men have contracted, the one to deliver and the other to take a certain stock at a specified price on an appointed future day, the former will naturally belong to the bears and the latter to the bulls. See STOCK-EXCHANGE.

Bear's Grease, or Bear's Oil: said to be efficacious in promoting the growth of human hair. The genuine article being insufficient to supply the demand, perfumers and others sell under the name of bear's oil large quantities of beef-marrow, hog's lard, spermaceti, etc.

Beas'ley, FREDERICK, D. D.: a clergyman of the Protestant Episcopal Church; b. near Edenton, N. C., in 1777; graduated at Princeton in 1797; and was provost of the University of Pennsylvania from 1813 to 1828. Among his works, which attracted attention in Europe, are *A Search of Truth in the Science of the Human Mind* and a *Reply to the Views of Dr. Channing*. D. at Elizabethtown, N. J., Nov. 2, 1845.

Beasley, Gen. NATHANIEL: b. in 1751; was a pioneer of Ohio, and a noted Indian-fighter and scout; was in the campaigns of St. Clair and Wayne, and afterward settled in Chillicothe, O.; member of Ohio Legislature, a canal commissioner, and for many years major-general of militia. D. in Knox co., O., Mar. 27, 1835.

Beast-fables: the general name given to short stories, whether of popular or learned origin, in which the lower animals appear (usually by themselves, but sometimes in connection with men) associating with each other as reasonable beings endowed with the virtues and vices of humanity. Such stories are found everywhere, in all ages, and among races of all degrees of civilization. Their rationale is to be sought in the "animistic" philosophy of savage man, who makes no essential distinction between his own mental and moral faculties and those which he ascribes to other living creatures—not lower animals to him. (See ANIMISM; Tylor, *Primitive Culture*, i. 422 ff.; G. A. Wilken, *Het Animisme bij de Volken van den Indischen Archipel*, 1884-85.) In this stage of thought the savage, of course, feels no improbability in such a story about beasts as would seem to him credible if told about men.

Of the considerable number of beast-tales that have been collected, some may no doubt be myths in embryo or the detritus of myths; but any general application of the hypotheses of solar or meteorological mythology to this class of stories is now thoroughly discredited. Countless examples of this learned trifling may be seen in the *Zoölogical Mythology* of A. de Gubernatis (2 vols., London, 1872), where a day-and-night interpretation is devised for many stories which are obviously post-"mythopœic." Others of these beast-tales are clearly totemistic, owing their origin or their point to a supposed relation of descent between the tribe or family of the narrator and the animal that formed the tribal or gentile cognizance. (See J. G. Frazer, *Totemism*, Edinburgh, 1887; examples in Chamberlain, *Nanibozhu in Siouan Mythology, Journal of American Folk-lore*, v. 293 ff.) But a larger number fall into the two classes of (1) tales told merely for amusement, and (2) tales told to explain phenomena of the animal world.

(1) To the former class belong the exploits of the jackal (in Bleek, Koelle, Theal, Basset, etc.), the hare (in Casalis, Harris, Jones, Baissac, Steere, etc.), the tortoise (in Bleek, Hartt, Roméro, Harris, etc.), the spider (in Dasent, Schlenker, Milne-Home). These narratives are not properly moral (except that they celebrate the savage virtue of subtlety), nor are they in any just sense satirical. They chiefly aim to amuse, but are also meant to appeal in some sort to the intellect. Thus *The Lion and the Jackal*, we are informed, is often told by the Hottentots "to show how clever and wily the jackal is" (*Folk-lore Journal*, Cape Town, ii. 53). Such stories easily pass into satire: the narrator has but to call up in his hearers, by a tone or a turn of phrase, the reflection, "And this is the way of the world." But the very easiness of the transition makes the category *beast-satire* hard to define or establish. The great mediæval "beast-epic" *Reynard the Fox* is commonly regarded as satirical, but many of the adventures that compose it do not differ in kind from the jackal and tortoise tales of Africa and Brazil, which apparently have no such purpose.

(2) Tales of the second class, *les pourquoi*, are very numerous. Thus Georgia Negroes explain why the alligator never sleeps far from the river-bank (Jones, No. 1, p. 1), and why he does not molest the moor-hen (ib., No. 11, p. 24); the Iroquois, why the chipmunk has a black stripe on his back (Smith, p. 80); the Eskimo, why the raven is all black (Boas, *Report of Bureau of Ethnology for 1884-85*, p. 641); the Pawnees, why the deer has no gall and the antelope no dew-claws (G. B. Grinnell, *Pawnee Hero Stories and Folk-tales*, New York, 1889, p. 204); the Hottentots, why the hyæna's left hind leg appears to be shorter than his right (Bleek, No. 7, p. 14); Madagasear natives, why there is a deadly feud between the snake and the frog (*Antananarivo Annual*, 1877, p. 113), and so on. Like tales of the first class, *les pourquoi* do not die out with the animistic stage of thought. The folk-lore of civilized countries is full of them (see, for example, *Les pourquoi du eoucou*, *Revue des Traditions Populaires*, iii. 262 ff.; cf. iii. 267, vi. 314), and they show an interesting tendency to become legends, explaining the *why* of this or that phenomenon by reference to a miracle of Christ or some saint (see examples in Ralston, *Russian Folk-tales*, pp. 330 ff.; and cf. *Mélu-sine*, ii. 43).

So far the term *beast-fable* has been used in its popular acceptance as equivalent to *beast-tale*. In a narrower sense the term is restricted to such beast-tales as are in some measure allegorical or at least have a moral purpose, tacit or outspoken. The step from the beast-tale pure and simple to the beast-apologue is the easy, perhaps the inevitable, result of the growth of reflection. It is difficult to conceive a beast-tale, of whatever origin, that might not lend itself to moralizing. The process may be illustrated by the anecdote of the wife who contradicted her husband, as told by the Knight de la Tour-Landry (ed. by T. Wright for the Early English Text Society, 1868). We might imagine the knight's daughters asking him why a certain lady has a broken nose and getting in reply a bare statement of facts: how the lady had made herself so troublesome by her bad habit that at last her husband, finding expostulation useless, knocked her down, inflicting the injury in question. This answer would be paralleled, in the realm of beast-fable, by the story of the jackal's neglecting to break the fall of the hyæna, told to satisfy an inquiry about the hyæna's limping with his left hind leg (Bleek, No. 7, p. 14). Instead of such a report of facts, however, the knight reads his daughters a lecture on the enormity of insubordination on the part of a wife, and uses the unfortunate lady as a deterrent. This would be paralleled if the mishap of the hyæna were told to exemplify the dangers of bad company or to enforce the thesis that there is *no* honor among thieves. The remark that hyænas still limp might then be omitted. If retained, it would serve merely as a means of heightening the effect: the victim of bad company received an incurable injury which he has handed down to all his posterity. Once established, the allegorical or moralizing beast-fable would, of course, tend to draw into its circle other beast-tales, whatever their origin, and would, in addition, propagate its kind. On the completion of this process we have the didactic fable, as known to ancient and modern literature, firmly established.

The importance of this distinction between tale and fable is insisted on with much cogency by Mr. Joseph Jacobs in his brilliant *History of the Æsopic Fable* (vol. i. of his edition of Caxton's *Æsop*, London, 1889, pp. 204 ff.); but Mr.

Jacobs, in his desire to restrict as far as possible to Greece and India all claim to fable literature, is too much inclined to rule all savage beast-tales out of the category of fable. The line can seldom be drawn with certainty. The *Uncle Remus* stories, for instance, appear in many cases to be purely beast-tales; yet they sometimes lend themselves, in the mind of the narrator, to a more or less distinctly uttered didactic purpose. Mr. Harris, who collected them and who knows the Negro so well, will not venture to say how far they were all felt as embodying a moral, but suspects some such tendency. To some of Col. Jones's *Negro Myths* a rudimentary moral is appended: "Careless man like Buh Turkey Buzzard" (No. 2, p. 4); "Bad plan to hunt for trouble" (No. 18, p. 40). The application of the Zulu story that the hyrax has no tail because he sent for one instead of going himself is hard to miss (Callaway, i. 355; the same fable among the Basutos, Jacottet, *Revue des Traditions Populaires*, iv. 110). It is difficult to escape the moral of the Brazilian (Indian) story of The Opossum and the Man (Roméro, *Contos populares do Brazil*, p. 191); or the North American Indian story of The Eagle and the Owl (Petitot, *Traditions Indiennes du Canada Nord-Ouest*, Paris, 1886, p. 276). It is, then, unsafe to assert that the beast-tales of any given people have no claim to be regarded as fables merely because they have no formal moral, or because no traveler has ever heard them told except for amusement. It is obvious that the tale and the fable may exist side by side, the tale sometimes being used as a fable, the fable sometimes losing its moral and being told as a tale, as boys read Æsop and as the mediæval congregations often took the "examples" in their preachers' sermons. Further, there is no reason why the beast-tales of one race should not become the beast-fables of another.

The *diffusion* of beast-tales is a complicated subject. When we examine such of these stories as have been taken down from the lips of savage or half-civilized races, we observe at once two distinct classes: those that are apparently indigenous, and those that are identical with European tales, popular or literary. The latter class are in almost every instance certainly borrowed directly or indirectly from the whites, and such borrowing is easily accounted for. Nothing travels farther or faster than a good story. The white man has carried his Æsop and his *Reynard the Fox* to the ends of the earth, and by means of the slave-trade has brought the ends of the earth to his own door. A few examples will illustrate these points. The diverting story of how the fox stole the butter, of which Col. Jones gives an excellent version from Georgia (No. 24, p. 53), occurs in Meyrae, *Traditions des Ardennes*, p. 458; in Bladé, *Contes populaires de la Gascogne*, iii. 195; in Gittée and Lemoine, *Contes populaires du Pays Wallon*, p. 159; in Radloff, *Proben der Volksliteratur der türkischen Stämme Süd-Siberiens*, iii. 369, and elsewhere. The details are too remarkable to admit of accidental coincidence. The Æsopic fable of the Fox and the Crane turns up among Negroes in Brazil (Roméro, p. 159). Reynard's device for stealing fish from the wagon is found in South Africa (Bleek, No. 8, p. 16), and, combined with the trick by which the bear lost his tail, among the Iroquois (Smith, p. 77). In the thirty-second of Col. Jones's *Negro Myths* (p. 73) we actually recognize the Herodotean romance of the Egyptian king's treasure-chamber transmogrified into a tale concerning "Buh Lion, Buh Rabbit, Buh Fox, and Buh Rocoon." The facility with which literary matter becomes a part of popular tradition when once made known, in whatever way, to a tale-telling people, has been a fruitful source of perplexity to students of folk-lore. Besides this borrowing from civilized masters or visitors, savage or half-civilized races have, of course, borrowed largely from each other. This exchange may be observed in those countries in which an African slave population has been brought in contact with the aborigines. On the composite character of the folk-lore of such countries the Portuguese scholar Theophilo Braga has made many excellent observations in his essay *Sobre a Novellística Brasileira*, prefixed to Roméro's *Contos populares do Brazil* (Lisbon, 1885). For a discussion of the beast-epic and of the theories relating to a Northern and a Southern cycle of beast-tales, see article REYNARD THE FOX in this encyclopædia.

The oral literature of modern Europe abounds in unmoralized beast-tales differing in no essential from those of uncivilized races. Some of these are clearly wild-shoots from Æsop or *Reynard the Fox*; others are survivals or modern representatives of the indigenous European stories

to which *Reynard* and probably much of Æsop owe their existence; others are doubtless imitations of old models. The beast-tales included in Asbjörnsen and Moe's *Norske Folkeeventyr* (2d ed., Copenhagen, 1852), in Bladé's *Contes populaires de la Gascogne* (Paris, 1886), in Crane's *Italian Popular Tales* (Boston, 1885), in Coelho's *Contos populares Portuguezes* (Lisbon, 1879), and in that corpus of zoölogical superstitions, Rolland's *Faune populaire de la France* (Paris, 1877 ff.), will serve as examples. Russia is particularly rich in such narratives; see A. Gerber, *Great Russian Animal Tales*, in the *Publications of the Modern Language Association of America*, 1885 (chiefly from Afanasiév's collection). Specimens of gypsy stories may be seen in H. von Wislocki, *Volksdichtungen der siebenbürgischen und süd-ungarischen Zigeuner* (Vienna, 1890).

Clearly, then, a people may outlive the animistic stage of mental development without ejecting unmoralized beast-tales from its oral literature. But in *written* literature it is only in the form of the apologue that such tales can win or maintain a place. In this form, in the collection known as the Fables of Æsop, they have had no small influence on the mental and moral life of ancient, mediæval, and modern Europe. The history of this collection is inextricably bound up with the history of Hindu fables, and the two may be briefly sketched together.

Stainhöwel's Latin and German *Æsop* (about 1480), of which Caxton's *Æsop* is an English translation made through the medium of Machault's French version, goes back in general, though not without intermediaries, to the Latin fables of Phædrus (about 25 A. D.; see PHÆDRUS) and the Greek mythiambi of the Roman Babrius (about 230 A. D.; see BABRIUS). The Greek prose fables of Æsop are merely paraphrases of Babrius. The history of Greek fable before Phædrus and Babrius is obscure. Of the date and nationality of Æsop we have no satisfactory information. We can not even be sure that he is an historical person, though that is probable. It is certain, however, that from the time of Aristophanes the Greeks regularly referred to him the fables which they used in writing and conversation. About 300 B. C. Demetrius Phalereus made a collection (*λόγων Αἰσωπέλων συναγωγή*, Diogenes Laertius, v. 80), now lost, of these floating stories, and it is not improbable that this, in a later recension, was the original of our Phædrus (Jacobs, *History of the Æsopic Fable*, p. 35). The immediate source of Babrius was perhaps the *Δεκαμυθία* of Nicostratus (second century of our era), doubtless a handbook for rhetorical teaching (Rutherford, *Babrius*, p. xl.). What relation this bore to the compilation of Demetrius is purely a matter of conjecture.

The question whether the Æsopic fables of Phædrus and Babrius (which show many correspondences) are native Greek or borrowed from India has been much discussed. The Indian documents most concerned are the Pāli Jātakas, or birth-tales (about 400 B. C., though not put into their present frame till perhaps 500 A. D.; see PĀLI LITERATURE), and the so-called *Fables of Bidpai*. In the Jātakas various beast-fables (in the narrower sense) are strung together as accounts of the incarnations of the Buddha. In the *Fables of Bidpai* (lost in its original form, but preserved in whole or in part in several translations, Syriac, Arabic, Tibetan, etc., and in the Sanskrit abridgment entitled PANCHATANTRA, q. v.) similar, and in some cases identical, stories are used to make up a *Buddhistic De Regimine Principum*. The date of the original work is unknown, but may be put at about 300 A. D. A considerable portion of its contents reappears in the *Hitopadeśa* and the *Kathā-sarīt-sāgara* (see SANSKRIT LITERATURE). The many correspondences between Phædrus-Babrius and the Bidpai collection make borrowing certain. Benfey was of the opinion that the Indians had borrowed largely from the Greeks: but the early date of the Jātakas proves that the former had a large stock of beast-fables of their own, and the appearance of several of the Jātakas among the Æsopic fables suggests an Indian source for such other of the Phædrus-Babrius apologues as are found in the Bidpai collection. It is therefore pretty certain that not a few of Æsop's fables came from the East. That all of them are of Oriental origin is, however, improbable. Unless the Greeks were different from the rest of mankind, they must have had their own primitive beast-tales, and some of these they would inevitably have moralized. Besides, we have a few specimens of Greek fable (in the narrower sense) that date from a time so early as to make borrowing unreasonable. The Hesiodic apologue of the hawk and the nightingale (*Works and Days*, 203 ff.) is an

example (see Rutherford's *Babrius*, p. xxvii., and cf. Joseph Jacobs, *Æsopic Fable*, pp. 26-29). Except the Indians and the Greeks, no ancient nation can be said to have made important original contributions to fable literature.

The history of the Æsopic fable in the Middle Ages is full of difficulties. A tenth-century version of eighty-three fables of Phædrus, which is ascribed in the manuscripts to "Romulus," was the medium through which the Latin fabulist became known to a large part of Western Europe. Most of the Old French "Ysopets," for example, go back to it, though not immediately. Babrius became known through the incomplete Latin translation by Avianus (about 380 A. D.; see AVIANUS). The celebrated Marie de France translated into Norman French of the twelfth century more than a hundred fables, which she ascribed to King Alfred. For a very ingenious conjectural genealogy of her collection the reader may consult Mr. Joseph Jacobs's *History of the Æsopic Fable* (vol. i. of his edition of Caxton's *Æsop*, London, 1889). This is a work which goes over all the questions of Greek, Latin, and Oriental fable afresh (with abundant references to the investigations of Benfey, Hervieux, Rutherford, Mall, and other scholars), and contributes to the subject many facts and much interesting theory.

We have already seen that the oral traditions of modern Europe possess many tales which may be recognized as Æsop's fables without their morals. A fruitful source for the introduction of these stories from written literature into oral literature was certainly the *exempla* of mediæval sermons (see T. F. Crane, *The Exempla of Jacques de Vitry*, London, 1890; and the article EXAMPLE-BOOKS). The people have kept the tales but discarded the *hæc fabula docet*.

The *Fables of Bidpai* was translated into Latin (from a Hebrew version of the Arabic) by John of Capua in the latter part of the thirteenth century under the title of *Directorium Vitæ Humane* (edited by Derembourg, Paris, 1889), and this version (first printed in 1483) did not fail of its influence on the literature of the fourteenth, fifteenth and sixteenth centuries. The Spanish *Calyla è Dymna* (about 1250; edited by Gayangos, 1860) is an independent rendering from the Arabic. The *Directorium*, however, never became popular in the sense in which the fables of Æsop were popular. Sir Thomas North's version (*The Morall Philosophie of Doni*, 1570; excellently edited by Joseph Jacobs, London, 1888) has special interest for the student of English letters.

The only great fabulist of modern times is La Fontaine (1621-95), whose exquisite art made the Æsopic apologue his own, without robbing it of its individuality. The *Fabeln* of Lessing (published 1759) are still read with pleasure, but can not be compared with the masterpieces of La Fontaine. Of other fabulists only the Englishman Gay, the German Gellert and the Russian Krilof need be mentioned. The fable is still used to some extent for ephemeral purposes, as, for example, in political campaigns, but can hardly be expected ever to regain a place in literature.

BIBLIOGRAPHICAL NOTE.—Materials for the study of the beast-tales of savage or semi-civilized races may be found scattered up and down in the anthropological, ethnological, and folk-lore journals. (See FOLK-LORE.) The following books and articles will also be of service: Émile Allain, *Contes Indiens du Brésil*, recueillis par M. le Général Couto de Megalhães (Rio, 1883); H. N. Allen, *Korean Tales* (New York, 1889); C. Baissac, *Le Folk-lore de l'Île Maurice* (Paris, 1888); René Basset, *Contes populaires Berbères* (Paris, 1887); L. J. B. Bérengar-Féraud, *Contes de la Sénégambie* (Paris, 1885); W. H. I. Bleek, *Reynard the Fox in South Africa* (Lond., 1864; in German, Weimar, 1870); the same, *A Brief Account of Bushman Folk-lore* (London and Cape Town, 1875); D. Brauns, *Japanische Märchen und Sagen* (Leipzig, 1885); H. Callaway, *Nursery Tales of the Zulus* (Natal and London, 1868); E. Casalis, *Les Bassoules* (Paris, 1859); Sir G. W. Dasent, *Anansi Tales*, appended to his *Popular Tales from the Norse* (2d ed., London, 1859); G. Dumoutier, *Les Chants et les Traditions populaires des Annamites* (Paris, 1890); Alcéc Fortier, *Bits of Louisiana Folk-lore*, in *Transactions of the Modern Language Association of America*, iii. 100 ff.; W. E. Griffis, *Japanese Fairy World* (Scheneectady, N. Y., 1850); J. C. Harris, *Uncle Remus, his Songs and Sayings* (New York, 1880); the same, *Nights with Uncle Remus* (Boston, 1883); the same, *Daddy Jake* (New York, 1889); the same, *Uncle Remus and his Friends* (Boston, 1892); C. F. Hartt, *Amazonian Tortoise Myths* (Rio, 1875); C. C. Jones, Jr., *Negro Myths from the Georgia Coast* (Boston, 1888); S. W. Koelle, *African Native Literature* (Lon-

don, 1854); C. G. Leland, *Algonquin Legends of New England* (Boston, 1884); L. C. Lloyd, *A Short Account of further Bushman Material* (London, 1889); M. P. Milne-Home, *Mamma's Black Nurse Stories: West Indian Folk-lore* (Edinburgh, 1890); A. B. Mitford, *Tales of Old Japan* (London, 1881); Émile Petitot, *Traditions Indiennes du Canada Nord-Ouest* (Paris, 1886); J. C. Poestion, *Lapp-ländische Märchen* (Vienna, 1886); J. Rivière, *Recueil de Contes populaires de la Kabylie du Djurdjura* (Paris, 1882); S. Romero, *Contos populares do Brazil* (Lisbon, 1885); F. J. de Santa-Anna Nery, *Folk-lore Brésilien* (Paris, 1889); C. F. Schlenker, *A Collection of Temme Traditions* (London, 1861); J. F. Schön, *African Proverbs, etc.* (London, 1886); H. R. Schoolcraft, *Algie Researches* (New York, 1839); the same, *The Myth of Hiawatha and other Oral Legends* (Philadelphia, 1856); Erminnie A. Smith, *Myths of the Iroquois*, in *Report of the United States Bureau of Ethnology for 1880-81*; Edward Steere, *Swahili Tales* (London, 1870); Karl von den Steinen, *Die Bakairi-Sprache* (Leipzig, 1892); G. McC. Theal, *Kaffir Folk-lore* (London, 1882; 2d ed. 1886). See also ANIMISM, FOLK-TALES, and REYNARD THE FOX. GEORGE LYMAN KITTEDGE.

Beast, Number of the: See APOCALYPTIC NUMBER.

Beat: in Alabama and Mississippi, a primary division of a county; a precinct.

Beatifica'tion [Lat. *beatifica'tio*; *beatus*, blessed + *facere*, make]: in the Roman Catholic Church, the solemn act by which the pope declares "blessed" a deceased person who lived and died in the odor of sanctity as proved by the testimony for his virtues, or by his martyrdom, and confirmed by miracles wrought after his death through his intercession. Beatification is a step toward CANONIZATION (*q. v.*).

JOHN J. KEANE.

Beatific Vision: or the direct vision of God; a Christian doctrine directly founded on Scripture (1 Cor. xiii. 12; 1 John iii. 2; Rev. xxii. 3, 4), and universally accepted by the Churches. The time, however, at which the beatific vision is to take place has been the subject of some dispute. The Greek Church puts it after the day of judgment, and among the Protestant Churches this view has been adopted by both the Calvinists and the Lutherans. But it was condemned by the Council of Florence, 1439, which determined that "the souls of those who have remained pure and spotless after baptism, and of those whose sins after baptism have been pardoned, either in this life or in the next, are immediately received into heaven, and behold plainly the triune God as He is"; which decision was confirmed by the Council of Trent.

Beating the Bounds: a popular phrase used in England to denote the periodical survey or perambulation by which the boundaries of parishes are preserved. It is the custom that the clergyman of the parish, with the parochial officers and the boys of the parish school, should march to the boundaries, which the boys strike with willow rods. The boys themselves were sometimes whipped in proximity to an important landmark, in order to impress the subject durably on their memories.

Bea'ton, Beaton, or Bethune, DAVID: Scottish cardinal; b. in Fife, Scotland, 1494; a zealous opponent of the Protestant Reformation. He was appointed Lord Privy Seal in 1528, and was sent as ambassador to France in 1533. He became a cardinal in 1538, and succeeded his uncle as Archbishop of St. Andrews in 1539. On the death of James V., in 1542, Beaton produced a forged will of that king, appointing himself, with three others, regent of the kingdom; but his artifice failed, and the Earl of Arran became the regent. Cardinal Beaton was a cruel persecutor of the Protestants, and caused George Wishart to be burned at the stake. He was assassinated in his own castle in St. Andrews by Norman Leslie and others, May 29, 1546. See Knox, *History of the Reformation in Scotland*; Froude, *History of England*, vol. iv.; Robertson, *History of Scotland*.

Bea'trice: city and railroad junction; capital of Gage co., Neb. (for location of county, see map of Nebraska, ref. 7-K); on Big Blue river; 90 miles S. S. W. of Omaha. It has a public library, 2 opera-houses, 7 fine schools, 13 churches, Holly system of water-works, extensive manufactures, etc.: \$100,000 court-house, new \$60,000 Government building, 7 miles of brick-paved streets, electric lights, electric motor street railway; 7 lines of railway, including Rock Island main line, Union Pacific, C., B. and Q., and minor lines; is the third city in the State in population, second in manu-

factures; has 2 daily and 5 weekly newspapers. It is noted for its fine water-power and excellent building-stone. Pop. (1890) 13,836; (1900) 7,875. EDITOR OF "EXPRESS."

Beatrice Portinari, *bāy-āā-tree'chiaï pōr-tēē-naa'rēē*: See DANTE.

Bea'tie, JAMES, LL. D., D. C. L.: poet; b. in Laurencekirk, Kincardine, Scotland, Oct. 25, 1735. In 1760 he became Professor of Moral Philosophy in Marischal College, Aberdeen. To refute the doctrines of Hume he published his *Essay on Truth* (1770), which was extremely successful. His most popular poem is *The Minstrel* (1771-74). D. in Aberdeen, Aug. 18, 1803. See Sir William Forbes's *Life of James Beattie* (2 vols., 1806); Alexander Bower's *Life of James Beattie* (1804).

Beatty, JOHN, M. D.: b. in Bucks co., Pa., Dec. 10, 1749; graduated at New Jersey College in 1769; studied medicine with Dr. Rush, but entered the army early in the Revolutionary war, and became lieutenant-colonel in the Pennsylvania line in Sept., 1776; was taken prisoner at the capture of Fort Mifflin, and, having been exchanged, was appointed commissary-general of prisoners in 1778, with rank of colonel; resigned in 1780, and engaged in the practice of medicine at Princeton, N. J.; was delegate to the Continental Congress 1783-85; often a member of the State Legislature; was Speaker of the House; member of convention which adopted the Federal Constitution; member of Congress 1793-95; Secretary of State for New Jersey 1795-1805; president of Trenton bank 1815-26. D. in Trenton, May 30, 1826.

Beatus Rhenanus: See RHENANUS BEATUS.

Beaucaire, bō'kār' (i. e. *Bellum Quadrum*, the beautiful square): a town of France; department of Gard; on the right (west) bank of the Rhône, and on a railway from Cette to Tarascon; 15 miles by rail E. of Nîmes (see map of France, ref. 8-G). A bridge nearly one mile long here crosses the Rhône. It has an active trade, which is facilitated by a canal extending to the Mediterranean. Here is held annually a great fair (July 25-28), which was formerly perhaps the largest in Europe. It is said to have been instituted by Count Raymond II. of Toulouse in 1217, although we do not find it mentioned until 1315. It has declined in modern times, but it is still frequented by merchants from all parts of Europe and the Levant. The number of annual visitors was formerly estimated at 100,000, but has greatly declined. The chief articles sold at this fair are silks, wine, oil, drugs, wool, leather, and spices. Pop. (1896) 9,020.

Beauchamp, bō'shān', ALPHONSE, de: a French historian and publicist; b. at Monaco, in Italy, in 1767; resided in Paris. He contributed to the *Moniteur* and the *Gazette de France*, and published many works, among which are a *History of La Vendée* (3 vols., 1806); a *History of Brazil* (1815); and a *Life of General Moreau* (1814). D. in Paris, June 1, 1832.

Beauchamp, bee'cham, EARLS OF: Viscounts Elmley (1815); Barons Beauchamp (1806, in the United Kingdom), a noble family of Great Britain.—FREDERICK LYGON, the sixth earl, was born Nov. 10, 1830, and succeeded his brother in 1866. He was Lord of the Admiralty in 1859, member of Parliament for Tewkesbury 1857-63, and for West Worcestershire 1863-66. He died Feb. 19, 1891, and was succeeded by William Lygon, the seventh earl, b. 1872.

Beauchamp, RICHARD: Earl of Warwick; b. about 1380; served as general of the English army in France under Henry V., and succeeded the Duke of Bedford as regent in France. D. at Rouen in 1439.

Beauelerk, bō'klaark', TOPHAM: friend of Dr. Johnson; b. Dec., 1739; only son of Lord Sydney Beauelerk. D. in London, Mar. 11, 1780. After his death Johnson wrote to Boswell: "Poor dear Beauelerk, his wit, his folly, his acuteness and maliciousness, his merriment and reasoning are now over. Such another will not often be found among mankind."

Beaufort, bō'fort: a port of entry; capital of Carteret co., N. C. (for location of county, see map of North Carolina, ref. 4-J); at the mouth of Newport river, about 4 miles from the ocean and 168 miles E. S. E. of Raleigh. Its harbor is the best in the State, and is defended by Fort Macon. There is a lighthouse 156 feet high at Cape Lookout, 11 miles S. E. of Beaufort, in lat. 34° 37' 16" N., lon. 76° 31' 07" W. Pop. (1880) 2,009; (1890) 2,007; (1900) 2,195.

Beaufort, byn'fort: on railroad; a port of entry; capital of Beaufort co., S. C. (for location of county, see map of South Carolina, ref. 8-E); on Port Royal island, and on an arm of the sea called Port Royal river, about 55 miles W. S. W. of Charleston. It has a good harbor, with nearly 16 feet of water over the bar at the entrance. Lumber, rice, and cotton are exported. Pop. (1880) 2,549; (1890) 3,587; (1900) 4,110.

Beaufort, HENRY, Cardinal: an English prelate; b. about 1375; was a natural son of John of Gaunt and half-brother of King Henry IV. He became Bishop of Lincoln in 1398, Bishop of Winchester in 1405, Lord Chancellor in 1403, again in 1413, and a third time in 1424. He acted a prominent part in political affairs, for which he had superior abilities. During the minority of Henry VI. he was very powerful, and was a rival of his nephew, the Duke of Gloucester. He was suspected of complicity in the murder of that rival, but the insinuation is baseless. He was present at the Council of Constance, and voted for Martin V., who, in return for his services, made him a cardinal (1417), but the king (Henry V.) would not allow him to accept the position. In 1426 he was again nominated, and, Henry VI. not opposing this time, he realized his ambition. He was extremely wealthy. D. in Winchester, Apr. 11, 1447. See Lord Campbell, *Lives of the Lord Chancellors*.

Beaufort, bō'fōr', FRANÇOIS DE VENDÔME, Duc de: b. in Paris in 1616; a grandson of Henry IV. of France, and a son of César de Vendôme. He was a leader of the malcontents or opponents of the court in the civil war of the Fronde. Having returned to his allegiance, he was appointed commander of the fleet by Louis XIV. about 1662. He was killed at the siege of Candia in 1669.

Beaufort, DUKES OF (1682): Marquesses of Worcester (1642); Earls of Worcester (1514); Earls of Glamorgan, Viscounts Grosmont, and Barons Beaufort (1642); Barons Herbert (1461); Barons Herbert of Ragland, Chepstow, and Gower (1506); Barons Bottetourt (1308, in England), an old and prominent family of Great Britain.—HENRY CHARLES FITZROY SOMERSET, the eighth duke, was born Feb. 1, 1824, and succeeded his father in 1853. He was member of Parliament for East Gloucestershire 1846-53; master of the horse 1858-59 and 1866-68; and lieutenant of Monmouthshire.

Beaugency, bō'zhāñ-see': an old town of France; department of Loiret; on the right bank of the Loire, and on the railway from Paris to Bordeaux, 16 miles S. W. of Orléans (see map of France, ref. 4-E). It has manufactures of woolen and leather goods, and a trade in wine, grain, and wool. In the fighting here, Dec. 7 to 10, 1870, the Grand Duke of Mecklenburg was victorious over the French army of the Loire. Pop. (1891) 4,313.

Beauharnais, bō'āär'nay', ALEXANDRE, Vicomte de: French soldier and statesman; b. on the island of Martinique, May 28, 1760; fought under Rochambeau in America; married (1779) Josephine Tascher de la Pagerie, afterward wife of Napoleon I.; member of the National Assembly 1789, and twice its president; general in the Army of the North 1791; general of the Army of the Rhine 1793; accused of participation in the surrender of Mainz; executed in Paris, July 23, 1794.

Beauharnais, EUGÈNE, de: son of Vicomte Alexandre de Beauharnais; b. in Paris, Sept. 3, 1781. His mother, Josephine, became the wife of Bonaparte, whom he accompanied to Egypt in 1798. He was rapidly promoted in the army, was appointed Viceroy of Italy in 1805, and married the Princess Amalie Augusta, a daughter of the King of Bavaria, in 1806. His functions as viceroy were performed with ability, prudence, and moderation. He also displayed superior military talents in the campaign against Austria in 1809 and in the invasion of Russia in 1812. Having obtained command of the army in Russia after it had suffered great disasters, he acted with remarkable firmness and constancy, and made a masterly retreat. After the battle of Lützen, May, 1813, in which he took part, he went to Italy, which he defended against the Austrians until the deposition of Napoleon. He afterward resided at Munich, and obtained from the King of Bavaria the title and estate of Duke of Leuchtenberg. D. in Munich, Feb. 21, 1824. One of his sons married Dona Maria, Queen of Portugal, in 1835. See Léonard Gallois, *Histoire du Prince Eugène de Beauharnais* (1821); A. Aubriet, *Vie de Eugène de Beauharnais* (1824).

Beauharnais, HORTENSE: See HORTENSE.

Beauharnais, JOSEPHINE: See JOSEPHINE.

Beauharnois, bō'āär'nwāä': capital of Beauharnois co., Quebec; on branch of Grand Trunk Railway, and on St. Lawrence river; 27 miles S. W. of Montreal (see map of Quebec, ref. 5-B). It has flax-mills, potteries, and factories. Pop. (1881) 1,499; (1891) 1,590.

Beaujour, bō'zhoor', LOUIS FÉLIX: b. in Provence, France, in 1765; entered the diplomatic service in 1788, and in 1804 became consul-general and *chargé d'affaires* to the U. S.; wrote *A Sketch of the United States at the Commencement of the Nineteenth Century*; returned to France in 1814; became consul-general at Smyrna in 1816, and inspector-general for all the Levant in 1817; was made baron in 1819. D. July 1, 1836.

Beaumarchais, bō'māär'shay', PIERRE AUGUSTIN CARON, de: a French dramatist remarkable for his wit and versatility, whose adventurous career and vicissitudes of fortune obtained for him great celebrity; b. at Paris, Jan. 24, 1732; was the son of a clockmaker. Although sent to the college (Anglicè, *school*) at Alfort, he was at the early age of thirteen apprenticed to his father. He soon discovered a decided taste for literature and an excessive fondness for music, in which art he became so proficient that he was enabled to procure an introduction to the court of Louis XV., and was employed to teach the princesses, his daughters, to play upon the harp, in the performance upon which he was skilled, and in the pedals of which he introduced an improvement. At the concerts given at the court he made the acquaintance of Duverney, the celebrated financier of that period, whom he was enabled to aid, by his influence with the princesses, in the accomplishment of certain projects in which the banker was at that time engaged. In return, Duverney instructed him in the affairs of finance, and aided him with funds and credit. The first literary production which attracted attention to Beaumarchais was his drama of *Eugénie*, published in 1767, which, however, did not meet with success. In Nov., 1768, Beaumarchais's second wife died, and in July of the same year Duverney. Although one-half of his wife's fortune was in a life-annuity, and the settlement of Duverney's affairs discovered a balance in favor of Beaumarchais, a rumor prevailed that he had poisoned his wife, and he was accused by Comte de la Blache, Duverney's heir, of embezzlement, fraud, and forgery. A seven years' litigation in securing the amount due him from Duverney was the occasion of his masterly *Mémoires* in his defense, which obtained for him great notoriety. These productions are admitted to be masterpieces in their way, and the interest and excitement produced by them is described as magical and electrical. Although thus occupied in the law and in his favorite literary pursuits, Beaumarchais was still actively engaged in various business speculations. He was prompt to foresee the success of the American Revolution, and engaged by connivance with, though unaided by, the French Government in supplying the Americans with arms and ammunition.

In the midst of his manifold labors he undertook at this time an expensive reproduction of the works of Voltaire, one edition of which was to be in seventy-two volumes, by which he sustained a very heavy loss. Notwithstanding he gave his support to the principles of the French Revolution, and imported firearms for the use of the French, his property was confiscated, and he was for a time an exile from his native land. After undergoing persecution and accusation, he returned to France when the Revolution was over. His sufferings during this period were described by him in a published work entitled *Mes Six Époques*. He recovered possession of his beautiful villa at Faubourg St. Antoine, where he remained till his death. The evening of May 17, 1799, he passed with his family and a few friends; on the morning of the 18th he was found dead in his bed.

Besides the works already mentioned, he was also the author of various dramatic productions. *Le Mariage de Figaro*, his masterpiece, produced the greatest excitement in Paris, and his *Barbier de Séville*, which preceded it, was also a great success. The first formed an epoch in the dramatic, social, and political annals of France, and was styled by Napoleon "the Revolution already in action." It is but proper to add that no conception of its wit, vivacity, and telling social and political allusions and sarcasms can be had at the present day, especially from the opera librettos with which we are familiar. See L. de Loménie's *Beaumarchais, sa Vie et son Temps* (1852); St.-Marc Girardin, *Notice sur la Vie de Beaumarchais* (1835); E. Berger, *Essai sur la*

Vie et les Ouvrages de Beaumarchais (1847); E. Lintilhac, *Beaumarchais et ses Œuvres* (1887).

Beaumaris: a seaport of Wales; capital of the island and county of Anglesea; on the east coast of the island; 3 miles N. of Bangor, and about 2 miles from the north end of Menai Strait (see map of England, ref. 8-D). It is a favorite place of resort for sea-bathing. The Bay of Beaumaris affords safe anchorage. Here is a ruined castle built by Edward I. Pop. (1891) 2,202.

Beaumont: city and railroad junction; capital of Jefferson co., Tex. (for location of county, see map of Texas, ref. 5-K); 83 miles E. by N. of Houston, and 68 miles N. E. of Galveston, and at head of tide-water navigation on Neches river, which is navigable for 331 miles from the sea by steamers. The yellow pine and cypress lumber and shingles manufactured on the Neches river (which has four mills) are shipped by Southern Pacific R. R. and in steamers and schooners from Beaumont via Sabine Pass. An average of 1,720 car-loads a month is shipped by rail through Texas, etc. Beaumont has fine water-works, electric-light, ice-works, refrigerating company, furniture-factory, foundry, steam-laundry, street-cars, etc., and is one of the most progressive lumber and shingle manufacturing towns in the South. Pop. (1890) 3,296; (1900) 9,427.

EDITOR OF "ENTERPRISE."

Beaumont, FRANCIS: dramatic poet; b. at Grace Dieu, in Leicestershire, England, in 1584; educated at Oxford. He was an intimate friend of John Fletcher, in partnership with whom he wrote about a third of the fifty-two plays which pass under their joint names, among which are the excellent tragedies and tragi-comedies, *Philaster*, *The Maid's Tragedy*, and *A King and No King*. D. Mar. 6, 1616, and was buried in Westminster Abbey.

Beaumont, bō'mōn', GUSTAVE DE LA BONNIÈRE, de: French publicist; b. in Beaumont la Chartre, Feb. 16, 1802; sent to America with De Toqueville in 1831 to study the U. S. prison system; member of the Chamber 1840; ambassador to London under Cavaignac. D. in Tours, Apr. 2, 1866. He was author of *Traité du système pénitentiaire aux États-Unis et de son application en France*; *Marie, ou l'esclavage aux États-Unis*; *L'Irlande sociale, politique et religieuse*.

Beaumont, WILLIAM, M. D.: surgeon; b. at Lebanon, Conn., in 1785. While in the U. S. army in 1825 a young man (Alexis St.-Martin) was brought to him who had received a wound from a musket discharged at the distance of only a few feet. The wound healed, and left an aperture about 2½ inches in diameter, through which the process of digestion could be seen. Dr. Beaumont availed himself of this to make various experiments on digestion, the results of which are extremely interesting and of great importance to physiological science. They were published in 1838. D. in St. Louis, Mo., Apr. 25, 1853.

Beaune, bōn (anc. *Vellaunodunum*): an old town of France; department of Côte d'Or; on the river Bouzoise, and on the Paris and Lyons Railway; 23 miles by rail S. S. W. of Dijon (see map of France, ref. 5-G). It has the beautiful Church of Notre Dame, and a splendid hospital founded in 1443, which retains nearly unchanged its original Gothic buildings. Here are manufactures of woolen cloth, cutlery, leather, etc. Good burgundy wine is produced in this vicinity. Pop. (1896) 13,726.

Beauport: a post-village and parish of Quebec co., Quebec, Canada, 3½ miles N. E. of Quebec; on north shore of St. Lawrence river (for location of county, see map of Quebec, ref. 4-D). It has extensive manufactures and trade in flour, lumber, nails, etc., and is the seat of Beauport Lunatic Asylum, a large and well-conducted institution. Pop. 4,800.

Beaurain, bō'rān', JEAN, de: b. at Aix-en-Essart in 1696; appointed royal geographer in 1721. His best work is *Topographical and Military Description of the Campaigns of Marshal Luxembourg from 1690 to 1694*. D. 1771.

Beauregard, PIERRE GUSTAVE TOUTANT: soldier and engineer; b. near New Orleans, May 28, 1818; graduated at U. S. Military Academy July 1, 1838; second lieutenant of engineers July 7, 1838; was distinguished at the siege of Vera Cruz, in reconnoissances before the battle of Cerro Gordo, and in battles in the valley of Mexico, for which twice breveted; wounded in assault on Belen Gate, Sept. 13, 1847; captain of engineers Mar. 3, 1853; in charge of defenses in Louisiana 1853-60; appointed superintendent of U. S. Mili-

tary Academy Nov., 1860, but held this position a few days only. Resigned Feb. 20, 1861, and was made brigadier-general in Confederate army, in which capacity he directed the operations against Fort Sumter which opened the civil war. He commanded subsequently the forces which defeated Gen. McDowell at Bull's Run, July 21, 1861, for which victory he was next day made general; was second in command at the battle of Shiloh, Apr. 6, but opposed the plan of advance, and on Johnston's death assumed chief command, holding his ground until 2 p. m. next day against the Federal forces, re-enforced by the army of Gen. Buell; he then withdrew to Corinth, which place he held against the forces of Gen. Halleck till May 30, when he evacuated it, retreating to Tupelo. He subsequently commanded, with headquarters at Charleston, the defense of the Southern coast, signalized by the unsuccessful attack, Apr. 7, 1863, of Admiral DuPont's squadron, and by the combined operations of sea and land forces under Admiral Dahlgren and Gen. Gillmore. In 1864 he commanded in Virginia, successfully resisting Gen. Butler's forces at Drury's Bluff, and later, with a force of 5,700 men, increased to 10,500, resisted Gen. Grant's front attack upon Petersburg, holding that place till re-enforced by part of Lee's army, thus compelling the long-protracted siege. Was subsequently charged with resisting Gen. Sherman's march to the sea, having but 5,000 men, partly militia. The skillful withdrawal of Gen. Hardee's army from Savannah, invested by Sherman, to Pocotaligo, was due to Beauregard. At the time of the surrender of Gen. Johnston's army Beauregard was voluntarily assisting him. After the war he was engaged in railroad management. In 1866 the chief command of the Roumanian army was tendered him, and in 1869 that of the army of the Khedive of Egypt, both of which he declined. Became adjutant-general of Louisiana 1878, and eventually served the Louisiana State Lottery. D. in New Orleans, Feb. 20, 1893.

Revised by C. K. ADAMS.

Beauvais, bō'vay' (anc. *Bellovacum*): an old city of France; capital of the department of Oise; situated on the river Thérain, and in a rich valley inclosed by wooded hills; 64 miles by rail N. N. W. of Paris (see map of France, ref. 3-F). It has a fine large but unfinished Gothic cathedral, a public library, a museum, and a college. Here are extensive manufactures of woolen cloths, flannels, shawls, Gobelin tapestry, printed cottons, and carpets. Pop. (1896) 19,906. It was the chief town of the Bellovaci in the time of Cæsar. In 1443 it was besieged in vain by the English. The citizens of Beauvais repulsed Charles the Bold, Duke of Burgundy, who besieged the city in 1472 with 80,000 men.

Beaven, ROBERT: See the Appendix.

Beaver (in Lat. *castor*): a remarkable quadruped (*Castor fiber*) of the order *Rodentia*; a native of Europe, Asia, and North America. Beavers were once abundant in the U. S., but they have gradually disappeared before the advance of civilization. They are characterized by industry, sagacity, and instinctive skill in building dams and houses. They have strong incisors or cutting teeth, in which a sharp, chisel-like edge is always preserved by the unequal abrasion of the hard enamel and the other part, which is softer. The body of the beaver is about 2 feet long. The toes of the hind feet are long, spreading, and webbed to the nails.



Beaver.

Among its remarkable characteristics is a tail of an oval form, about 10 inches long, horizontally flattened, and about 3 inches wide. This is covered with horny scales, but the

body is clothed with a very fine and valuable fur, the color of which is sometimes chestnut-brown; this fur is used for making hats and caps. The food of the beaver consists of bark of trees, leaves, roots, and berries. Its favorite haunts are rivers and lakes which are bordered by forests. "Their work is all performed in the night," says Dr. Godman. When they find a stream that is not sufficiently deep for their purpose, they build a dam across it with wonderful ingenuity and industry. The dam, which is formed of sticks, roots, stones, and mud strangely combined, is water-tight, and presents a convex surface toward the current. To obtain material for it they cut down the trees growing on the margin of the stream above the dam, and float them down. They prefer small trees, but sometimes fell those that are 10 inches or more in diameter. It is stated that they have built dams nearly 300 yards long. The sides of the dam incline toward each other, so that the bottom of it is much thicker than the top. There is a popular opinion that beavers use their tails as trowels in plastering. It is more probable that the tail serves as a prop or support when they work with their fore feet or carry burdens with them. They pass the winter in houses or lodges which are 2 to 3 feet high, are built on the edge of the water, and afford them protection from wolves and other wild beasts. They also have holes or burrows in the ground (adjacent to their lodges), with entrances under the water, in which they take refuge if their lodges are destroyed or become untenable.

The houses or huts of beavers are not built of sticks first and then plastered, but all the materials, sticks, mud, and stones, are mixed together, and this composition is employed from the foundation to the summit. "The tops of the houses," says Godman, "are generally from 4 to 6 feet thick at the apex of the cone." "The outside of the hut is covered or plastered with mud late in the autumn, and after frost has begun to appear. By freezing it soon becomes almost as hard as stone, effectually excluding their great enemy, the wolverine, during the winter. The door or hole leading into the beaver-hut is always on the side farthest from the land, and is near the foundation of the hut or at a considerable depth under water." When they are much disturbed by the presence of hunters and settlers, beavers renounce their original programme, cease to build dams and houses, and, adapting themselves to their altered circumstances, excavate in the banks of rivers holes for their residence—a signal manifestation of sagacity.

Beavers are easily tamed, but no wooden cage will keep them confined, because they gnaw through. Many of them are caught in traps by the Indians and other trappers. In 1820 60,000 beaver skins were sold by the Hudson's Bay Company. Their numbers are rapidly diminishing in consequence of the exterminating warfare waged against them by hunters, who often kill the young before they have attained half their growth. The bait which is used to entice beavers is prepared from the substance called castor (*castoreum*), obtained from glandular pouches connected with the reproductive organs of the male beavers. "The only species of beaver known," says Dr. Godman, "is the one we have described," but others believe the Old World and New World beavers to be distinct species. The so-called extinct giant beaver, known as the *Castoroides ohioensis*, is not related to the beaver, but to the South American octodonts, a group represented by the COYPU (*q. v.*). It was first described by Col. J. W. Foster, and by him was called *Castoroides*. See Morgan, *The American Beaver* (1867).

Beaver: borough; on railroad; capital of Beaver co., Pa. (for location of county, see map of Pennsylvania, ref. 4-A); on the right bank of the Ohio river, 2 miles below the mouth of the Beaver river, and 27 miles N. W. of Pittsburgh. It is the seat of Beaver College, a female seminary, an academy, and has good union schools; has water-power and natural gas. There is a fine park in the center of the village. Pop. (1880) 1,178; (1890) 1,552; (1900) 2,348.

Beaver: city; capital of Beaver co., Utah (for location of county, see map of Utah, ref. 6-L); on Beaver river; about 50 miles S. by W. of Fillmore. The chief productions are the cereals and wool. Copper and lead are found in the vicinity. Pop. of precinct, including Beaver city (1880) 1,911; (1890) 1,752; Beaver city (1900) 1,701.

Beaver Dam: on railroad; a city of Dodge co., Wis. (for location of county, see map of Wisconsin, ref. 6-E); on Beaver Dam creek; 61 miles N. W. of Milwaukee. Beaver Dam is the seat of Wayland University, and has a fine water-power, two woolen factories, a large seeder establishment,

etc. It is situated in an agricultural district, and is a place of summer resort. Pop. (1880) 3,416; (1890) 4,222, to which the enveloping township added 1,341; (1900) 5,128.

Beaver Falls: borough; on railroad; Beaver co., Pa. (for location of county, see map of Pennsylvania, ref. 4-A); on Beaver river, 4 miles above its junction with the Ohio; 31 miles N. W. of Pittsburgh. It has Geneva College, important manufactures, natural gas, plenty of coal, and water-power. Pop. (1880) 5,104; (1890) 9,735; (1900) 10,054. EDITOR OF "TRIBUNE."

Beaver Islands: a group of islands in the north part of Lake Michigan; a part of Charlevoix co., Mich. (for location, see map of Michigan, ref. 3-H). St. James, on Big Beaver island, is the chief town. Here a branch of the Mormons under James J. Strang settled in 1847. See Campbell's *Outlines of the Political History of Michigan*, and *An American King*, Harper's Magazine, Mar., 1882.

Bebber, beb'ber, WILHELM JAKOB, van, Ph. D.: German meteorologist and author; forecaster for the Seewarte meteorological service; b. at Grieth-am-Niederrhein, Rhine Province, Prussia, July 10, 1841; educated at the gymnasium at Emmerich, the academy at Münster, and the university at Bonn. After teaching for some years he became in 1875 rector of the Realschule at Weissenburg-am-Sand, and in 1879 chief of the division of weather-telegraphing of the German Seewarte at Hamburg, which position he still holds. Prof. van Bebber issues daily the weather forecasts for the German and other European coasts, and part of the interior. He has also prepared 130 or more publications of some length. Among these are two well-known and valuable books: *Handbuch der ausübende Witterungskunde* (2 vols., 1885 and 1886) and *Lehrbuch der Meteorologie* (1890). M. W. HARRINGTON.

Bebee'ria, or **Bebee'rine** (C₁₉H₂₁NO₃): a vegetable alkali or alkaloid obtained from the bark of the bebeeru, or green-heart, a tree of British Guiana. It is used in medicine as a substitute for quinine, which it resembles in properties.

Bebee'ru, **Bibiru**, or **Bibisi** (*Nectandra rodigi*): a tree of British Guiana: the timber is known in commerce as green-heart. It is of the family *Lauraceæ*. See GREEN-HEART.

Bebel, bay'bel, FERDINAND AUGUST: German socialist; b. in Cologne, Feb. 22, 1840; learned the turner's trade; settled in Leipzig; became prominent in labor organizations; associate editor of the *Volksstaat*, and later of *Vorwärts*; member of the North German Parliament 1867, of the German Parliament 1871-81 and 1883-; member of the Legislature of Saxony from 1881 to 1894; frequently sentenced to imprisonment; a gifted orator; author of *Our Aims* (10th ed.); *The German Peasant War* (1876); *Woman* (10th ed. 1891), etc. C. H. THURBER.

Bebel, HEINRICH: German humanist; b. in Ingstetten, 1472; Professor of Oratory and Poetry at Tübingen in 1497; poet-laureate by the Emperor Maximilian in 1501. He is the author of numerous poems, mostly written in Latin and in praise of the German emperor. His love for popular traditions and poetry is shown by his collections of German proverbs (*Proverbia Germanica*), and of popular jokes and stories which he published under the title *Facetie*, and which were read extensively, being directed chiefly against the Roman Catholic clergy. D. in Tübingen, 1518. See his *Life* by G. W. Zapf (Augsburg, 1802). JULIUS GOEBEL.

Beccafico, bek-ka-fee'kō [Ital., fig-pecker]: any one of several small European birds which feed or are supposed to feed on figs, as the BLUE-THROAT (*q. v.*) and especially *Curruca hortensis*; a small bird of the family of *Sylviidæ* or warblers, sometimes called the garden-warbler. It is abundant in Southern Europe as a summer bird of passage. The flesh of it is esteemed as a delicate food by the Italians. It has an agreeable song.

Beccaria, bek-kā-ree'ā, CESARE BONESANA, Marquis di: an eminent Italian economist and writer on penal laws; b. in Milan, Mar. 15, 1738. His principles were formed by the influence of Montesquieu. His most important work is a *Treatise on Crimes and Punishments* (*Trattato dei Delitti e delle Pene*, 1764), in which he advanced eloquent arguments against the severities and abuses of criminal law. It obtained great popularity, and was translated into many languages. Voltaire admired it, and wrote a commentary on it. In 1768 he was appointed Professor of Political Philosophy at Milan. D. in Milan, Nov. 28, 1794. See C. P. Villa, *Vita del Marchese C. Beccaria* (1821); P. Custodi, *Vita di C. Beccaria*.

Bêche-de-Mer, baysh'de-mâr' [Fr., sea-spade]: also called **Trepang**; a name given to the dried bodies of several species of *Holothuria*, or sea-cucumber, which are abundant in shallow lagoons and on reefs between Australia, the Fiji islands, and the southeast coasts of Asia. They are esteemed as an article of food by the Chinese. The Malay divers catch them and prepare them in large quantities for the Chinese market. This animal is usually about 9 inches long, but sometimes measures 2 feet. It is stated that 8,000 cwt. of the trepang are annually exported from Macassar to China. See **HOLOTHURIDÆ**.

Becher, bech'er, JOHANN JOACHIM: a German chemist; b. at Speyer in 1635; is called the author of the first theory of chemistry. He became aulic councillor at Vienna, but soon fell into disgrace, and removed to Mayence. He was addicted to speculation, and wrote, besides other works, *Physica Subterranea* (1669). His theory was the basis of that which was developed by Stahl. D. in London, Oct., 1682.

Becher, SIEGFRIED: political economist; b. at Plan, in Bohemia, Feb. 28, 1806; became Professor of History and Geography in the Polytechnic Institute in Vienna in 1835. D. in Vienna, Mar. 4, 1873. Among his works are *Das Oesterreichische Münzswesen von 1524-1833* (2 vols., Vienna, 1838); *Organization des Gewerbeswesens* (Vienna, 1851); and *Die Volkswirtschaft* (Vienna, 1853).

Bechman, GEORGES: civil engineer; in charge of the water-supply and sewerage of the city of Paris; b. in Paris, Jan. 1, 1848. In 1869 he finished his studies at the Polytechnic School, and entered the School of Bridges and Roads. Here he graduated in 1873, having lost one year by serving a term in the army during the Franco-Prussian war. After varied service on harbors and other works, he was attached to the water-supply of Paris. In 1886 he reached the grade of engineer-in-chief of bridges and roads, remaining still connected with the works of the city of Paris under M. Alphand. He designed the new water-supply of the city, to be brought from the department of the Eure. During the exposition of 1889 he constructed the illuminated fountains of the Champ de Mars. Since the death of Durand-Claye he has had charge also of the sewerage of Paris, and is the author of the great works for utilizing the sewage on the plain of Asnières, which are an extension of those of Gennevilliers, and those of the plain of Méry, which are now in course of execution. He has been often consulted upon the sewerage of other cities, among them Messina, Turin, and Toulon. He is an officer of the Legion of Honor, and member of many foreign orders. W. R. HUTTON.

Bechuana, bet-shwaa'na: an African race occupying the interior of South Africa, between the parallels 22° S. and 28° S., and the meridians 22° E. and 29° E., a nearly treeless area, including a large part of the Kalahari desert. The race numbers about 200,000. They are not nomadic, but live in towns of considerable size. They are industrious and bright, alive to whatever will increase their property or comfort, and many migrate for a time to Cape Colony, where they are highly prized as servants. While not exactly warlike, they are inured to warfare, but they have been unable to withstand the more savage Kaffres, Zulns, and Matabele on the E. They are well formed, dark brown or bronze: the lips are thicker and nostrils wider than with the Europeans, but they are not of a marked African type, and are often handsome. The hair is frizzled, but not kinky. They possess some of the arts, and the women practice agriculture to some extent. They have no particular religious system, but believe in witchcraft and practice circumcision. Rain is scanty with them, and the rainmaker is an important personage, whose commands are implicitly obeyed, but sometimes, when he fails, he is sacrificed to their wrath. The language is copious, and, like the Kaffre and Zulu, belongs to the Bantu family. Theodore Bent suggests that their name may be a corruption of *Baquaina* (i. e. children of the quaina, or crocodile), the native name of one of the most powerful tribes, whose totem is the crocodile. M. W. H.

Bechuanaland: a British protectorate in the interior of South Africa, extending (since Nov., 1895) from the Molopo river, the present northern boundary of Cape Colony, northward over the Kalahari desert as far as the Zambesi, and having Matabeleland and the Transvaal on the E. and German Southwest Africa on the W., the twentieth meridian (E.) being for the most part the dividing line; area, about 386,200 sq. miles. The British crown colony of the same name which lay S. of the Molopo river, and had an area of

51,574 sq. miles and a population (1891) of 72,736, was incorporated into Cape Colony on Nov., 1895. Within the limits of the protectorate are included the domains of the native chiefs Khama, Sebele, and Bathoen, each of whom rules his own people under the protection of the Queen, and with the assistance of a resident, and continues to enjoy the hunting privileges he has hitherto possessed. With these exceptions the whole region is administered by the British South Africa Company. A railway extending from Capetown, through Kimberley, Vryburg, and Mafeking, has now (1897) reached Palapye, the capital of Khama's country (pop. 25,000), and is being pushed on to Bnlwayo and Fort Salisbury in Mashonaland. A telegraph line has already been established as far as Fort Salisbury. A tax of \$2.50 is levied on each native hut. Cattle-rearing and agriculture are the chief industries, and the natives are peaceable.

Beck, JAMES B.: U. S. Senator; b. in Dumfriesshire, Scotland, Feb. 13, 1822; emigrated with his parents to Lexington, Ky.; admitted to the bar 1846; served in Congress as a Democrat 1867-75; elected to U. S. Senate 1877; re-elected 1882 and 1888. D. in Washington suddenly, May 4, 1890.

Beck, JOHANN TOBIAS: See the Appendix.

Becker, bek'âr', GEORGES: French figure-painter of note; b. in Paris in 1845; pupil of Gérôme; second-class medal, Paris Salon, 1872; Legion of Honor 1889; well known in the U. S. as the painter of a large picture, *Rizpah Protecting the Bodies of her Sons*, exhibited at the Centennial Exhibition, Philadelphia, 1876. Studio in Paris. W. A. C.

Becker, bek'er, HERMANN HEINRICH: a German politician, called DER ROTHE BECKER (i. e. the Red Becker, on account of his extreme radical views in politics); was b. in Elberfeld, Sept. 15, 1820; took part in the revolutionary movement in 1848, and was imprisoned for several years. In 1862 he was elected a member of the Prussian House of Deputies, and in 1867 and 1868 of the North German Parliament; became a recognized leader of the Liberal party; mayor of Dortmund 1870; of Cologne 1875. D. Dec. 9, 1885.

Becker, KARL FRIEDRICH: b. at Berlin in 1777; studied philosophy and history at Halle; was a teacher in Berlin, but gave up all kinds of business on account of ill health, and d. Mar. 15, 1806. From 1801 to 1805 he published his *Weltgeschichte für Kinder und Kinderlehrer* (9 vols., Berlin, 1801-05), which has been often reprinted and translated into other languages. On account of a singular felicity both in arrangement and style, it was to young readers a very pleasant and useful book, but since the death of the author it has been so much augmented, continued, corrected, and changed as to become nearly valueless.

Becker, MAX J.: civil engineer; b. in Coblenz in Rhenish Prussia, June 1, 1827; came to the U. S. in 1850. From 1856 to 1858 he was engineer of the board of public works of Ohio, and later engaged in railroad construction. Since 1867 he has been chief engineer of the Pittsburg, Cincinnati and St. Louis R. R. During 1889 he was president of the American Society of Civil Engineers.

Becker, THOMAS A.: first Roman Catholic bishop of the diocese of Wilmington, Del.; b. of German Protestant parents in Pittsburg in 1832; studied in Munich, where he joined the Catholic Church, and at the Propaganda in Rome; was ordained 1859. After serving as professor in St. Mary's College, Emmitsburg, Md., he was consecrated as Bishop of Wilmington, Aug. 23, 1868; transferred to the see of Savannah, May, 1886.

Becker, WILHELM ADOLF: German author; b. at Dresden in 1796. He attempted to reproduce the social life of ancient Rome in *Gallus* (1838), and that of ancient Greece in his *Charicles* (1840), both of which were translated into English by Metcalfe. His chief work is *Handbuch der röm. Alterthümer* (1843-46). D. in Weissen, Sept. 30, 1846.

Beckerath, bek'ke-räät, HERMANN, von: Prussian statesman; b. Dec. 13, 1801, in Crefeld; made a fortune as a banker; advocated German unity; member of National Assembly at Frankfort 1848; Minister of Finance 1848-49. D. in Crefeld, May 12, 1870.

Becket, THOMAS A': Archbishop of Canterbury; b. in London, Dec. 21, 1118; studied at Oxford and Paris, and was appointed High Chancellor in 1155, being the first native Englishman after the Conquest who filled a high office. His style of living was sumptuous in this part of his life, but when he became Archbishop of Canterbury in 1162 a remarkable change took place in his habits and deportment. He

practiced or affected great austerity, and appeared as a zealous champion of the Church against the aggressions of the king, whose policy tended to keep the clergy in subordination to the civil power. Becket having been involved in a conflict with Henry II., escaped in 1164 to France, and appealed to the pope, by whom he was supported. Henry confiscated his property and sequestered the revenues of his see, and received in return a menace of a papal interdict. In 1170 a formal but hollow reconciliation was made between the king and the obstinate and haughty prelate, who returned to England and resumed his office. He also renewed his defiance of the royal authority, but on Dec. 29, 1170, at the altar, in the cathedral in Canterbury, was assassinated by four knights, servants of the king. He was regarded as a martyr by many patriotic Saxons, as well as by the zealous votaries of the Church. He was canonized by the pope in 1173, and his bones were deposited in a splendid shrine at Canterbury, which became the object of one of the great pilgrimages of Christendom. Henry VIII. destroyed the shrine and scattered Becket's ashes. See *Lives* by J. C. Robertson (London, 1859); R. A. Thompson (1888); and *Materials for the History of Thomas Becket* (1875, sqq., 8 vols.); and *Chronicles and Memorials of Becket* (1880).

Beckford, WILLIAM: an English author; b. at Fonthill, Wiltshire, Sept. 29, 1759. He inherited from his father an immense fortune, including the estate of Fonthill. His annual income was about £100,000. He married in 1783 Lady Margaret Gordon, a daughter of the Earl of Aboyne. In 1784 he published his principal work, *Vathek*, an Eastern tale (written in French), which was highly commended by Lord Byron. He was elected to Parliament in 1790, resided some years in Portugal, and expended an enormous sum in the erection of Fonthill Abbey, which he filled with rare and expensive works of art. In 1822 he sold this palace and the estate of Fonthill, with all its collections, to Col. Farquhar for £330,000, and built another palace at Bath. He published in 1834 a series of letters entitled *Italy, with Sketches of Spain and Portugal* (2 vols., 1834), and *Memoirs of Extraordinary Painters* (1835). He was a witty and graphic writer, and had much talent for sarcasm. D. May 2, 1844. See *Memoirs of William Beckford*, by Cyrus Redding (London, 2 vols., 1859); *Quarterly Review* (for Mar. and June, 1834).

Beckwith, JAMES CARROLL: portrait and genre painter; b. at Hannibal, Mo., Sept. 23, 1852; pupil of Carolus-Duran, Paris; honorable mention, Paris Salon, 1887; third-class medal, Paris Exposition, 1889; associate member of National Academy of Design, member of the Society of American Artists (1881), and American Water-color Society. He began his studies in the school of the Academy of Design in Chicago about 1869, studied two years in New York in the academy schools, and went to Paris in 1873. He returned to New York in 1878, and has been a regular exhibitor at the Academy, the Society of American Artists, and other places ever since, sending pictures also from time to time to the Salon. He exhibited also at the Royal Academy, London, in 1892. He is a draughtsman of great skill, and a painter of much more than ordinary cleverness. His portraits are notable for sound construction as well as truth of line. Studio in New York. WILLIAM A. COFFIN.

Beckwith, JOHN WATRUS, D. D.: second Bishop of Georgia; b. in Raleigh, N. C., Feb. 9, 1831; graduated at Trinity College, Hartford, Conn., in 1852; ordained deacon in 1854, and priest in 1855. He ministered in North Carolina, Maryland, Mississippi, Alabama, and Louisiana, and was consecrated Apr. 2, 1868. D. in Atlanta, Ga., Nov. 23, 1890. Bishop Beckwith was distinguished for the brilliancy of his rhetoric, the splendor of his eloquence, and for his simplicity of character.

Bequerel, bek'rel', ANTOINE CÉSAR: French savant; b. at Chatillon-sur-Loing, Loiret, Mar. 8, 1788. He served in the army as an officer of engineers from 1810 till 1815, after which he gave special attention to the study of electricity, and made discoveries in electro-chemistry. He refuted and exploded Volta's theory of contact, and constructed the first constant pile. In 1837 he received the Copley medal of the Royal Society of London. He invented a method of electrotyping. He published, besides other works, *Traité expérimental de l'électricité et du magnétisme* (7 vols., 1834-40). He became a member of the Academy of Sciences in 1829. D. Jan. 19, 1878.—His sons, ALEXANDRE EDMOND (b. Mar. 24, 1820; d. May 12, 1891), a physicist, and LOUIS ALFRED, a physician (b. in 1814; d. in 1862), both attained distinction as scientific men.

Beese, bech'e, OLD (Hun. *O' Becse*): a market-town of Hungary; in the county of Bacs; 48 miles S. of Szegedin; on the Theiss (see map of Austria-Hungary, ref. 8-H). Pop. 16,850. *New Beese*, which has a population of 7,193, is in the county of Torontal; on the Theiss; 8 miles E. of Old Beese.

Beeskerek, Nagy, noj'bech-kā-rek' (Great Beeskerek): a town of Hungary; county of Torontal; on the left bank of the Bega; 59 miles S. W. of Temesvár, with which it is connected by a canal (see map of Austria-Hungary, ref. 8-1). It has a considerable trade. Pop. (1890), 21,934.

Bed: in geology, a stratum, or layer of stratified sedimentary rock of variable thickness. A bed often consists of numerous thin laminae or plates, resulting from intermissions in the supply of the materials, produced by such causes as the ebb and flow of the tide, and variable degrees of the turbidness of the water under which they were deposited. A thin bed, if different in kind from its neighbors, is sometimes called a seam. For an aggregate of several beds of the same kind of rock the term formation is used.

Bed-bug: a well-known hemipterous insect, the *Acanthia lectularia*, known to the Greeks as κόρις, infesting beds and houses, and it is said also dove-cotes, and the nests of swallows, bats, etc. The eggs are oval and white; the young vermin flat and transparent. In eleven weeks the insect reaches its full size. It is tenacious of life, and has been kept alive more than a year in a sealed bottle without food. Cockroaches devour them in large numbers. Mercurial solutions, benzine, etc., will extirpate these vermin, but prevention by cleanliness is best.

Bedchamber, Lords of the: twelve officers of the British royal household who in the reign of a king wait in turn on the person of the sovereign. They are under the groom of the stole, who attends his majesty only in public ceremonies and on occasions of state. During the reign of a queen these offices are performed by ladies of the bedchamber and the mistress of the robes, who is substituted for the groom of the stole. Queen Victoria had about eleven ladies and extra ladies of the bedchamber. These offices are usually filled by the "prime nobility" of the kingdom, who are appointed by the sovereign, and are not removed on each change of the ministry.

Bed'does, THOMAS, M. D.: an eminent English physician and writer; b. at Shifnal, in Shropshire, Apr. 13, 1760. He was educated at Oxford, and was well versed in the Latin and other languages. He married Anna, a sister of Maria Edgeworth, and in 1788 was appointed to the chemical lectureship in the University of Oxford. In 1792 he resigned this position. He wrote for the benefit of the working-classes a popular work called *The History of Isaac Jenkins*. In the year 1798 he opened at Clifton a hospital for the cure of disease by medicated gases, in which Humphry Davy was his assistant. Among his works is *Hygeia, or Essays, Moral and Medical* (3 vols., 1802). D. Dec. 24, 1808. See E. Stock, *Life of T. Beddoes* (London, 1811).

Beddoes, THOMAS LOVELL, M. D.: poet; son of Thomas Beddoes and nephew of Maria Edgeworth; b. at Clifton, England, July 20, 1803. He studied medicine and anatomy at Göttingen, and resided many years in Germany. In 1822 he produced *The Bride's Tragedy*. Among his poems is a tragedy called *Death's Jest-book* (1851), which displays great richness of imagery and passionate eloquence. He died at Basel, Jan. 26, 1849, in consequence of a dissection-wound received in 1848.

Bede (in Lat. *Be'da*): surnamed THE VENERABLE; English scholar and monk; b. in Wearmouth, county of Durham, in 673 A. D. He was ordained a priest at the age of thirty, and devoted much time to study and literary pursuits. His name is regarded as the greatest in the ancient literature of Britain. He wrote on astronomy, grammar, music, etc. His most important work is an *Ecclesiastical History of the English Nation (Historia Ecclesiastica Gentis Anglorum)*, which King Alfred translated into Anglo-Saxon, and which has often been reprinted. D. in the monastery of St. Paul's, in Jarrow, May 26, 735 A. D. His whole works were published by Dr. Giles (London, 6 vols., 1844), including an English translation of his *Ecclesiastical History*; a better one is that by L. Gidley, 1870. See Gehle, *De Bedæ Venerabilis Vita et Scriptis* (1838); J. A. Giles, *Life of Bede*, prefixed to his complete works (1844); and G. F. Browne (1879).

Bedeau, be-dō', MARIE ALPHONSE: general; b. in Vertou, near Nantes, Aug. 10, 1804. He served with distinction in Algeria (1836-47), and became a general of division in Sept., 1844. He had the command (under Bugeaud) of the troops in Paris when the Parisians revolted in Feb., 1848, and under the new republican régime he became commander-in-chief of that city. As a member of the National Assembly (1849-51) he acted with the republicans; opposed Louis Napoleon, and went for a time into exile. D. in Nantes, Oct. 29, 1863.

Bed'egar, or **Bedeguar** [viâ Fr. from Pers. *bādāwar*, wind-brought]: a gall (sometimes called sweet-brier sponge); found on the branches of the sweet-brier and other species of rose. It is produced by the *Rhodites roseæ* and other insects, and is often one inch or more in diameter. It was once used in medicine. See GALL INSECTS.

Be'del, TIMOTHY: a Revolutionary patriot; b. in Salem, N. H.; removed to Haverhill, N. H., and was a lieutenant in 1760, serving in Canada. He became in 1775 a captain of rangers, and in 1776 colonel of the first regiment of New Hampshire troops; served at Montreal and under Schuyler, and afterward was major-general of New Hampshire militia. D. at Haverhill, N. H., in Feb., 1787.

Bedell, GREGORY THURSTON, D. D.: the third Bishop of Ohio; b. in Hudson, N. Y., Aug. 27, 1817; was educated at Flushing, L. I., and Bristol College, Pennsylvania. After a rectorate at the Church of the Ascension, New York city, he was consecrated assistant bishop of the diocese of Ohio, Oct. 1859; bishop in 1873; resigned his see in 1889, from which the diocese of Southern Ohio was set off in 1875. D. in city of New York, Mar. 11, 1892. Author of *The Divinity of Christ*; *The Profit of Godliness*; *Sacredness of the Grave*; *The Principles of Pastorship*; *The Age of Indifference*; *Episcopacy—Fact and Law*; *A Canterbury Pilgrimage*; *A Volive Pillar: Memorial of Bishop McIlvaine*; and *Pastoral Theology*. Some of his sermons were published in Scotland as well as in the U. S.

Bedell, GREGORY TOWNSEND, D. D.: an Episcopal clergyman; b. on Staten Island, N. Y., Oct. 28, 1793. He graduated at Columbia College in 1811, was greatly admired as a pulpit orator, and wrote, among other religious works, *Onward, or Christian Progression*; *Renunciation*; and two volumes of sermons. He was the father of the bishop named above. D. in Baltimore, Aug. 30, 1834. See his *Life*, by Rev. Dr. Tyng, 1836.

Bedell, WILLIAM: a prelate of the Church of Ireland; distinguished for his wisdom and virtue; b. in Essex, England, in 1571. He went to Venice in 1604 as chaplain to Sir Henry Wotton, the English ambassador, and remained there eight years. In 1627 he was elected provost of Trinity College, Dublin, and in 1629 became Bishop of Kilmore and Ardagh. He reformed abuses in his diocese, and acquired much influence by his acts of charity and his other virtues. He procured the translation of the Old Testament into Irish. D. at Drumlor, Feb. 7, 1642. See Burnet, *Life of Bishop Bedell* (1685); H. J. Monck Mason, *Life of W. Bedell* (1842); *Life* published by the Camden Society (1872).

Bedford: an old market-town of England; capital of Bedfordshire; on the river Ouse, here crossed by two bridges; 48 miles by rail N. N. W. of London (see map of England, ref. 10-J). Several railroads pass here. It has more charitable institutions and public endowments, in proportion to its size, than any town in England. It has several fine Gothic churches, a public library, a famous grammar school, a lunatic asylum, a jail, a penitentiary, numerous schools and charities, including about sixty almshouses. Bedford has manufactures of farming implements, lace, and straw hats, and a trade in corn, malt, and timber. John Bunyan wrote *Pilgrim's Progress* in Bedford jail. Pop. (1891) 28,023.

Bedford: town; Missisquoi co., Quebec, Canada (for location, see map of Quebec, ref. 6-B); on Can. Pac. Ry.; 18 miles from St. Johns; has manufacturing of knitting-machine needles, paints, gloves, and farming implements. It has excellent water-power. Pop. (1881) 1,080; (1891) 1,571.

Bedford: railroad junction; capital of Lawrence co., Ind. (for location of county, see map of Indiana, ref. 9-D); 76 miles N. of Louisville, Ky.; has 3 public schools, an opera-house, 24 stone-quarries employing over 1,000 men, and a stone court-house. Pop. (1880) 2,198; (1890) 3,351; (1900) including suburbs, 6,115.

EDITOR OF "DEMOCRAT."

Bedford: town; on railroad; capital of Taylor co., Ia. (for location of county, see map of Iowa, ref. 7-E); is on a prairie and on the river One-Hundred-and-Two, about 100 miles S. W. of Des Moines, and has considerable trade. Pop. (1880) 1,763; (1885) 1,742; (1890) 1,643; (1900) 1,977.

Bedford: village; Cuyahoga co., O. (for location of county, see map of Ohio, ref. 2-H); on the C. and P. and C. C. and S. R. Rs., 5 miles S. E. of Cleveland. Bedford has graded schools, 3 churches, a fine public hall, 6 chair-factories, a grist-mill, feed-mill, saw-mill, and lumber-yard. Dairying is a thriving industry. The town was first settled in 1813, and organized as a municipality in 1823. Pop. (1880) 766; (1890) 1,043; (1900) 1,486.

EDITOR OF "NEWS REGISTER."

Bedford: railroad junction; capital of Bedford co., Pa. (for location of county, see map of Pennsylvania, ref. 6-D); on the Raystown Branch of the Juniata, and on Bedford Division of Pennsylvania R. R.; 94 miles W. S. W. from Harrisburg. Has 8 schools, including a high school, and 8 churches. Agriculture is the principal industry of the community. Bedford was laid out as a town in 1766. It contains several historic houses—the residence of Gen. Arthur St. Clair when he was prothonotary of the county; the house in which Gen. Washington, Gen. Knox, Alexander Hamilton, and others stopped when on the march to suppress the Whisky Rebellion of 1794 in Western Pennsylvania. Bedford Springs, about a mile distant, is a fashionable place of summer resort. Iron ores abound, and iron is here manufactured. Pop. (1880) 2,011; (1890) 2,242; (1900) 2,167.

EDITOR OF "GAZETTE."

Bedford, DUKES OF (1694): Earls of Bedford (1550); Marquess of Tavistock (1694); Barons Russell of Cheney (1539); Barons Russell of Thornough (1603); Barons Howland (1695, in England), a prominent family of Great Britain.—GEORGE WILLIAM FRANCIS SACKVILLE RUSSELL, the tenth duke (of this family), was b. Apr. 16, 1852, and succeeded his father Jan. 14, 1891; was M. P. for Bedford 1875-85; succeeded by his brother, Lord Herbrand Arthur, Mar. 24, 1893.

Bedford, GUNNING: a patriot of Delaware; b. in Philadelphia, about 1730; served against the French in 1755; an officer of the Revolutionary army; wounded at White Plains; became mustermaster-general in 1776; was a member of Congress (1783-85); Governor of Delaware (1796-97). D. in Newcastle, Del., Sept. 7, 1797.

Bedford, GUNNING: cousin of the preceding; b. in Philadelphia in 1747; graduated at Princeton in 1771; member of Congress from Delaware (1785-86), and of the convention (1789) that formed the U. S. Constitution. He was U. S. district judge (1789-1812). D. in Wilmington, Mar. 30, 1812.

Bedford, GUNNING S., M. D.: physician; b. in Baltimore in 1806, and graduated at Mt. St. Mary's College in 1825. After serving as professor in Charleston, S. C., and at Albany Medical College, he settled in 1836 in New York city, where he was Professor of Midwifery in the University of New York (1840-42). He published an excellent treatise on obstetrics and *Lectures on the Diseases of Women*, besides valuable translations from the French. D. in New York, Sept. 5, 1870.

Bedford, JOHN PLANTAGENET, Duke of: third son of King Henry IV. of England; b. in 1389. He was created Duke of Bedford in 1414; was commander-in-chief of the forces in England during the absence of Henry V., who was his brother. After the death of Henry V. (1422) the Duke of Bedford was regent of France, and waged war with success against the French dauphin. He gained a victory over the French at Verneuil in 1424, but his conquests were soon checked by Joan of Arc. D. in Rouen, Sept. 19, 1435. See Hume, *History of England*.

Bedford City (formerly **Liberty**): the county-seat of Bedford co., Va. (for location of county, see map of Virginia, ref. 6-E). It is situated in a beautiful rolling country, at the eastern base of the Blue Ridge Mountains, at an elevation of 1,000 feet above the level of the sea. It is a regular market for leaf tobacco raised in the surrounding country; has a number of factories for the manufacture of plug and smoking tobacco and cigars; a successful woolen-mill, a knitting-mill, foundry, planing-mills, two flouring-mills, and other industries. In recent years it has assumed importance as an educational center. In it are located Randolph Macon Academy (under control of the Methodists), Belmont Seminary for young ladies (Presbyterian), St. John's (Episcopal)

Institute for girls, and the Jeter Female Institute (Baptist) for young ladies. Pop. (1880) 2,191; (1890) 2,897; (1900) 2,416.

EDITOR OF "BEDFORD DEMOCRAT."

Bedford Level, or The Fens: a tract of flat land in the eastern part of England; bounded on the E. by the German Ocean; comprises parts of Huntingdon, Northampton, Cambridge, Lincoln, Norfolk, and Suffolk. Its inland boundary is a range of highlands in the form of a horse-shoe. Nearly all the marshy district called The Fens is included in the Bedford Level, which is intersected by the Cam, Ouse, Nene, and Welland rivers. It was formerly a vast morass, and was named in honor of Francis, Duke of Bedford, who in 1634 undertook to reclaim it, and expended £100,000 in draining it. The work was completed by his son, William, Duke of Bedford, who spent £300,000 on it. This tract now produces good crops of grain and flax, and grass for pasture. Its drainage has been improved in the present century.

Bedlam, or Bethlehem (of which *bedlam* is a corruption): a hospital for the insane in London, which was originally the priory of St. Mary of Bethlehem. When Henry VIII. suppressed the religious houses, this one, coming into the control of the corporation of London, was converted in 1547 into an asylum for the insane. In 1814 the insane patients were removed to a new asylum in St. George's Fields, Southwark, which has good accommodations for almost 500 patients, and is managed in an excellent manner. Bedlam is sometimes used as synonymous with a mad-house, or a place of uproar.

Bedloe's Island: an island in New York harbor; in the city of New York; 1½ miles S. W. of the Battery. It was named from a former owner. In 1800 it was ceded to the U. S. Government, and in 1841 Fort Wood, mounting seventy-seven guns, was erected upon it. Bartholdi's colossal statue of *Liberty Enlightening the World*, presented to the U. S. by the French people, now stands within the fort, the U. S. Government having allowed this island to be used for the erection of the statue. See NEW YORK CITY.

Bedmar, bād-maar', ALFONSO DE LA CUEVA, Marquis de: a Spaniard; b. in 1572. He was sent as ambassador to Venice by Philip II. in 1607, and formed a daring and nefarious plot to betray the Venetian city and state into the power of the King of Spain. The plot was detected one day before that appointed for its execution, and Bedmar was expelled from Venice. He became a cardinal in 1622, and died in 1655. His conspiracy is the subject of Otway's *Venice Preserved*. See Daru, *Histoire de Venise*; Saint-Real, *Conspiration contre Venise*.

Bed of Justice (in Fr. *lit de justice*): a term applied to the seat or throne occupied by the King of France when he was present at a session of Parliament; also to such a session, or the conference of the Parliament with the king, who came to overrule the decisions of Parliament and enforce edicts or ordinances to which that body was opposed. Decrees promulgated at such a session were more authoritative than the ordinary decisions of Parliament. The ceremony became synonymous with an act of arbitrary power. The last "bed of justice" was held by Louis XVI., in 1787.

Bedos de Celles, bā'dōs'de-sel', JEAN FRANÇOIS: a French Benedictine monk; b. at Caux in 1706. He made several good organs at Toulouse, and wrote a work called *L'Art du Facteur d'Orgues* (4 vols., 1766-78), which is highly commended. He wrote also *L'Art du relieur et du doreur des livres*, and an excellent *Gnomonique* (1760). D. 1779.

Bed'ouin, or Beduin, written also **Bedaween** and **Bedawee** (inhabitants of the desert): nomadic Arabs; according to tradition, the descendants of Ishmael and the aborigines of Arabia. They are a pastoral people, having no houses but tents, and no permanent places of residence. They form the greater portion of the population of Arabia, but are not confined to that country. Though they are not united by a strong national organization, they have never been entirely subjugated by any foreign conqueror, as the desert into which they can retreat forms an almost insuperable obstacle to an invading army. They are now widely distributed over Northern Africa, Syria, etc. As they have no general government or political institutions, religious traditions and customs form the only bond of order and union among them. They are divided into tribes, each of which is ruled by a sheik, whose authority is patriarchal. Their riches consist chiefly in flocks of sheep, camels, horses, goats, etc. They are ignorant, fierce, depraved, addicted to robbery and fighting, and reckless of the rights of property. They profess the Mohammedan religion, but are not very strict in the

practice of its discipline. Their complexion is brown of various shades. They are generally lean, sinewy, and active. An admirable picture of Bedouin life and character may be found in Palmer's *Desert of the Exodus* (1871), and in Selah Merrill's *East of the Jordan*.

Bedstraw (*Galium*): name of a genus of herbaceous plants of the family *Rubiaceæ*; distinguished by a wheel-shaped corolla, and a fruit which is dry or fleshy, two-lobed, separating when ripe into two seed-like, indehiscent, one-seeded carpels. It comprises numerous species, natives of Europe, Asia, and the U. S. The roots of several species, as *Galium verum*, *Galium tinctorium*, etc., contain a red coloring-matter which is said to be equal to madder. The *Galium verum*, which is a common weed in England, is sometimes called cheese rennet, because it has the property of curdling milk. It is naturalized to some extent in the U. S. The *Galium tuberosum* is cultivated by the Chinese, who eat its farinaceous roots. *Galium aparine*, or cleavers, is a valuable diuretic.

Bee (Gr. μέλισσα; Lat. *apis*; Fr. *abeille*; Germ. *Biene*): an insect of the order *Hymenoptera*, which feeds its helpless larvæ on pollen, honey, or food digested or secreted by the adult. There are two large families, *Andrenidæ* and *Apidæ*. To the former of these belong all those which live solitary, tunneling out galleries in the soil or boring out the dead stalks of pithy plants, as the sumac or blackberry. These they divide into several distinct compartments, placing in each a small ball of pollen, on which the egg is laid and on which the larva feeds. The species belonging to this family consist of two classes, males and females. The solitary bees can be distinguished from the social bees by their shorter tongue or labium. They are frequently called miner-bees or carpenter-bees. To the *Apidæ* belong the social bees, or those in which the tongue or labium is greatly elongated. It includes the parasitic and true honey-producing bees. The former are not parasites in the strict sense of the word, but they intrude themselves in the nests of other bees, being protected by their form and protective coloring. They are better known as *Inquinales*. Of these, as of the *Andrenidæ*, there are but two classes, males and females. The honey-producing bees, to which the common honey-bee belongs, live in immense colonies, in holes in the ground, hollow trees, old stumps, or hollow logs. There are three classes, males, females, and workers or sterile females.

Linnaeus included all bees in the genus *Apis*, but systematists are now agreed in restricting this term to the honey-bee. There is still great difference of opinion as to whether all of the varieties should be recognized as a single species or as several species. If naturalists were to find all the forms of pigeons that have been produced by breeding in nature, they certainly would recognize them as distinct species. As a species is only an idea, it seems best to recognize the several races as distinct species. Some excellent authorities consider them all as varieties of *mellifica*, the black-bee; others recognize as many as sixteen species. The genus *Apis* is a native of Europe, but has become, through the agency of man, almost cosmopolitan.

We should probably look for the type form in *Apis mellifica*, the black, brown, or German bee, which is found in its original condition in Middle and Northern Europe. This species is recognized by its brownish-black body, pilose with lighter hairs, together with its much shorter tongue. Under domestication it is known for its irritable temper, making it dangerous to handle; it is quarrelsome with neighboring bees and does not offer a good barrier against robbers; but it is a good honey-gatherer, excels as a comb-builder, and is less liable to swarm out, leaving unfinished sections.

There are several varieties of the German bee, of which probably the Carniolan, Krainer, or Hungarian is the best. Its distinctive character is the lighter rows of hairs, to be considered, perhaps, as a kind of albino. The queens are a little larger than those of typical *mellifica*. They winter well, having strong constitutions, are mild-tempered, good honey-producers, but free swarmers. They are natives of Southwestern Austria. Another variety, not differing in marking from the German bees, is found in Northern Germany, and is known as the heath-bee. It differs only in its swarming more frequently.

The Ligurian, Italian or yellow Alp bee, *Apis ligustica*, is easily recognized by the yellow-banded abdomen. This species is a native of Southern Europe, and is found as far E. as Asia Minor. There are two varieties of the Italian, but the differences shade insensibly into each other. In the Italians the abdominal segments two to five are trans-

versely banded with yellow hairs, while the first three rings beneath the hairs are yellow. In *mellifica* the black segments of the abdomen are banded with hairs not quite as light as in *ligustica*. The Italians are smaller than *mellifica*, the tongue is longer, the abdomen flatter and more pointed. The drones are not so yellow above as the workers, but are almost wholly yellow beneath. The queens vary from very light to almost as dark as those of *mellifica*. The Italians excel in their milder temper, making them much easier to handle; in the fruitfulness of the queens; in being excellent defenders of their stores; in their excellence as honey-gatherers, and in their industry. They are not so able to withstand severe winters as *mellifica*; the comb honey is not so fine in appearance; unless watched they are liable to convert great quantities of their stores into nursery food, and on slight encouragement to become robbers. It certainly produces a superior race to cross them with the Germans.

Another race, probably equaling either of the others in importance, is the Cyprians. They are natives of the island of Cyprus; are noted for their activity, the fertility of the queens, their industry as honey-gatherers, the production of queen-cells, and as rapid comb-builders. The serious objection to the Cyprians is their demoniacal temper when aroused; but with practical beekeepers they seem to be in favor. The Cyprians are smaller than the Italians, with more intense or brighter colors, though the arrangement of the markings is the same. The dorsum of the thorax and the scutellum is a brighter yellow. A variety found in the Holy Land and Syria, and claimed by some to be the progenitors of the Italians and Cyprians, does not differ materially from the Cyprians, although the colors are not so bright, and they are a little larger. Their tempers vary, but they are excellent foragers. Like the Cyprians they produce a great number of queens, one author recording over 150 queens from a single colony.

The Egyptian bees, *Apis fasciata*, date the time of their domestication before the building of the Pyramids, there being hieroglyphic writings concerning them near this time. They are in all probability the species kept by the ancient Egyptians on their floating apiaries or boats, in which they ascended the Nile, and, slowly drifting down, followed the growth of melliferous flowers produced by the annual inundations. They are blackish brown, with an abundance of whitish hairs. The wings are infuscated, the second and third abdominal segments in part dark orange. They are excessively vicious, and frequently produce fertile workers. Besides the above-named species or varieties there are several others which are not so well known. In Southern Africa there are two species, *Apis caffra* and *Apis scutellata*. The former is black, the second abdominal segment red at base; the latter has the abdomen brown, with the base of the segments grayish pubescent. They have a serious fault of producing many fertile workers, which are liable to find their way into other colonies. *Apis nigritarum* is found in the Congo region. It has the antennæ black, at base yellow; abdomen black, grayish pilose, first abdominal segment and the second in part yellowish. In Senegal is found *Apis adansonii*. The natives, when they collect the honey, stifle the bees, and hang the emptied hives in the trees, awaiting the arrival of a new swarm. They are similar to the Italians, but smaller. *Apis unicolor*, in which the abdomen is shining black, unifasciate, is a native of Madagascar, where it is domesticated, and has been introduced in the isle of Bourbon and Mauritius, also the Canary islands. The honey is unwholesome. *Apis indica* is indigenous to Hindustan and the East Indian Archipelago. It is small, black, pilose with grayish hairs, two basal segments of abdomen reddish brown. It has been cultivated by Europeans; the natives make rude hives of bamboo which are placed under the eaves of the houses. Although *indica* is generally a poor honey-producer in nature, it increases remarkably by domestication. The Bhootan bee is larger than *indica* and probably distinct. It is very dark, with light-colored hairs, and has an exceedingly mild temper. *Apis dorsata*, found in India, Sumatra, and Java, is the largest species of the genus, the smallest of the workers being larger than the largest of the Italians or Germans. The thorax is yellowish above, with brownish triangular spots; black beneath, with reddish hairs. In nature they build under the boughs of trees, frequently in caves. All attempts at colonizing have been futile. *Apis florea*, on the other hand, is the smallest species; the drones are strongly differentiated from the queen and workers.

As has been already stated, each colony is composed of three classes: the drones, or males; the queen, or fertile female; the workers, neuters or sterile females.



FIG. 1.—a, worker; b, queen; c, drone.

The males are usually present in the hive from May to November, but may be found at any time of the year. They are shorter than the queen, longer than the worker, and stouter than either. Their wings are larger, their flight more awkward, producing a loud, buzzing noise. The labium and maxillæ are shortened, the mandibles have a rudimentary tooth, the posterior tibia and metatarsus are convex, the pollen-basket being absent. The webbed hairs and the sting are wanting. The eyes are large and prominent. The antennæ are long and broad, and well supplied with olfactory cavities and sensory hairs. The wax glands and the pollen-digesting glands are wanting. The drones, though surrounded by an abundance of honey, would starve to death unless fed by the workers. The sole object of the drone is the fertilization of the queen. This always takes place on the wing outside the hive, and always results in the death of the male. When the supplies of the colony get low, or nectar is scarce, or just before winter sets in, the workers, either by constantly biting and worrying them or by withholding their food, kill off the drones. Neither the eggs, young larvæ, nor the chrysalis escape extermination. The longevity of the male, with the exceptions just stated, depends on accident. The eggs intended to produce drones are always unimpregnated, and are laid in cells that are deeper and broader than those of the workers. These are called drone-cells, and when not filled with young are used for storing honey.

The queen is a fully developed female and the mother of the colony. She is larger than either the drones or the workers; her abdomen is long and slender; wings short, reaching but little beyond the third abdominal segment. The labium and maxillæ are similar to those of the male. Although the posterior tibia is broad and flattened, it does not have the cavity and surrounding hairs, as in the workers. The webbed hairs are also wanting. The sting is longer than that of the worker, and is curved. It is very rarely used, except in contests with rival queens. The eyes are not as large as those of the drones, and do not meet above. She is followed, guarded, and fed by the workers. The function of the queen is the production of eggs for the perpetuation of the colony. During the summer a queen may lay over 3,000 eggs in a day, or over 1,000,000 during a lifetime. An egg is about $\frac{1}{16}$ of an inch in length; and if all the eggs produced by a queen were placed end to end, they would reach over a mile. Queens are developed only from impregnated eggs, and in cells prepared especially for them, which are usually on the edge of the comb or around an opening in it, extending vertically or diagonally downward. These cells are constructed of pieces of wax cut from old cells, and are very rough, much resembling a peanut. There are several things that may induce a colony to build queen-cells, as the loss of a queen, crowded quarters, poor ventilation, or inability of the queen to lay impregnated eggs. There is no difference in the eggs from which workers and queens are developed; the difference is wholly in the food. A queen can be produced from an egg or from a worker larva not more than four days old. To do this the workers remove the partitions of the adjoining cells, surround the larva by a royal cell, and feed it an abundance of rich food, called royal jelly. It usually takes from ten to twelve days to produce a queen from a worker larva; three to six days later she goes forth, if the day be sunny, on her marriage flight. The success of the queen is marked by the appendages of the drone which will be hanging to her. If the queen fails to mate the first day, she will go forth again and again; but if impregnation does not take place before the fifteenth day, she is likely to remain a virgin queen, and will lay only unimpregnated eggs which will produce only drones or males. After this the queen never

leaves the hive except with a swarm. Two or three days after impregnation the queen begins to lay worker eggs. The queen is longer lived than either drones or workers, living from three to five years. If the queen ceases to lay fertile eggs, the workers, before all the worker eggs are gone, raise a new queen and destroy the old one. If from some accident, however, a colony lose its queen and does not have any worker larvæ of the proper age, it will dwindle and die out, if another queen is not introduced.

The workers are the most numerous individuals of the hive, a good colony having from 15,000 to 40,000. They are developed only from impregnated eggs, which are usually laid in the small horizontal cells. The egg hatches in three days into a small, white, footless maggot. After this has been fed grudgingly for five days by the workers, the cell is capped over. The adult larva, having lapped up all the food placed before it, spins a silken cocoon, changes to a pupa, and emerges in about twenty-one days as an adult bee. The workers never attain an old age, their age depending on the season of the year in which they emerge; those emerging at the most active honey-gathering period wear out in about a month. As already stated, the workers are undeveloped females. When a colony becomes hopelessly queenless (and occasionally at other times), there appear workers that have the ovaries somewhat developed and are able to lay eggs. These eggs, of course, always produce drones, and such workers are called "fertile workers." No tenable explanation has yet been made of this fact, though many theories have been advanced. Upon the workers fall all the labor of the colony. The young bees do not go forth for a week or more after emerging as imagoes, but build the comb, feed the larvæ, drones, and queens, cap the cells, and ventilate the hive. Upon the old bees devolve the duties of collecting the honey, the pollen, and the propolis, defending the hive against intruders, destroying the drones and worthless queens, and leading forth a portion of the bees when circumstances impel them to swarm.

Nature never produces new organs for new functions she wishes performed, but modifies an already existing organ so as to perform the new function. So it is with the honey-bee. The work it does is varied, yet it does not differ from insects in general in the plan of its structure. In a grasshopper the mandibles are stout and toothed, the labium

muscles which move the ligula, and the salivary duct, which opens by a valve at its base. Other than this the mentum has no opening and is not tubular. At each side of the mentum are the maxillæ, which are attached to the head by slender pieces, the stipes and the lacinia. At the base of the lacinia are the rudimentary maxillary palpi. The stipes and lacinia are hollowed out, fitting close against the sides of the labium, while the labial palpi embrace the tongue or ligula before and behind respectively, forming with the maxillæ a tube in which is situated the ligula and which has the power of moving from side to side. The ligula is covered with transverse rows of hairs and spines, while scattered among these hairs are sensory hairs or papillæ. When a bee desires to feed on honey or other liquids the apical part of the epipharynx closes down on the opening left between the bases of the maxillæ; the labial palpi lie close together beneath and between the overfolding maxillæ; the maxillæ are alternately arched and flattened, causing the palpi to recede from and approach to the maxillæ. The nectar flows into the space thus made, and when the maxillæ contract flows on into the pharynx.

The numerous hairs on the ligula are a great aid to the bee in sucking up liquids when they are present in abundance; but when it desires to collect them in much smaller quantities, as in sipping the nectar of flowers, it must have recourse to another method, else the nectar would be evaporated before reaching the pharynx, cementing together the parts and clogging up the tube. If we examine a trans-section of the ligula, we will find on the under side a slit or opening which is continuous, extending the entire length of the ligula and opening at its base. There extend on each side of this slit within the walls of the ligula two lateral pouches or side ducts, which are convoluted and covered with minute hairs. Immediately above the slit and above the side ducts there is a small, rounded, trough-like hollow, its lower approximated edges being lined with a row of stiff bristles, forming a false tube. The bee in feeding on the nectar of flowers takes up the smaller drops by means of the subdivided hairs on the apex of the tongue, transferring them to the side ducts or the central duct, according to the amount of the liquid for transportation to the pharynx. It is claimed by some authorities that the ligula contains a closed duct. That there is no such duct can be easily demonstrated by taking a worker bee and squeezing its thorax so as to force the blood into the tongue, thus distending it. The two margins of the ventral slit will be spread apart, the side ducts forced out between them, and the central duct drawn down to the lower edge, where it can be seen to be composed of a groove edged with bristles. By the above operation the ligula has not been subjected to unnatural methods, as it is in this way that the worker bee is enabled to clean these ducts of grains of pollen; while if it had been a closed tube the grains would entirely clog it up.

When the food reaches the pharynx it is there mixed with saliva, which is secreted by salivary glands located in the head and thorax, and opening by ducts at the base of the mentum and in the pharynx. This changes the cane-sugar to the grape-sugar of honey. The liquid on leaving the mouth is carried by a long slender œsophagus through the head and thorax into the abdomen, where it is stored in a muscular sac or pouch, the "honey-stomach" or "sucking-stomach." While

in this sac the liquids are not changed except by being mixed with the saliva. The honey is kept from passing into the chyle stomach by the stomach-mouth, which is a small cylindrical organ at the end or bottom of the honey-sac. Its upper surface is divided into four triangular lips, which close the opening and separate the pollen from the honey. When the bee returns to the hive, it goes to the empty honey-cells, the strong muscles of the honey-sac contract, and it regurgitates the honey into the cell.

In the legs we find many interesting developments. Situated here are the organs used in cleaning the antennæ and in collecting and carrying the pollen. On the outer edge of the anterior metatarsus there is a row of long stiff bristles, which are used to comb out of the hairs placed between the facets of the eyes any grains of pollen or foreign substance that would impede vision. At the base of the metatarsus and on the opposite side is the antenna-cleaner. This consists of a deep, curved recess in the metatarsus, and an especially adapted spine or velum attached to the apex of the

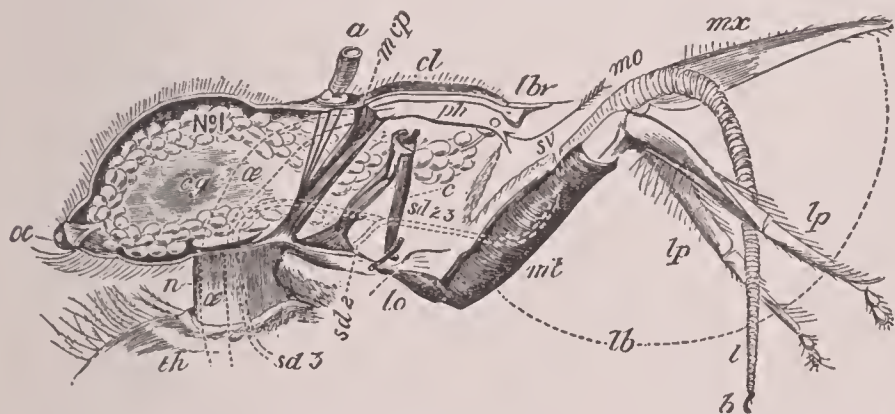


FIG. 2.—Longitudinal section through head, right maxilla removed. *a*, antenna; *b*, spoon of ligula; *c*, cardo; *cg*, cephalic ganglion or brain; *cl*, clypeus; *l*, ligula; *lb*, labium; *lbr*, labrum; *lo*, submentum; *lp*, labial palpi; *mt*, mentum; *mx*, maxilla; *n*, neck; *No. 1*, chyle gland; *o*, opening of chyle gland; *oc*, ocellus; *œ*, œsophagus; *ph*, pharynx; *sd 2 3*, salivary ducts; *sv*, opening of salivary duct; *th*, thorax.

short, the maxillæ short and fitted for biting and tearing. In the mouth-parts of the honey-bee we find the same identical parts, but here they are modified so as to serve as a sucking organ, and have been specialized into a long tube for sipping various saccharine juices, such as the nectar of flowers, the juices of ripe fruits, the sap of trees, or the honey-dew of aphids. The form of this tube is very complex. The apex of the epipharynx projects beneath the labium, forming the upper part of the mouth opening. The labium, or under lip, forming the underside, is composed of a number of pieces. The largest part is the mentum, which is at the base and bears at its apex the four-jointed labial palpi, and the ligula, which is a long, slender tongue placed between the palpi. On each side of the ligula and attached to the mentum is the paraglossa. The mentum lies a little behind and beneath the head, and can be moved backward and forward. At its base there is a small triangular sclerite, the submentum, by which it is attached to the head. In the mentum are located the strong

tibia. This mechanism is found not only in the workers, but also in the queen and drones. If the curved recess be examined carefully, there will be found many slender teeth in each comb. At the base of the middle tibia there is a long slender spine, by means of which the pollen mass is removed. The middle legs are brought back over the pos-

terior ones, and the spine, entering at the top, passes down behind the mass and turns it out. It is also used in cleaning the wings, and is present in the queen and drones. The posterior legs are the most specialized. The femora, as well as the anterior pairs of legs and the body, are covered with ciliate hairs which are useful in collecting the grains of pollen. The tibia is triangular, and meets the oblong metatarsus in a right angle. On the apical outer edge there is a row of strong spines, which fasten the metatarsus to the tibia by shutting down over a flattened plate in the former. On the under side of the metatarsi there are stiff combs, the teeth of which are straight, horny spines arranged in transverse rows. By means of these combs the pollen collected by the ciliated hairs is combed out, and when the combs are filled the pollen is transferred to the hollow side of the tibia. This cavity is glabrous; while the sides and bottom are lined with two rows of stiff bristles, a third bends over the front. This is the corbicular or pollen-basket. The pollen on the right metatarsus is transferred to the left tibia, and *vice versa*.

Propolis or bee-gum is carried in the same way as pollen. It is collected by the bees from resinous buds, such as the hickory and horse-chestnut, and is used to glue the combs to their supports, to fill all cracks, and to lessen the place of exit. Alcohol, ether, and chloroform dissolve it.

If the abdomen of a worker be elongated by gently separating the segments, and examined, there will be found at



FIG. 4.—Under side of worker carrying wax-scales.

the base of abdominal segments two to five, two smooth plates, called the wax-plates. These plates are smooth, and are strengthened by rims of chitine, which also give them a definite outline. The apex of each segment projects over the wax plates of the next posterior segment, and is

covered with webbed hairs. The true wax glands are situated beneath, the wax passing through by osmosis. A marked peculiarity of these glands is the great abundance of tracheæ or air-tubes with which they are supplied. Wax is like all animal secretions—the silk of spiders, for example—liquid at first. It is derived from the blood by cell

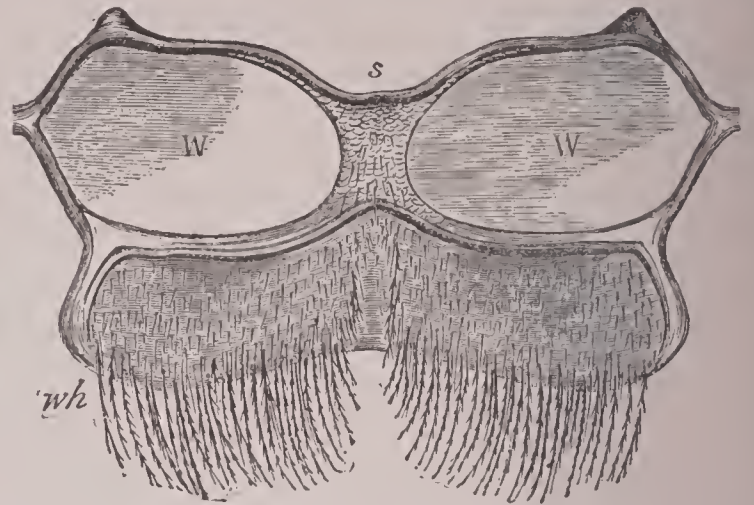


FIG. 5.—Third ventral abdominal segment of worker. *s*, strengthening carina; *w*, wax-plates; *wh*, ciliated hairs.

action, solidifying when brought in contact with the air. If a colony is placed in an empty hive, they climb the sides, the upper ones firmly securing themselves to the sides of the hive by means of their claws, and the next bee hooking its front claws into the hind claws of the one above, until the ladders of bees reach the bottom of the hive. Before leaving its old home the bee gorged itself with honey; this is now used in producing the wax. When the above arrangement is complete the bees remain perfectly still, and the wax flows over the thin membrane of the pocket. The wax having been secreted, a single bee starts the comb. The scales are removed by means of the stiff bristles at the apex of the posterior tibia, which are passed beneath the wax scales, scooping them out. By prolonged chewing it is made into plastic material, which is attached to a middle wall or the midrib, forming the base or end of the layer of cells covering it on each side. Wax can be produced only at the expense of many times the weight of the bee in honey or sugar. The bees, realizing this, economize, 35,000 or more worker cells being molded from a single pound of wax. The sides of the cells are liquid proof. If water mixed with dyes be placed in worker or drone cells adjacent to those containing clear water, they will not intermingle.

Swarming is the result of natural increase. The queen, in the spring or early summer, begins making preparations by the laying of drone eggs. When the drone brood is well under way queen-cells are started, the number varying with the race or variety of bees from three to fifteen, and in some varieties to over 100. When the queens begin to mature they are guarded by the workers, as the old queen would sting them to death. If the colony is crowded, the ventilation insufficient, or the hives unshaded, some sunny day, generally about eleven o'clock, there is a great uproar in the hive, the workers fill their honey-sacs, and the bees—queen, workers, and drones—come out with a rush. The swarm usually cluster upon the limb of a tree, or on a fence-post near, where they remain a short time. It is claimed by some that the workers look out a new home the day before swarming, by others while they are clustered. It is always the old queen that goes with the first swarm, and if the swarm miss the queen after leaving the hive they will return. In about one week the first queen will emerge; in two or three days she will or may lead a new colony forth. This is preceded by the peculiar note of the queen, known as the "piping of the queen." This noise is thought by some to be produced by rubbing the abdominal segments together, and is made sometimes before the queen is out of the cell. Swarms will issue in periods of from one to two days. As many as eight after-swarms have been recorded as issuing from the old home. If the swarming is not interfered with by man, the workers may destroy the queen-cells and drive the drones from the hive. See APICULTURE.

ALEX. D. MACGILLIVRAY.

Bee, BARNARD E.: Confederate general; b. in South Carolina 1824; graduated at West Point 1845 in the artillery; served with distinction throughout the Mexican war (wound-

ed at Cerro Gordo), and his native State presented him with a sword of honor. He was on frontier duty from 1848 to Mar. 3, 1861, when he resigned, and was made a brigadier-general in the Confederate army. At the first battle of Bull Run, July 21, 1861, he was killed.

Bee'be, BEZALEEL: b. at Litchfield, Conn., Apr. 28, 1741; a Revolutionary officer; joined the Rogers Rangers in 1758; became a captain Jan., 1776; was taken prisoner at the capture of Fort Washington; was exchanged, and became major in 1777, lieutenant-colonel in 1780, colonel in 1781, and afterward commanded the Connecticut troops raised to defend the seacoast; was often a member of the Connecticut Legislature between 1781 and 1795. D. in Litchfield, May 29, 1824.

Beech [O. Eng. *bēce*, a deriv. from word appearing in O. Eng. *bōc*; O. N. *bōk*; O. H. G. *buohha* (> Germ. *Buche*); c. f. Lat. *fāgus*, Gr. *φηγός*]: a tree of the genus *Fagus*, and family *Cupuliferæ*; natives of Europe, America, and Australasia. The sterile flowers have a bell-shaped calyx five to seven cleft, with eight to sixteen stamens. The fertile flowers grow on the same tree, the fruit of which is a triangular or sharply three-sided nut, two of which are inclosed in an urn-shaped, coriaceous involucre or husk. These nuts, called beechmast, are edible, and are valuable as food for swine. They yield a large proportion of a bland fixed oil which is used as food and burned in lamps by Europeans; the husks contain a volatile, narcotic, poisonous principle called *fagine*. The genus comprises several species of beautiful forest trees, with a close and smooth ash-gray bark and a light horizontal spray. The *Fagus sylvatica*, or common beech of Europe, forms whole forests in many parts of that continent. It grows to the height of about 100 feet, and sometimes has a diameter of 4 feet, and is a very ornamental tree, especially when it stands alone. The wood is hard and valuable for fuel, and, being durable under water, is employed in the erection of mills. The French use it extensively in the manufacture of *sabots* or wooden shoes. The *Fagus ferruginea* (American beech) is abundant in the Northern U. S., sometimes growing gregariously in forests which contain few other trees. Its leaves are oblong-ovate, taper-pointed, distinctly and often coarsely toothed or serrate. This is an ornamental tree, which sometimes attains a height of 100 feet, and surpasses most trees in the depth of shade produced by its rich green and shining foliage. The wood is hard, heavy, good for fuel, plane-stocks, shoe-lasts, tool-handles, and other purposes. The color of the wood is a light brown or reddish. Among the other species is the myrtle-tree of Tasmania (*Fagus cunninghamii*), a very large and ornamental tree, with evergreen and coriaceous leaves, which resemble birch leaves in form. *Fagus procera*, which attains a lofty stature in the Andes of Chili, is a valuable timber tree. The *Fagus antarctica* is a characteristic tree or shrub of far antarctic regions.

Beech Drops: See CANCER-ROOT and EPIPEGUS.

Beecher, CATHARINE ESTHER: eldest daughter of Lyman; b. at East Hampton, Long Island, Sept. 6, 1800. She conducted a female seminary at Hartford, Conn., 1822-32, and for two years afterward was at the head of an institution in Cincinnati, O., for female education. For many years afterward she was employed in developing a plan for female Christian education, which included the training and subsequent employment of teachers. She published, besides other works, *Treatise on Domestic Economy*; *True Remedy for the Wrongs of Women*; *Elementary Book of Instructive Theology*; and *Common Sense Applied to Religion*. D. in Elmira, May 12, 1878.

Beecher, CHARLES: preacher and writer; b. at Litchfield, Conn., Oct. 7, 1815; was ordained in 1844 pastor of a church at Newark, N. J., and was settled at Georgetown, Mass., in 1857; from 1870-77 he resided in Florida; became stated supply at Wysox, Pa., 1885. Author of *Redeemer and Redeemed*, and other works. He edited the *Autobiography* of his father, Lyman Beecher (1864, 2 vols.). D. in Georgetown, Mass., Apr. 21, 1900.

Beecher, EDWARD, D. D.: brother of Charles Beecher; b. at East Hampton, L. I., Aug. 27, 1803; graduated at Yale in 1822; was pastor of Park Street church, Boston (1826-30); president of Illinois College from 1831 to 1844; pastor of Salem Street church, Boston, from 1846 to 1856; editor of *The Congregationalist* (1849-53); pastor in Galesburg, Ill., 1856-71, and of Parkville Congregational Church, 1885-89. D. in Brooklyn, July 29, 1895. He published *The Conflict*

of Ages (Boston, 1853; 5th ed. 1855) and other works, including an able work on Baptism (New York, 1849); *History of Opinions on the Scriptural Doctrine of Retribution* (1878).

Beecher, HARRIET ELIZABETH: See STOWE, HARRIET BEECHER.

Beecher, HENRY WARD: author and divine; son of Dr. Lyman Beecher; b. at Litchfield, Conn., June 24, 1813. At an early age he had a strong predilection for a seafaring life, which, however, he renounced in consequence of the deep religious impressions which he experienced during a revival. Having graduated at Amherst College in 1834, he devoted himself to the study of theology at Lane Seminary under the tuition of his father, who was then president of that institution. He was pastor at Lawrenceburg, Del., 1837-39; then at Indianapolis, Ind., until 1847, when he was installed as pastor of Plymouth (Congregational) church in Brooklyn, where his genius and remarkable eloquence continued to attract one of the largest congregations in the U. S. He was equally successful as a lecturer and a popular orator. He was editor of the *Independent* from 1861 to 1863, when he visited Europe for the benefit of his health. His earnest addresses to large audiences on the subject of the civil war in the U. S. appear to have had considerable influence in turning the current of public opinion in Great Britain in favor of the Union cause. Mr. Beecher was also long a prominent advocate of anti-slavery and of temperance reform, and at a later period of the rights of women. He delivered three courses of lectures on *Preaching* (1872-74) at the Yale Divinity School, on the "Lyman Beecher" foundation. Among his published works are *Lectures to Young Men* (1850); *Star Papers* (1855); *Life Thoughts* (1858); *Royal Truths* (1864); a novel, *Norwood* (1864); *Life of Christ* (vol. i, 1871); *Evolution and Revolution* (1884); *Sermons on Evolution and Religion* (1885); and many volumes of sermons and addresses. He was founder and editor of the *Christian Union* (1870-81). D. in Brooklyn, N. Y., Mar. 8, 1887. See his *Biography* by William C. Beecher and Rev. Samuel Seoville, assisted by Mrs. Henry Ward Beecher (1888). His widow, Eunice White Bullard Beecher (b. Aug. 26, 1812), d. at Stamford, Conn., Mar. 8, 1897.

Beecher, LYMAN, D. D., theologian; b. at New Haven, Conn., Oct. 12, 1775; graduated at Yale College in 1797; studied theology under President Dwight; he was licensed to preach in 1798, and in 1799 was ordained pastor of the Presbyterian church in East Hampton, L. I., where he continued to preach till 1810, when he became minister of the Congregational church at Litchfield, Conn. He was a popular preacher, and acquired great influence among the orthodox churches. To oppose the rapid progress of Unitarian doctrines he removed to Boston about 1826, and preached in the Hanover Street church. He was president of Lane Seminary at Cincinnati 1832-51. Here he was brought to a stormy trial for heresy, and, although not condemned by the presbytery, this event was one of the great factors in the separation of the New from the Old School Presbyterians in 1837. He published, beside other works, *Views in Theology* and *Sermons on Temperance*, which had a great circulation. He was a man of very energetic character. D. at Brooklyn, N. Y., Jan. 10, 1863. His works were published in 3 volumes (Boston, 1852). See his *Autobiography* and *Correspondence*, edited by his son, Charles Beecher (2 vols., 1864-65).

Beecher, THOMAS KINNICUTT: Congregational minister; son of Lyman Beecher; b. in Litchfield, Conn., Feb. 10, 1824; graduated at Illinois College (Jacksonville, Ill.) in 1843. He was the author of *Our Seven Churches*, a volume of discourses (1870). He became (1854) pastor of Park Church in Elmira, N. Y. D. in Elmira, Mar. 14, 1900.

Beecher, WILLIS JUDSON, D. D.: Professor of Hebrew Language and Literature in Auburn Theological Seminary; b. in Hampden, O., Apr. 29, 1838; graduated at Hamilton College (1858) and Auburn Seminary (1864). Before entering upon his present work, in 1871, he had held two brief pastorates, and had been for three years teacher in Whites-town Seminary, N. Y., and for four years Professor of Moral Philosophy and Belles-Lettres in Knox College, Illinois (1865-69). He published many pamphlets and articles, mostly on sociological, statistical, and exegetical subjects; the most important being the series of Old Testament articles in the *American Supplement to the Encyclopædia Britannica* (1883-89), and three series of articles in the *Old and New Testament Student* (1885-90).

Beech'ey, FREDERICK WILLIAM: English navigator; b. in London, Feb. 17, 1796. He accompanied Sir Edward Parry in an Arctic expedition in 1819, and explored the northern coasts of Africa in 1821. He commanded an exploring expedition to the Polar Sea via Bering Strait; discovered Port Clarence and Port Grantley; returned in 1828, and published a narrative of his voyage in 1831. He became a rear-admiral of the blue in 1854. D. Nov. 29, 1856.

Beechey, SIR WILLIAM, R. A.: an English portrait-painter; father of Frederick William Beechey, the navigator; b. in Burford, Oxfordshire, Dec. 12, 1753. He became a pupil at the Royal Academy in 1772; was employed by the nobility; and in 1793 was made portrait-painter to Queen Charlotte and associate of the Academy. D. in Hampstead, Jan. 28, 1839.

Beeder: same as BIDAR.

Bee-eater: a bird of the family *Meropidae* allied to the kingfishers. The genus *Merops* comprises numerous species, found in Asia, Africa, and Europe, which feed on bees and other hymenopterous insects. The common bee-eater (*Merops apiaster*) abounds in the south of Europe as a summer bird of passage. It seizes bees as they fly in the



The Namaqua bee-eater.

air, and watches for them near their hives. It breeds in holes which it excavates in the banks of rivers. There are several other genera called bee-eaters. The Namaqua bee-eater (*Rhinopomastes cyanomelas*) is a West and South African bird.

Beef-eater: a bird of the genus *Buphagus*, belonging to the family of starlings; sometimes called ox-pecker. The beef-eaters are exclusively African, and have a remarkable habit of running over the backs of oxen, buffaloes, camels, etc., in order to feed on the larvæ of flies which they find in their hides, and which is said to be their principal food. This genus includes the South African species called buffalo-bird.

Beef-eaters [the common derivation from a supposed **buffetier* (buffet, sideboard) is groundless]: jocularly, one of certain British functionaries belonging to the yeomen of the guard, who form part of the train of royalty, and attend the sovereign at royal banquets, coronations, etc.

Beef Tea: an article of diet important in the treatment of the sick and the nurture of infants. To prepare palatable beef tea is a matter of some difficulty, but the following rules are excellent and easy to follow: Take 1 lb. of juicy, lean beef from the shoulder or the round, and mince it with a sharp knife on a board or a mincing-block. Put it with its juice into an earthen vessel containing a pint of tepid water, and let it stand for two hours. Strain off the liquid through a clean cloth, squeezing well the meat, and add a little salt.

Place the whole of the juice thus obtained over the fire, but remove it as soon as it has become browned. Never let it boil, otherwise most of the nutritious matter of the beef will be thrown down as a sediment. A little pepper or allspice may be added if preferred.

Beefwoods (*Casuarinaceæ*): a family of trees numbering twenty-three species, all of one genus (*Casuarina*); natives mostly of the Australasian region. Treub's recent studies of the ovules of *C. suberosa* appear to indicate that beefwoods are related to the gymnosperms, although they have usually been associated with the oaks, gallworts, etc.

CHARLES E. BESSEY.

Beelzebub [i. e. the god of dung or of flies; Gr. Βεελζεβούβ, *Beelzeboul*, or *Beetzebul*]: properly Baalzebub; a god worshiped by the people of Ekron, in Philistia (2 Kings i. 3). The name of Beelzebub came in course of time to be commonly applied to a prince or chief of evil spirits, and in this sense it is employed in the Gospels (Matt. x. 25, xii. 24, 27; Mk. iii. 22; Luke xi. 15, 18, 19). This name is found only in the New Testament. The original and authorized spelling is Beelzebub, which appears to have been afterward changed so as to resemble Baalzebub, which was the proper name of the heathen divinity.

Beer [O. Eng. *bēor*; Germ. *Bier*; probably connected ultimately with name for barley; cf. O. Eng. *bēo*]: the fermented infusion of malted barley, flavored with hops. In a wider sense the term *beer* is applied to beverages prepared from cereals, barley, rye, wheat, Indian corn, millet, etc., the chief constituent of which is starch. The treatment involves the preliminary operations of *malting* and *mashing*, or changing the starch to gum (dextrin) and sugar (glucose) by the aid of the natural process of germination. The term *wine*, on the other hand, is restricted to alcoholic liquids obtained by fermenting the saccharine juices of fruits, as the grape, apple, pear, currant, and gooseberry, or the sap of such plants as the sugar-cane, palm, American aloe, etc. There are, however, many beverages of inferior quality called beer, which consist of saccharine liquors more or less completely fermented, and flavored with various substances, such as spruce beer, ginger beer, root beer, etc.

The manufacture of beer from barley is divided into two distinct processes—*malting* and *brewing*—which are conducted in different establishments, the *malt-house* and the *brewery*; the brewer often purchasing his malt from the maltster.

Malting consists of four successive operations: (1) *Steeping*. The barley is placed in wooden cisterns, covered with cold water, and allowed to soak for two or three days, when the water is drained off. By this operation the barley absorbs from 10 to 50 per cent. of water, softening and swelling up at the same time. (2) *Couching*. The softened barley is thrown out upon the floor of the malt-house in heaps or *couches*, where it heats spontaneously and begins to germinate, throwing out rootlets or *radicles*, and shoots or *acrospires*. At the same time it evolves a portion of its water, the operation being called *sweating*. (3) *Flooring* is resorted to in order to check the germination by reducing the temperature. It consists in spreading the barley over the floor, and repeatedly turning and respreading it over a constantly widening area in layers of diminishing thickness. When the process of germination has proceeded as far as is desirable, it is completely stopped by (4) *Kiln-drying*. This is effected in a large room with brick or tile floors, the *kiln*, which is heated to the desired temperature. Here the germinated barley is rendered perfectly dry and crisp. It is then *malt*. The appearance of the malt, and the color of the beer made from it, depend upon the temperature of the kiln. At between 90° and 100° F. pale malt results; at 120° to 125°, amber malt; 150° to 170°, brown malt for porter and stout. Black malt is prepared by roasting the malt in cylinders, at 360° to 400° F., such as are used for roasting coffee. It is used as a coloring for porter. During the process of malting the barley increases in volume and diminishes in weight; 100 measures of barley yield 101 to 109 of malt, but 100 lb. yield only about 80 lb. of malt. The loss in weight is due largely to the perfect drying in the kiln, fresh barley containing 10 to 16 per cent. of water.

The object of changing the barley to malt is to render its constituents soluble, and bring them into a condition suitable for fermentation. During germination the albuminous substances are changed to *diastase*, a body which exerts a wonderful action upon starch. One part of diastase is said to change 2,000 parts of starch (which is insoluble) to dex-

trin (gum), and then to glucose (grape-sugar), both of which are soluble in water.

The diastase of malt is capable of changing to glucose a much larger quantity of starch than exists in the barley; hence unmalted grain is sometimes added to the malt during the subsequent operation of mashing. In Belgium potato-starch is largely employed.

Brewing.—The first operation of the brewer is the *bruising* or crushing of the malt, which is accomplished by passing it between iron rollers. It is then placed in the mash-tub with warm water, and raised gradually to about 167° F. It is here that the starch is transformed into dextrin and glucose, which, with the soluble albuminous and saline constituents, are taken into solution by the water. From 1 to 4 bush. of malt are used for each barrel of beer. When the price of malt is high, a portion of it is replaced by cheaper amylaceous or saccharine substances, such as potato starch, or glucose prepared from it by the action of sulphuric acid. The insoluble residuum from the malt is sold under the name of brewer's grains for feeding cows. The infusion is allowed to stand for a few hours to clarify or set, and the sweet clear *wort* is then drawn off into a copper boiler, when it is boiled with the hops. From 1 to 5 lb. of hops are added for each barrel of beer, the quantity varying with the strength of the beer, the length of time it is to be kept, and the climate to which it is going. The hops are the female flowers of the *Humulus lupulus*; they contain a peculiar essential aromatic oil, a bitter principle, *lupuline*, tannic acid, resin, etc. They communicate an agreeable flavor to the beer, add to its tonic and stimulating properties, aid in clearing it by the action of the tannic acid on the albumin, and diminish its liability to spoil on keeping. See HOPS.

The boiled wort is cooled as quickly as possible, either by placing it in shallow vessels or passing it over a series of tubes through which cold water circulates. It is then run into the fermenting vats or tuns, which in large breweries sometimes have a capacity of 1,200 or 1,500 barrels. The temperature of the wort best suited to successful fermentation depends upon the season. In summer, with the atmosphere at 75° F., it should stand at about 55°; with air at 55°, at 60°; while in the winter it should have a temperature of at least 64°. If a very quick fermentation is desired, it may be considerably higher. For every 100 gal. of wort about 1 gal. of yeast is added, which has been produced in a previous brewing of the same kind of beer. The yeast is usually mixed with a little wort, and left in a warm place till it begins to ferment. This *lobb*, as it is called, is then added to the tun. More yeast is employed in winter than in summer; twice as much at 50° F. as at 68°. In six or eight hours fermentation becomes active; the wort begins to work, the glucose, under the influence of the active ferment, *yeast*, undergoes decomposition, yielding alcohol and carbonic acid, the latter escaping in bubbles, and bearing to the surface particles of yeast, which form a scum. The yeast itself, being a plant, develops rapidly, largely at the expense of the nitrogenous albuminous matters of the wort, which are thus withdrawn. The temperature rapidly increases, rising many degrees. This fermentation continues for six or eight days. When it has reached the proper point, the beer is separated from the yeast, and transferred to the *cleansing butts*. Here a slow, almost imperceptible, fermentation takes place. The solid particles of the yeast rise to the surface and escape through the bung-holes of the casks. Finings are sometimes added to clear the beer; they generally consist of isinglass dissolved in a little sour beer. The beer is then transferred to store-casks, where a slow fermentation occurs, which produces no perceptible quantity of yeast; the beer develops its finer qualities, and is here finished for use. See FERMENTATION.

The composition of the water used in brewing is believed to exert an important influence on the success of the process. Lime salts are said to aid in clearing the beer, as they form insoluble compounds with some of the acids present. Sulphate of lime, or gypsum, is sometimes added to the water. The spring water at Burton-on-Trent is said to contain considerable sulphate of lime. The strength and taste of beer depend upon the quantities of malt and hops employed and the mode of conducting each of the several operations, especially the fermentation. *Strong* beers contain much alcohol; *substantial* beers are those which have not been fermented so thoroughly, and which consequently contain more of the extractive matters of the malt. Bitter beers contain more of the hop extract.

Ale is prepared from pale malt, and the active fermenta-

tion is checked while there still remains a considerable quantity of sugar unchanged. This, by subsequent fermentation in the barrel or bottle, keeps up the briskness. *Pale ale* is made from malt dried in the sun or by steam. It is not allowed to rise above 72° during the fermentation. The formation of acetic acid is thus prevented, and the unpleasant flavor due to the solution of the yeast by the alcohol is avoided. *Scotch ale* is a sweet strong ale. *Small beer* is a weak liquor made by using little malt, or by mashing with fresh water the malt residuum left after the wort for ale or porter has been drawn off. *Porter* is a dark-colored beer made from a mixture of pale, amber, brown, and black malt. *Stout* is strong porter. *Berlin white beer* (*weiss beer*) is prepared by quick fermentation from a mixture of 1 part of barley malt and 5 parts of wheat malt with half a pound of hops per bushel.

Lager Beer.—The beer of Bavaria, which has of late years been so extensively manufactured in the U. S. under the name of *lager beer*, owes its name (from *lager*, a store-house) to the fact that it is stored in cool cellars or vaults for several months before it is used, and its remarkable keeping qualities and highly prized properties to the peculiar kind of fermentation by which it is produced. The fermentation of ordinary beer and ale takes place at high temperatures; it is consequently rapid, and the carbonic acid, evolved in bubbles, carries a portion of the yeast to the surface, forming a thick scum. This scum protects the beer from the oxygen of the air. The fermentation of lager beer is conducted at a low temperature—between 40° and 50° F. It proceeds more slowly, and the carbonic acid does not carry the yeast to the surface. Consequently the air has a freer access, and the gluten is more completely converted. This beer is usually fermented in the winter, or, if in summer, in rooms cooled by ice. This is called sedimentary or under-fermentation, to distinguish it from the ordinary surface fermentation. The yeast, called bottom yeast, is quite different from ordinary yeast, and has a tendency to induce the kind of fermentation by which it was produced. The following is a brief outline of the process employed at one of the largest lager-beer breweries in New York. The barley is soaked two or three days, changing the waters; it germinates six to ten days, till the radicles are brownish; it is then kiln-dried. It is crushed between rollers, mashed at 120° to 140° F., the temperature being raised by the addition of boiling water to 160° or 170°. By adding hot water to the residue a second wort is obtained. The first wort is boiled with the hops; the second wort is let in, and the whole is boiled three or four hours. After cooling to between 44° and 50° F., it is run into open fermenting tuns. One gallon of yeast is added for every twenty to twenty-five barrels. Fermentation continues from ten to twenty days. There is a heavy froth at first, which subsides, leaving the surface clear. It is racked off into hogsheads, when the yeast is found at the bottom of the tuns. It stands in these hogsheads with the bung open. A few days before it is to be put in barrels for use the bung is driven in to accumulate carbonic acid for *life*.

Three varieties of this beer are made: (1) "*Lager*," or summer beer, for which 3 bush. of malt and 1½ to 3 lb. of hops are used per barrel, and which is not ready for use in less than from four to six months. (2) "*Schenk*," winter or present-use beer; 2 to 3 bush. malt and 1 lb. hops per barrel; ready in four to six weeks. (3) *Bock* beer, which is an extra strong beer, made in small quantity and served to customers in the spring, during the interval between the giving out of the schenk beer and the tapping of the lager. In its manufacture 3½ bush. of malt and 1 lb. of hops per barrel are used, and it requires two months for its preparation.

The barrels for lager are coated with pitch on the inside, to prevent the beer soaking into the wood and giving rise to acetic acid when they are empty. Lager is therefore the product of a peculiar slow under-fermentation, which takes place at low temperatures.

Chica, or maize beer, was used by the South American Indians before the Spanish conquest. *Bourza*, or millet beer, is made by the Crim Tartars. *Quass*, or rye beer, is a sharp acid beverage prized by the Russians. *Koumiss*, or milk beer, is prepared by the Tartars from mare's milk, which they dilute and ferment.

Composition of Beer.—The stimulant and tonic properties of beer are due to the alcohol and the bitter principle of the hop, while its nutritive value is ascribed to the extractive matters derived chiefly from the malt. The exact

character of many of the constituents of beer is not known. Besides water, alcohol, dextrin, and grape-sugar, the following substances have been identified: glycerin, succinic, acetic, lactic, propionic, glucic, and carbonic acids, albumen and albuminous principles, bitter and resinous matters and essential oil from the hop, and alkaline and earthy salts. The latter, which amount to from 0.15 to 0.28 per cent. of the beer, are from one-half to two-thirds alkaline and earthy phosphates. The unrecognized constituents of beer are grouped under the term extractive matters. In the following table the term *extract* includes all the substances left when the alcohol and water are removed by evaporation:

ANALYSIS OF BEER.

KINDS.	PERCENTAGES.		CONTENTS PER IMPERIAL PINT.	
	Alcohol.	Extract.	Alcohol, fl. ounces.	Extract, ounces.
Burton ale (Allsopp's).....	8.25	13.32	2.16	2.77
Bass's barley wine.....	8.41	11.75	2.18	2.42
Edinburgh ale.....	4.41	3.58	1.12	0.72
Guinness's stout.....	6.81	6.17	1.74	1.25
Truman, Hanbury & Co.'s porter..	4.02	5.12	1.03	1.01
Whitbread's porter.....	4.28	5.15	1.09	1.03
Hoare's porter.....	4.18	5.04	1.06	1.03
Perry's ale.....	3.87	3.65	0.98	0.73
Munich lager.....	4.70	6.10	1.19	1.22
New York lager.....	5.86	4.32	1.48	0.88
Munich schenk.....	3.90	5.7	1.00	1.16
Munich bock.....	4.60	9.2	1.17	1.90

Adulteration of Beer.—There is a popular impression that beer is extensively and injuriously adulterated; that potato-starch, grape-sugar, glycerin, and molasses are added as substitutes for malt; pine bark, quassia, walnut leaf, wormwood, bitter clover, aloes, picric acid, cocculus indicus, and strychnine as substitutes for hops; and various chemicals to neutralize acidity or conceal dilution. A few of the first mentioned would not be unwholesome, and it is not probable that many, if any, of the others are ever used. Glucose, or grape-sugar, made from corn-starch, is extensively used whenever the relative prices of barley and grape-sugar make it profitable to do so. Grape-sugar is in no way unwholesome, but it is a very poor substitute for barley. It yields alcohol by fermentation, but does not contain the albumen, extractive substances, and inorganic salts which are contained in barley; consequently the beer is poor. It has been customary of late to omit the storage of beer before it is sold; the beer is sent to the consumers without waiting for the after-fermentation in the barrels; and to produce the effervescence which formerly came from fermentation compressed disks of sodium bicarbonate are introduced into the kegs and barrels through the bung-hole.

Revised by IRA REMSEN.

Beers, HENRY AUGUSTIN: b. at Buffalo, N. Y., July 2, 1847; graduated at Yale College 1869; spent two years in New York in the study of law; was appointed tutor in Yale in 1871, and Professor of English in 1875. Besides stories, essays, and sketches in the magazines, and special contributions to dictionaries, encyclopædias, and other reference books, has published the following books: *Odds and Ends* (verse, 1878); edited *A Century of American Literature* (1878); *Life of N. P. Willis* (1885); edited *Prose Writings of N. P. Willis* (1885); *The Thankless Muse*, a volume of poems (1885); *An Outline Sketch of English Literature* (1886): this was reprinted, with appendix, as *From Chaucer to Tennyson* (1890); *An Outline Sketch of American Literature* (1887): this was reprinted as *Initial Studies in American Letters* (1891).

Beer'sheba (i. e. the well of the oath, or well of the seven): an ancient frontier place of Palestine, situated about 50 miles S. S. W. of Jerusalem, and near the border of the desert. Abraham, Isaac, and Jacob often dwelt there. The phrase "from Dan to Beersheba" was used proverbially to express the whole extent of the land of Israel. There are still to be seen seven wells of ancient masonry, from 5 to 12½ feet in diameter; but only two of them now contain water.

Beestings: See COLOSTRUM.

Beeswax: a substance manufactured or secreted by the honey-bee; the material of which its cells and combs are constructed, and an important article of commerce. Purified beeswax is tasteless, odorless, and colorless. Its specific gravity is about .960. It fuses at 145° F., is insoluble in

water, and partly soluble in boiling alcohol. Beeswax is extensively used in the manufacture of candles and tapers, and for other purposes. It consists of (1) myricin, which is insoluble in boiling alcohol, and is chiefly myricyl palmitate, $C_{30}H_{61}.C_{16}H_{31}O_2$; (2) cerotic acid, $C_{27}H_{54}O_2$, which dissolves in boiling alcohol, but crystallizes out on cooling; (3) cerolein, which remains dissolved in the cold alcohol.

Beet (*Beta vulgaris*): a plant allied to spinach, and belonging to the family *Chenopodiaceæ*. It is native to the Mediterranean basin and western temperate Asia, and has been in cultivation for two thousand years or more. The beet is cultivated in five forms: (1) As an ornamental plant, it is grown for the rich markings of the leaves. A number of varieties have been produced for this purpose, with large leaves marked with several shades of red, orange, and silver-white. (2) As a leaf-vegetable in the form of Swiss chard. The leaf-stalks have been much broadened by selection, until, in rich soil, they reach a width of 2 or 3 inches. These thickened petioles are used as a boiled or pot vegetable. The young leaves of various kinds of beets are also much used for "greens." (3) As a root-vegetable, and this is probably its best-known form. It runs into several types, characterized by the shape and color of the root, but the commonest classification of the garden varieties is into the turnip-beets, which are comparatively small, rounded, and early, and the long-beets, which are usually late. About fifty varieties of garden beets are grown in the U. S. The beet demands a loose, rich soil. It can be sown early, even before the latest frosts are past. (4) As mangolds or mangel-wurzels, which are very large beets grown for cattle-feeding purposes. They demand the same culture as the ruta-bagas or Swedish turnips, although they are usually sown earlier. (5) As sugar-beets, an important source of cane-sugar. (See SUGAR.) These are very extensively grown in Central Europe, and the industry is now assuming some importance in many parts of the U. S., as California, Nebraska, and Kansas. It is probable that the range of adaptability of the sugar-beet in the U. S. is greater than has been supposed. Dr. Wiley writes: "It has been found in general that the coast valleys of California, and probably large areas near the coast in Oregon and Washington, certain parts of the Dakotas and Nebraska, localities in Minnesota, Iowa, Wisconsin, and Michigan, parts of Northern Illinois, Indiana, Ohio, and New York, present favorable conditions for sugar-beet culture, but in the localities thus broadly intimated there are certain restricted areas most suitable to the sugar-beet, and it is only these restricted areas to which we must look for success." See the *Annual Reports of the United States Dept. of Agr.*; *Special Rep. 28* (U. S. Dept. Agr.); *Bulletins 5, 27, 30*, Division of Chemistry (U. S. Dept. Agr.); and the bulletins of the experiment stations of California, Utah, Colorado, Nebraska, Kansas, Missouri, Iowa, South Dakota, Minnesota, Wisconsin, Indiana, Michigan, New York (Cornell).

L. H. BAILEY.

Beet, JOSEPH AGAR, D. D.: English Wesleyan theologian; b. in Sheffield, Sept. 27, 1840; graduated in Wesley College, Sheffield, and Wesleyan Theological College, Richmond, near London; entered the ministry, and in 1885 became Professor of Systematic Theology in his theological *alma mater*. He wrote the excellent commentaries upon Romans (London, 1877), Corinthians (1882), Galatians (1885), Ephesians, Philippians, Colossians to Philemon (1890), and other works, including *Through Christ to God: A Study in Scientific Theology*, 1892.

S. M. JACKSON.

Beethoven, bay'tō-ven, LUDWIG, van: musical composer; b. at Bonn, Dec. 17, 1770. He was the second of four children, of whom the first died an infant. His father, Johann van Beethoven, tenor singer in the chapel of the elector, being poor, mainly in consequence of bad habits, discerned the remarkable musical talents of his son, and prepared early to press them into service by teaching him to play the harpsichord before he was five years old. Having outgrown his father's instruction, the lad was put under the tuition of Pfeiffer, oboist in the chapel, and then under that of Van der Eder, reputed the best organist in Bonn. At the age of eleven he was transferred from Van der Eder to his successor in the chapel, Neefe, who spoke warmly of the boy's proficiency and mastery of the music adapted to the harpsichord. The master himself seems to have given him special instruction in the science of composition, and even had published some of his compositions. At this period the lad dedicated to the elector three pianoforte sonatas, which also were printed. From this time his reputation increased,

and his prosperity, under the auspices of eminent patrons, brightened. When but fourteen he was made assistant court-organist, and three years later was sent to Vienna, at the elector's expense, to pursue his studies under the direction of Mozart, then at the height of his fame. In Vienna he finally made his home, after an incidental residence of several years in Rome, where his efforts were required to support his two younger brothers. On his return to Vienna he studied hard with Haydn and Albrechtsberger, the celebrated contrapuntist, making himself perfect master of the science of musical composition. His favorite instrument at this time was the pianoforte, on which he soon rivaled the best performers. His technical education being completed, his powers trained, his method formed, works came from his hand with astonishing rapidity. There is difficulty in fixing the dates of his compositions, but before he was thirty years old he had published as many as 20 sonatas for the pianoforte, 9 for piano and instruments, 2 concertos for piano and orchestra, trios, quartets, quintets, septets, a ballet, *The Men of Prometheus*, and two orchestral symphonies. At this period he moved in the best society, was noticed by persons of rank, and recognized by all as a genius of the first order. These were his happy, hopeful days, but they did not last long; they were soon clouded by the one great calamity of his life—a misfortune that to a musician would seem almost fatal to achievement. Already in 1800 he speaks sadly of a defect in his hearing which occasioned serious inconvenience. It increased so rapidly that before long, in the course of two or three years, during which he had a violent sickness, he became totally deaf. This affliction clouded his inner life, made him distrustful, restless, suspicious, melancholy, and unsocial. From this time books, meditation, and solitary walks in the country were his sole recreation. His society was limited to a few select friends, with whom he could forget himself. He lived in his work, and his work went on increasing in volume, gaining in power, and deepening in intensity from year to year. The achievements of his genius can not be described in a few words. In less than five years were produced the *Heroic Symphony*; *Fidelio*; *Fourth, Fifth, and Sixth Symphonies*; with the grand mass in C. In 1813 came the *Seventh Symphony*; three years later the *Eighth*; in 1824 the *Ninth* or *Choral Symphony*, by many thought the most wonderful of all—by Beethoven himself regarded as the most significant; and in the intervals between these gigantic creations was produced some of his most perfect music. To give here any account of these works is impossible; they can not so much as be named, for they cover nearly every species of composition, and are so remarkable that nearly every one merits special notice. They are as extraordinary for their wealth of thought and feeling as for their mastery of the laws of composition. They constitute a musical library by themselves. The nine symphonies and the grand sonatas for the pianoforte are monuments of genius which alone would give immortality to their creator.

Beethoven died Mar. 26, 1827, of dropsy, following a violent inflammation of the lungs. His constitution, naturally strong, had been tried by severe shocks of illness. His life was solitary; he was never married. His strongest natural attachment was for a nephew who proved unworthy of his uncle's devotion. Though his deafness made him a recluse, he was not selfish, sordid, or narrow-souled. On the contrary, his human feeling was of the deepest, and, though he could never have been rich, he showed himself capable of generosity. An enthusiastic republican in his belief, and an ardent sympathizer with his countrymen in their struggles for political liberty, Beethoven suffered bitterly for the woes of his Fatherland, and poured out through his music the passion of his proud, agonized heart. There are worlds of sorrow in his compositions. They are, in every sense of the words, modern and living. Though so thoroughly accomplished in musical science, Beethoven was never scholastic; though so deeply charged with emotion, he was never sentimental. His works convey the profound, various, comprehensive feeling which was natural to a sensitive spirit, keenly responsive to all the joy and sorrow of the new age. To this is due their extraordinary hold on people who are quite unable to appreciate their technical excellence.

That Beethoven was a man of vast intellect his compositions testify. But he was something besides a musician. He read much and thought much; he was by no means unfamiliar with the literature of Germany, and even with Italian letters. When interested, his conversation was animated, brilliant, and instructive.

In person Beethoven is said to have been of middle size, stout, and apparently strong. His statues, busts, and portraits represent him with a massive head, broad brow, a dignified, somber expression of countenance, and features of harsh but heroic cast. The bronze statue erected in the public square of his native city in 1845 is of majestic aspect. His latest and most careful biographer, Mr. A. W. Thayer (1876-79), describes him as looking much like a mulatto, short and sallow, with wide nostrils and projecting teeth, heavy lips, and high cheek-bones. See Grove's *Dictionary of Music and Musicians*.

Beetle: a common name given to insects of the order *Coleoptera*. They may be recognized by the much thickened horny anterior pair of wings (elytra), which meet in a straight line down the back and conceal the second membranous pair of wings, the true organs of flight. The young hatch as grubs, and undergo a complete metamorphosis, and the mouth parts are in the form of jaws, fitted for biting. Many beetles are remarkable for their singular forms and the brilliant colors and ornamental markings of their elytra. See COLEOPTERA and SCARAB.

Beet-root Sugar: sugar made from beets. The beet-root contains about 10 per cent. of saccharine matter; chemically it is the same as ordinary cane-sugar. The Prussian chemist Aehard was the first who succeeded in extracting sugar from beets. A comparatively small amount is made in the U. S. The production for 1896-1901 was as follows:

COUNTRY.	1900-1901	1899-1900.	1898-99.	1897-98.	1896-97.
	(estimated).				
	Tons.	Tons.	Tons.	Tons.	Tons.
Germany	1,875,000	1,798,631	1,721,718	1,852,857	1,836,536
Austria	1,050,000	1,108,007	1,051,290	831,667	934,007
France	1,060,000	977,850	830,132	821,235	752,081
Russia	940,000	910,000	776,066	738,715	728,667
Belgium	340,000	304,000	244,017	265,397	288,009
Holland	190,000	171,029	149,763	125,658	174,206
Other countries..	345,000	253,929	209,015	196,245	202,990
Total for Europe	5,800,000	5,523,446	1,982,001	4,831,774	4,916,586
The U. S.	150,000	71,427	32,471	40,399	.....

See SUGAR.

Beets, NICOLAAS: Dutch poet and writer; b. in Haarlem, Sept. 13, 1814. He studied at Leyden, and became in 1840 pastor at Heemsteê; in 1854 he was established as pastor in Utrecht, and in 1875 he became Professor of Theology in the University of Utrecht. Happy in his married life, in his success as a pastor, and in the respect of his countrymen, his career has been on the whole quiet and uneventful. As a writer he has passed through three somewhat different phases. As a youth he felt powerfully the influence of Sir Walter Scott, and his first publications show this. He made his poetical *début* in 1831 in the *Musen-Almanak*, with a poem on the death of a lady named Bilderdijk-Schweiekhart. This was followed by other poems, and by translations from Scott. Soon, however, he fell under the influence of Byron, though in a somewhat superficial fashion. Beginning with slight translations of Byron, in 1834 he published his *Jose, een Spaansch verhaal*, in which he attempted to give expression to his admiration for *Childe Harold* and *Manfred* by imitating them. In the same vein were his *Kuser* (1835), *Guy de Vlaming* (1837), and *Ada van Holland* (1840). The last poem, however, was his last Byronic experiment. In 1837 he had begun to write, over the name "Hildebrand," striking sketches of Dutch life in prose. In 1839 these sketches were published in a volume entitled *Camera Obscura*, and were at once felt by the public to be original and powerful. In 1838 had appeared *Gedichten*; in 1853, *Korenbloemen*; in 1857, *Nieuwe Gedichten*; in 1863, *Verstrooide Gedichten*; in 1869, *Madelieven*. His collected poems appeared in three volumes, Amsterdam, 1873-76. He also achieved success as a critic.

A. R. MARSH.

Beeville: town; capital of Bee co., Tex. (for location of county, see map of Texas, ref. 6-11); on San An. and Aransas Pass and a branch of Southern Pac. R. Rs.; 96 miles S. of San Antonio, and 56 miles from the coast; has five churches, graded schools, and high school. Beeville is situated in the same latitude as Tampa, Fla., in a region where oranges and bananas may be grown, and well adapted to market-gardening. Pop. (1880) 208; (1890) 1,311; not returned in 1900.

PUBLISHER OF "BEE."

Beg: See BEY.

Begas, bay'gāas, KARL: painter; b. at Heinsberg, Germany, Sept. 30, 1794. He was a resident of Berlin and court painter to the King of Prussia. He painted *The Finding of Moses* and other scriptural subjects; also portraits, including Humboldt and Schelling. D. Nov. 23, 1854.

Begg, JAMES: See the Appendix.

Beggar: a person who solicits charitable aid from the public at large. In all ages and countries persons have practiced various arts in order to enlist the sympathies of the benevolent. Severe enactments have from time to time been made against them. By a law of Richard II. (1388) able-bodied beggars were punished and compelled to labor, and provision was made for the helpless. By an act of Henry VIII. (1530) licenses were given to poor persons to beg within fixed limits, but unlicensed beggars were whipped, and all persons giving alms to such forfeited ten times the amount given. By an act of the reign of Elizabeth (repealed in 1593) beggars were grievously whipped, burned through the ear with a hot iron, and for the third offense put to death. The best method of regulating and suppressing the practice of begging is a matter much discussed and still unsettled. See CHARITY ORGANIZATION.

Begging Friars: See FRIARS, DOMINICANS, etc.

Beg'hards [O. F. *begard*; M. H. G. *beghart*, derived from name of Lambert le Bègne; cf. *Béguine*]: name applied to semi-monastic societies of men, originating in the Netherlands, and dating from the early part of the thirteenth century, or not very long after similar societies of women (the Béguines) had been formed, and spreading over Germany, France, and Italy. At first distinguished for piety and works of beneficence, they quickly degenerated into mere pious beggars. They were also joined by heretics of every description, and so fell under the ban of the church in the fourteenth century, and were severely hauled by the Inquisition, but continued down to the Reformation. See Mosheim, *De Beghardis et Beguinabus Commentarius* (Leipzig, 1790); Hallmann, *Geschichte d. Ursprungs d. belgischen Beghinen* (Berlin, 1843); L. Keller, *Die Reformation und die alteren Reformparteien* (Leipzig, 1885).

Begharmi: same as BAGIRMI.

Begonia: a genus of herbaceous ornamental plants, comprising between 300 and 400 species. The genus contains several well-marked sections. A rough classification of the garden kinds groups them into the "foliage" begonias (as shown in *Begonia rex*), the small-leaved flowering non-tuberous sorts and the tuberous species. The rex or foliage section comprises some of the choicest of ornamental-leaved plants. Some of the dark-leaved varieties are known as "beefsteak geraniums." They all demand a shaded situation in the greenhouse or window-garden. They are propagated by seeds and stem-cuttings, and many of them grow readily from leaf-cuttings. The tuberous-rooted section is gaining rapidly in public favor. The species are adapted both for indoor and outdoor cultivation. They profit by a partially shaded location. The flowers are very variable in size, shape, and color, sometimes attaining a diameter of over 4 inches. The tuberous begonias are grown from the tubers, from seeds, and from stem-cuttings, although the last method is perhaps not generally advisable with amateurs.

L. H. BAILEY.

Begonia'ceæ [so named from *Begonia*, one of the genera]: a natural order of exogenous plants, mostly herbaceous; have alternate leaves, oblique at the base, and eyes of unisexual pink flowers, with a colored perianth and numerous stamens. There are also white and deep scarlet varieties. They are nearly all tropical plants, but one species of *Begonia* grows on the Himalayas 11,500 feet above the sea. The order comprises about 160 species. Some of the Mexican species are used as drastic purgatives.

Béguines, bay'geen' [Fr. *Béguine*, a deriv. from the name of Lambert le Bègue, a priest of Liège in the twelfth century, founder of the order]: the name given to semi-monastic societies of women originating in Belgium, perhaps at Liège, about 1180 A. D. These societies grew in part out of the numerical inequality between the sexes caused by the crusades. The women, without assuming monastic vows, lived in houses by themselves, labored for their own support, and took care of the sick. They had similar fortunes with the BEGHARDS (*q. v.*), but being worthier survived their persecutions. There are now in Belgium twenty of these establishments, with about 150 members. For literature, see BEGHARDS.

Begum, be-gūm' [from Turk. *bégin*, princess; cf. Eng. *bey*]: a title of honor given in the East Indies to princesses and the sultanas of seraglios. Among the charges against Warren Hastings was his cruelty to two rich begums of Oude, the mother and the wife of Sujah Dowlah. In order to extort money from them, Hastings or his agents invaded the privacy of their zenanas, and reduced them to the alternative of delivering their treasures or exposing their faces to the view of strange men. They preferred the former of these two evils.

Behaim, bay'him, or **Behem**, bay'hem, MARTIN: an eminent cosmographer and navigator; b. at Nuremberg about 1459. He became a merchant, and visited foreign countries in that capacity. In 1484 and 1485 he accompanied the navigator Diego Cam in a voyage of exploration along the west coast of Africa. He gained distinction as a maker of maps and globes. A large globe which he made in 1492 is still preserved by his descendants in Nuremberg, and is prized as a monument and record of the progress of geography. D. in Fayal, July 29, 1506. See Ghillany, *Geschichte des Seefahrers Ritter Martin Behaim* (1853); C. G. von Murr, *Diplomatische Geschichte des Ritters M. Behaim* (1778).

Behaim, MICHAEL: mastersinger; b. at Sulzbach, 1416; a weaver by trade; burgomaster of his native village, where he was murdered in 1474. Though he wrote numerous poems of all descriptions, he must be considered the representative of the greatest decline of the art of poetry in Germany during the fifteenth century. JULIUS GOEBEL.

Beham, bay'ham, BARTHEL, or BARTHOLOMEW: a German portrait-painter and engraver; b. in Nuremberg in 1502; a pupil of Dürer. D. in Italy in 1540. He was a master of copper-plate engraving, of which his *Emperor Charles V.* is a fine specimen.—His nephew, HANS SEBALD BENAM; b. in Nuremberg, 1500; one of the best of the Nuremberg engravers, whose grotesque, sometimes coarse subjects. D. in Frankfort, Nov. 22, 1550.

Behar': a division of Bengal, British India; between the parallels 24° and 28° N., and the meridians 83° and 89° E., S. of Nepal and E. of the Northwestern Provinces. It is a generally flat country, divided by the Ganges into two nearly equal parts. Area, 44,163 sq. miles. Pop. (1891) 24,284,370, of whom 84 per cent. were Hindus and 13 per cent. Mohammedans. The population is rapidly increasing, and is now nearly 550 per sq. mile. Rice is the main staple of food; in elevated and drier localities, wheat, maize, millet, and pease are substituted. Potatoes and cabbages have been introduced by Europeans and are now largely grown. The commercial staples are oil-seeds, opium, indigo, sugar, cotton, and saltpeter, the opium being a government monopoly. The East Indian Railway runs through the division along the Ganges, and it is entered or crossed in part by several others. The climate is very hot from March to June, when the rains set in and last till the end of September. The rainfall is about 50 inches. The cool season lasts from October to March, and is the pleasantest part of the year.

Behar is the cradle of Búddhism. From the fourth century before our era to the fifth after, it was a part of the splendid kingdom of Magadha. In 1202 it fell into the hands of the Mohammedans. In 1765 it was acquired by the East India Company. It is now divided into twelve districts, and contains many important cities, as Patna and Chapra. Behar city is in 25° 10' N. lat., 85° 35' E. lon. It was formerly the residence of a governor, and is now the capital of the district of the same name. Pop. about 53,000. MARK W. HARRINGTON.

Beheading: See CAPITAL PUNISHMENT.

Behem, MARTIN: See BEHAIM, MARTIN.

Behemoth: a huge animal described in the book of Job (xl. 15-24). Some critics consider the Hebrew term a plural noun for cattle in general. Others think some extinct species of animal is referred to. Others think the elephant is meant. But most writers, including English commentators generally, say the hippopotamus.

Behistun, bay-his-toon' [Lat. *Bagista'nus*, Pers. *Baghistan'*, i. e. place of gardens]: an ancient and ruined town of Persia; in Irak-Ajemi, 21 miles E. of Kermanshah (see map of Persia and Arabia, ref. 5-F). Here is a remarkable limestone mountain (the ancient *Mons Bagistanus*, on the confines of Media), which rises to the height of 1,700 feet, and is almost perpendicular on one side. According to Dio-

dorus, the famous Semiramis, on her march from Babylon to Ecbatana, encamped here and prepared a residence, and having cut away the lower part of the rock of Bagistanus, caused her portrait to be carved or sculptured there. The geography of this locality has been carefully investigated by Rawlinson and Masson. A peculiar interest attaches to the rock of Behistun on account of its cuneiform inscriptions, which were made by order of Darius I., King of Persia, about 515 B. C., and have been deciphered by Sir H. Rawlinson. Close to these inscriptions are thirteen human figures, one of which represents Darius. "The labor," says Rawlinson, "bestowed on the whole work must have been enormous. . . . But the real wonder of the work consists in the inscriptions. For extent, for beauty of execution, for uniformity and correctness, they are perhaps unequalled in the world. It is evident that after the engraving of the rock had been accomplished, a coating of silicious varnish had been laid on to give a clearness of outline to each individual letter, and to protect the surface against the action of the elements. The varnish is of infinitely greater hardness than the limestone rock beneath it. It has been washed down in several places by the trickling of water for three-and-twenty centuries, and it lies in flakes upon the foot-ledge like thin layers of lava." (*Journal of the Asiatic Society*, vol. x.) The Persian inscriptions which Rawlinson deciphered are contained in five columns, one of which has ninety-six lines, and each of the others nearly as many. There are on the same rock inscriptions in the Median and Babylonian languages. See Rawlinson's *Herodotus*, vols. i. and ii.

Behm, baym, ERNST: geographer; b. in Gotha, Jan. 4, 1830; founded 1856 the *Geographisches Jahrbuch*; began in co-operation with H. Wagner the publication of *Die Bevölkerung der Erde* (1872); succeeded Dr. Petermann as editor of the *Mitteilungen* (1878); statistician of the *Almanach de Gotha* (1876). D. in Gotha, Mar. 16, 1884.

Behn, ben, APIARA, or APIRA (*Johnson*): an English dramatist; b. at Wye, Kent, in 1640; daughter of a barber. She was married (about 1658) to an English merchant of Dutch descent, named Behn, who died before 1666, and she was employed as a spy at Antwerp by Charles II. She wrote under the name of "Astræa" some seventeen plays and a number of poems, epistles, and novels, the most noteworthy of which is *Surinam*, the story of a native prince of Oroonoko, in South America, whose acquaintance she had made during a short residence in that province in her youth. Her writings are witty, but immoral; latest reprint London, 1871, 6 vols. D. in London, Apr. 16, 1689, and was buried in the Poets' Corner of Westminster Abbey.

Behrends, ADOLPHUS JULIUS FREDERICK, D. D.: Congregationalist minister; b. at Nymwegen in Holland, Dec. 18, 1839; graduated at Denison University, Ohio, 1862; studied at Rochester Theological Seminary; became pastor of the Baptist church at Yonkers, N. Y., 1868; of the First Baptist church, Cleveland, O., 1873; then pastor of the Union Congregational church, Providence, R. I., 1876; and of the Central Congregational church, Brooklyn, N. Y., 1883. He was the author of *Socialism and Christianity* (1886) and the *Philosophy of Preaching* (1890), and was a frequent contributor to theological journals. D. in Brooklyn, N. Y., May 22, 1900. GEORGE P. FISHER.

Behring: See BERING.

Beilan, bay'-laan': a town and pass of Northern Syria; on the east side of the Gulf of Iskanderoon; one of only two passes between Cilicia and Syria. It is thought by some to be the same as the ancient *Amanian Gates*. The town of Beilan is situated on a hill-crest 1,500 feet above the sea. Pop. about 5,000. It has numerous aqueducts.

Beilstein, bil'stîn', FRIEDRICH CONRAD: chemist; b. in St. Petersburg, 1838; professor in the Technological Institute in that city since 1866. He has done much valuable work in the field of organic chemistry. He is probably best known by his *Handbuch der organischen Chemie* (3d ed. 1891), a work highly prized by all engaged in higher work on the compounds of carbon.

Beira, bay'-raã, or **Beyra**: a province of Portugal; bounded N. by Entre-Douro-e-Minho and Tras-os-Montes, E. by Spain, S. by Estremadura and Alentejo, and W. by the Atlantic. Area, 9,244 sq. miles. Besides the Douro, which flows along its north boundary, and the Tagus, which touches it in the southeast corner, Beira is also drained by the Mondegos. The surface is mountainous; the soil is gen-

erally poor. Among the staple productions are wine, grain, and olives. Marble, iron, and coal are found here. Capital, Coimbra. Pop. (1881) 1,377,432.

Beirut, or **Bairut**: See BEYROUT.

Beit-el-Fa'kih, bayt'el-faa'kêe (i. e. house of a saint): a town of Arabia; in Yemen; on the Red Sea; 90 miles N. of Mocha (see map of Persia and Arabia, ref. 10-D). The heat here is very great, the thermometer rising to 104° F. in the shade, and 145° in the sun. It has a citadel and a mosque. Pop. about 8,000. It is one of the largest marts in Arabia for coffee.

Beja, bay'zhaã (anc. *Pax Julia*): a town of Portugal; in Alemtejo; 57 miles by rail S. of Evora (see map of Spain, ref. 18-B). It has a castle, a cathedral, and manufactures of earthenware and leather. It is the seat of a Roman Catholic bishop. Two annual fairs are held here in the fall. Pop. 8,500.

Be'jan: name of the freshman class in universities of St. Andrews and Aberdeen, Scotland, and in earlier times in many of the continental universities.

Bejapoor: same as BIJAPPOOR.

Bejar, bay'-khaar': a Spanish town romantically situated on the Cuerdo de Hombro; 48 miles S. of Salamanca (see map of Spain, ref. 15-D). It has manufactures of wool, and is noted for hams. There are thermal silicate springs in the vicinity which are much frequented. Pop. (1887) 12,120.

Beke, CHARLES TILSTONE: English traveler; b. in London, Oct. 10, 1800. He early attracted attention by his biblical and archaeological writings, and in consequence received an honorary Ph. D. from the University of Tübingen (1834). He explored Abyssinia (1840-43), and after his return published, besides other works, an *Essay on the Nile and its Tributaries* (London, 1847), and *On the Sources of the Nile in the Mountains of the Moon* (1848). He has since made other visits to Africa and Asia, and performed many eminent public services, especially in Abyssinia. He claimed (*Discoveries of Sinai in Arabia and of Midian*, 1878) to have discovered that Mt. Sinai was Jebel-el-Nur, a grand mountain with a broad plain at its base, near the Gulf of Akabah, on the E. D. in Bromley, Kent, July 31, 1874.

Bekes, bay'-kesh': a county of Central Hungary; bounded N. by the county of Szaboles, E. by Bihar, S. by Csanad, and W. by Csongrad. Area, 1,321 sq. miles. The country consists of a plain, and is watered by the Black, White, and Rapid Körös. The climate is unhealthy, but the soil is extremely fertile, yielding large quantities of wheat of the first quality. Pop. (1890) 257,888.

Bekes, or **Bekesvár**, -vaãr': a town of Hungary; capital of county of same name; at the confluence of the White and Black Körös; 62 miles S. W. of Debreczin (see map of Austria-Hungary, ref. 7-I). It has considerable trade. Pop. 24,561.

Bek'ker, AUGUST IMMANUEL: philologist; b. in Berlin, May 21, 1785; was a pupil of F. A. Wolf at Halle. He became Professor of Philology at Berlin in 1810, and published *Anecdota Græca* (3 vols., 1814-21). He produced good editions of many classics, among which are *Plato* (10 vols., 1814-21); *The Attic Orators* (5 vols., 1823-24); and *Aristotle* (4 vols., 1831-36). D. in Berlin, June 7, 1871.

Bel: See BAAL.

Bela, bay'laã: name of four Hungarian kings of the Arpad dynasty. B. I. (1061-63) regulated the systems of measures, weights, and coinage, and introduced the representative system into the Diet.—B. II., The Blind (1131-41); addicted to drink; entirely dominated by his bloodthirsty wife, Helena.—B. III. (1174-96) introduced Byzantine customs and culture into the court.—B. IV. (1235-70); son of Andreas II.; fled before the Mongols to Austria 1241; afterward fostered the development of the country by the encouragement of colonists.

Belaia: same as BIELAYA.

Bel Air: capital of Harford co., Md. (for location of county, see map of Maryland, ref. 1-F); on Balt. and Lehigh R. R.; 22½ miles N. of Baltimore. It is a manufacturing town, and trade-center of an agricultural district. Pop. (1890) 1,416; (1900) 961.

Bel and the Dragon, History of: an apocryphal book of the Bible; regarded as a fable by St. Jerome and many eminent theologians. It is canonical in the Roman Catholic

Church, being part of the fourteenth chapter of Daniel in the Vulgate. By the Anglican Church it is recommended to be read for edification. It was written in Greek, probably in Alexandria, in the third century B. C. It has no historical value. Its object seems to have been to give a warning against idolatry. See PSEUDEPIGRAPHA.

Belcher, Sir EDWARD, F. R. S.: an English vice-admiral; b. in Halifax, N. S., 1799. As commander of the *Sulphur*, he sailed on a voyage around the world in 1836, and explored the western coasts of America. During this voyage he served in the naval operations against the Chinese in 1841. He became a post-captain in 1843, and commanded an expedition sent in search of Sir John Franklin in 1852. Returning without any success, and having lost his vessels, he was placed before a court martial, but acquitted. In 1864 he became rear-admiral of the red. He published, besides other works, a *Narrative of a Voyage round the World in the Sulphur*. D. Mar. 18, 1877.

Beleher, JONATHAN: merchant; b. in Cambridge, Mass., Jan. 8, 1681; graduated at Harvard in 1699. He was Governor of Massachusetts and New Hampshire from 1730 to 1741. Having been removed from office, he went to England to vindicate himself, and was appointed Governor of New Jersey in 1747. D. in Elizabeth, Aug. 11, 1757.

Belcher, JONATHAN: son of the preceding; b. at Boston, Mass., July 28, 1710; studied law at the Temple, London; was one of the first settlers in Chebucto, Nova Scotia; became lieutenant-governor of Nova Scotia in 1760, and chief justice in 1761. D. in Halifax, N. S., Mar. 29, 1776.

Bel'ding: city; Ionia co., Mich. (for location of county, see map of Michigan, ref. 7-I); on the D., L. and N. R. R.; 138 miles N. W. from Detroit. It is the seat of extensive manufacturing industries, the first silk-mill built in the West being placed here. There are now two silk-mills, employing over 600 operatives, mostly girls; a large refrigerator-factory, casket-factory, furniture-factory, basket-factory, washing-machine factory, a chemical fire-extinguisher factory, paper-box factory, besides other smaller concerns. Pop. (1880) 562; (1890) 1,730; (1900) 3,282.

PUBLISHERS OF "BANNER."

Bel'ed-el-Jereed' (i. e. the country of dates): an extensive region of Northern Africa; bordering on the Desert of Sahara; is bounded on the N. by Algeria, and on the W. by Morocco. The soil is mostly arid and sterile, except some oases which produce the date-palm, which affords the inhabitants their principal and often their only food.

Belem, baÿ-lei': a city of Brazil. See PARA.

Belem'nite [from Gr. *βέλεμων*, dart]: the common name of the internal *guard* of an extinct type of dibranchiate cephalopoda, of which the genus *Belemnites* is the main representative. See BELEMNITIDÆ.

Belemnitidæ: a family of extinct cephalopods of the sub-order *Decapoda*, of which *Belemnites* is the typical genus. The parts generally preserved in the fossil state are (1) the *guard*, a cylindro-conical, elongated calcareous shell, mainly solid, but with a shallow conical cavity in the larger end in which is inserted the *phragmacone*, (2) which is chambered and traversed by a marginal siphon on the ventral side; on the dorsal side the phragmacone is extended in a thin, extremely delicate plate (3) expanded and rounded in front, which is rarely preserved, representing the "pen" of the *Loligo*. This is called the *pro-ostracum*. Occasionally traces of the "ink-bag" and impressions of the arms are preserved, showing the animal to have been constructed on the plan of the recent *Loligo*. In the latter genus the "pen," representing the pro-ostracum of the *Belemnites*, is the only part of the internal skeleton developed.

The *Belemnitidæ* include the genera *Belemnites*, *Belemnitella*, *Xiphoteuthis*, *Beloptera*, *Spirulorostra*, and others, all of which are confined to the Mesozoic (Triassic, Jurassic, and Cretaceous) and the lower part of the Tertiary.

H. S. WILLIAMS.

Belfast': an important city and seaport of Ireland; in the county of Antrim and province of Ulster; situated on Belfast Lough (an arm of the sea), at the mouth of the river Lagan, 101 miles by rail N. of Dublin, and 118 miles S. W. of Glasgow; lat. 54° 35' N., lon. 5° 57' W. (see map of Ireland, ref. 5-J). The river is crossed by three bridges, the finest of which is the Queen's bridge. Railways extend from this point to Dublin, Armagh, and Londonderry. The site of the city is low and level, but is partly inclosed by the ridge

of Divis and Cave Hill, the former of which rises to the height of 1,567 feet. The houses are mostly of brick and are well built; the streets are regular, spacious, well-lighted, and macadamized. Belfast is the most prosperous commercial town of Ireland, except Dublin. The principal public edifices are Queen's College, a beautiful structure in the Tudor style (opened in 1849); a Presbyterian and a Methodist college; the Royal Academical Institution, affiliated to the London University; the museum, the theater, Linen Hall, the Corn Exchange, etc. It has about 80 churches, of which 28 are Presbyterian. Although the seat of the Roman Catholic bishop of Down and Connor, it is mostly Protestant, having only five Roman Catholic churches. The botanic garden of the Natural History Society occupies about 17 acres. Belfast is the chief seat of the Irish manufactures of linen and cotton, and is the great *dépôt* of the linen trade. The linen manufacture was established here in 1637. The other chief branches of industry are weaving of linen and cotton, bleaching, dyeing, calico-printing, and iron-founding. Numerous steamers, engaged in the Channel trade, ply regularly between Belfast and Liverpool, Glasgow, Dublin, London, etc. The chief articles of export are linens, cotton goods, grain, flax, cattle, and provisions. This city has also a large foreign trade. The adjacent country is extremely beautiful. Belfast returns four members to Parliament. It first became an important place about 1604, and was chartered in 1611. Pop. (1881) 207,671; (1891) 255,896.

Belfast: city and port of entry; capital of Waldo co., Me. (for location of county, see map of Maine, ref. 9-D). It is the terminus of the Belfast and Moosehead Lake R. R., and is situated at the head of West Penobscot Bay, 2 miles W. of Penobscot river, and about 30 miles S. by W. from Bangor. It has a spacious harbor, which is safe and sufficiently deep for large ships. Belfast has a good school system, including high school, public library of over 5,000 volumes in a handsome stone building, and churches of six denominations. The principal industries are the manufacture of shoes, patent medicines, doors, iron, and the quarrying of granite, and ship-building. It was first settled in 1770; was invested by the British in 1815; adopted a city charter in 1853. Pop. (1880) 5,308; (1890) 5,294; (1900) 4,615.

EDITOR OF "AGE."

Belford, JAMES B.: b. in Lewistown, Pa., Sept. 28, 1837; educated at Dickinson College; studied law; was appointed one of the judges of the Supreme Court of Colorado (1870-75). Since the admission of Colorado as a State he has been elected its representative in the 44th, 45th, 46th, 47th, and 48th Congresses, but was refused his seat by the Democratic majority in the 45th.

Belfort, bel'fôr': an important fortified town of France; at the foot of the Vosges and on the river Savourense; 60 miles by rail N. E. of Besançon (see map of France, ref. 4-I). Pop. (1891) 25,455. It has a citadel constructed by Vauban, a fine church, and a public library; also manufactures of iron, paper, and calico. It was ceded to France by Austria in 1648. In the winter of 1870-71 it was besieged by the Germans, and capitulated Feb. 16 with the sanction of the Government, but was afterward evacuated by the Germans. It once belonged to the department of Haut-Rhin; is now in the small territory of Belfort. Area, 235 sq. miles; pop. (1891) 83,670; (1896) 88,047.

Bel'gæ: the name given by Cæsar to the warlike tribes which in ancient times occupied one of the three great divisions of Gaul (*Gallia*). Their country, which was bounded on the N. W. by the ocean and on the E. by the Rhine, comprised the modern Belgium, part of Holland, and the north-east part of France. This region was sometimes called *Belgica* or *Gallia Belgica*. It was separated from the territory of the Celtæ by the river *Sequana* (Seine) and its affluent the *Matrona* (Marne). Cæsar represents the Belgæ as distinct from the Celtæ proper and the Aquitani in language, usages, and political institutions. A part of the Belgæ were probably Germans or of German origin, and a part are believed to have been Cymric Celts. Some of the Belgæ had crossed the Channel and settled in the southern maritime parts of Britain, and were found there by Cæsar when he invaded the island. The Belgæ were a brave, warlike people. See Cæsar, *Commentaries on the Gallic War*; Smith, *Dict. of Ancient Geog.*

Belgaum, bel-gawm': a district and city of the Bombay Presidency, British India. The district is near the west coast, in lat. 16° N., northeast of Goa. Area, 4,657 sq. miles. The

chief occupation is agriculture, but there are considerable manufactures of cloth, wood, metals, and shoes. Among the agricultural products are rice, wheat, sugar-cane, barley, and tobacco. The population is about 870,000, 57 per cent. of whom are Hindus, 7 per cent. Mohammedans, and 5 per cent. Bûddhists. The city of Belgaum is in about lat. 15° 50' N., lon. 74° 40' E. It is the capital of the district. Pop. 35,000.

Belgiojoso, bel-jō-yō'sō, CRISTINA, Princess of: b. at Milan, June 28, 1803; a daughter of Marquis Geronimo Isidoro Trivulzio; married on Sept. 14, 1824, Prince Emilio Barbian e Belgiojoso. She embraced the Italian cause with great enthusiasm; was expelled from Italy by the Austrian Government in 1830, and settled in Paris, where her salon soon became the center of a most brilliant political and literary circle. In 1848 she returned to Italy, equipped a corps of volunteers at her own expense, and took part most actively in the revolution in Milan and Rome. But in 1850 she was once more exiled; visited Greece and Turkey, and settled in 1855 once more in Paris, still working indefatigably for the cause of her country. In 1861 she finally returned to Italy, and d. in Milan, July 5, 1871. Besides being a frequent contributor to various French and Italian journals, she published *Essai sur la Formation du Culte dogmatique* (1846); *Souvenirs d'Exil* (1850); *Emina, Récits turco-asiatiques* (2 vols., 1856); *Asie mineure et Syrie*; and *Scènes de la Vie turque* (1858); *Histoire de la Maison de Savoie* (1860); and *Réflexions sur l'État actuel de l'Italie*, etc. (1869).

Belgium: a kingdom of Europe; on the German Sea between Holland, Prussia, and France; has an area of 11,373 sq. miles, and a population (est. 1898) of 6,669,732 inhabitants (see map of Holland and Belgium, under Holland). It is the most densely peopled country of Europe, having 540 inhabitants to the square mile. The soil is partly fertile, partly (in the E.) sandy and marshy. The only mountains are some offshoots of the Ardennes in the S. The coast has a length of 46 miles, and is flat and undiversified. The country is well watered by the Meuse and the Scheldt, and their affluents, the Sambre, Ourthe, Werze, Lys, Dender, and Rupel. There are no lakes of importance, but many canals. The climate in general is temperate. Among the chief products of Belgium belong cattle, fish, corn, fruit, wood; among those of the mineral kingdom, iron and coal. A coal region covering an area of 476 sq. miles traverses all Belgium, and embraces two large basins, one of which extends into France and the other into Prussia. Celebrated mineral springs are found at Spa. The people belong, in almost equal proportion, to two different nationalities, the Flemish (German) and the Walloon (French). The Flemish language, which is spoken by about 2,500,000, prevails in the provinces of East Flanders, Antwerp, Limburg, West Flanders, and Brabant, while the Walloon is the predominant language in the provinces of Liège, Hainaut, Namur, and Luxemburg, and is spoken by a population of about 2,000,000. The French, though the language of the minority, has since 1794 been the official language of the state authorities and the court; of late, however, the Flemings have begun an active agitation for the recovery of equal rights for their idiom. A considerable number of periodicals are published in the Flemish language. With the exception of about 15,000 Protestants and 3,000 Jews, the entire population belongs to the Roman Catholic Church, which has in Belgium one archbishop at Malines, and five bishops at Namur, Ghent, Bruges, Tournay, and Liège.

There are four universities—at Ghent, Liège, Louvain, and Brussels; the two first named are controlled by the state; the third by the Catholic bishops, and the last named by the Liberal party. Prominent among the other educational institutions of the country are the Academies of Fine Arts at Antwerp and Brussels, the Museum of Painting and Sculpture at Brussels, the Conservatories of Music at Brussels, Liège, and Ghent. The people are chiefly occupied with agriculture, and in this respect excel most nations of Europe. The working of mines is also a most important part of the national industry. First in order are the coal mines (with three great centers at Mons, Charleroi, and the city of Liège), which produced in 1898 22,088,000 tons. The annual produce of the iron mines amounted, in 1898, to 240,744 tons; 2,544,403 tons of iron ore were imported for manufacture, chiefly from Luxemburg. Wool is the object of an immense industry, and the Belgian woolen cloths are superior in quality. The linen cloths of Belgium

have long been highly valued; and the manufacture of lace, though now less prosperous than formerly, has nothing to fear from foreign competition. The breweries are very numerous, and beer is the common beverage of all classes. The commerce of the country is also in a very prosperous condition, being greatly promoted by a dense net of railroads, which in 1898 had an aggregate length of 2,867 miles. It is chiefly carried on with France, Holland, England, Prussia, North America, and Russia. The exports amount to about \$600,000,000, and the imports to a trifle more. The commercial fleet, in 1891, consisted of 56 vessels (46 steamers), with an aggregate of 75,946 tons. The aggregate length of the telegraph lines was, in 1898, 3,960 miles. The most important ports are those of Antwerp and Ostende; the most important centers of the commerce of the interior are Brussels, Ghent, Bruges, Liège, Namur, Courtray.

Government.—According to the constitution of Mar. 3, 1831, Belgium is a constitutional monarchy. The crown is hereditary, according to the right of primogeniture, in the male line only. The executive power is vested in the king alone; the legislative he shares with the Senate and the House of Representatives. The Court of Cassation at Brussels is the supreme court of the country; besides it there are three courts of appeal (Brussels, Ghent, and Liège). The jury has been introduced since 1831. The Code Napoléon is regarded as the judicial standard. The public budget for 1900 was, revenue, \$452,246,618; expenditure, \$450,929,726; public debt, \$2,603,787,175. The army on the war footing numbered (without officers) 163,000 men, 25,823 horses, and 240 pieces of ordnance; besides, the country has a civil guard consisting of 40,443 active and 90,000 non-active men. The navy is unimportant. The most important fortresses are Antwerp, Mons, Charleroi, Philippeville, Mariembourg, Ath, Tournay, Menai, Ypres, Ghent, and Namur. The measures and coins have been since 1817 the same as in France. In point of administration the country is divided into nine provinces: South Brabant, Antwerp, East and West Flanders, Hainaut, Namur, Liège, Limburg, Luxemburg. Brussels is the capital and residence of the king; during the summer months the king resides at Laeken. The national colors are red, yellow, and black, placed perpendicularly beside each other; the escutcheon, the lion of Brabant, with the inscription, "L'union fait la force."

History.—In the time of the Romans, the present Belgium, which was then inhabited by Celtic and Germanic tribes, formed, under the name of Gallia Belgica, a part of Gaul. The treaty of Verdun in 843 united the southern districts with France, the northern with Germany. After the termination of the Carolingian rule, the French districts were gradually converted into duchies and counties. In 1385 the county of Flanders fell to the House of Burgundy, which in the early part of the fifteenth century gradually obtained possession of all the provinces of the Netherlands. The marriage of Maria of Burgundy, the last scion of her house, with the Emperor Maximilian I., incorporated the Netherlands with the extensive dominions of the House of Habsburg, and, under the name of the "Circle of Burgundy" (*Burgundischer Kreis*), with the German empire. When, after the abdication of Charles V. (1555), his states were divided, Belgium remained united with Spain, and this union continued after the northern provinces had successfully established their independence. Only from 1598 to 1621, Belgium constituted an independent state under the rule of Isabel, daughter of Philip II., and her husband, the Archduke Albert. In the course of the seventeenth century Spain had repeatedly to cede portions of Belgian territory to France. The peace of Utrecht in 1713 gave Belgium to Austria.

In the Austrian war of succession the whole country was conquered by the French, but it was restored to Austria in the peace of Aix-la-Chapelle (Oct. 18, 1748). In consequence of the unpopular reforms and innovations which Joseph II. undertook to introduce, an insurrection broke out against Austrian rule in Dec., 1789, and on Jan. 11, 1790, the Belgian provinces (with the exception of Luxemburg) proclaimed their independence under the name of "United Belgium," but in Nov., 1790, the rule of the Austrians was re-established. After the battle of Jemappes (Nov. 7, 1792), Belgium was occupied by the French, and in 1794 the country was ceded by Austria to France. It was then divided into nine departments, and the administration wholly assimilated to that of France. In 1814 the first treaty of Paris united Belgium with Holland into the kingdom of the Netherlands. The union lasted until Aug., 1830, when the whole country rose in revolution against the Dutch Government. On Sept. 20,

a provisional government was formed, which, on Oct. 4, after the evacuation of the capital by the Dutch, proclaimed the independence of Belgium. On June 4, 1831, Prince Leopold of Saxe-Coburg was elected king. The preliminary treaty of 1833 between England, France, and Holland put an end to the efforts of the Dutch Government for the recovery of Belgium, but the definite acceptance of the articles drawn up by the London Conference in 1831 for the regulation of the frontier between Holland and Belgium did not take place until 1838. The subsequent history of Belgium under Leopold I. (d. Dec. 10, 1865) and his son Leopold II. has been one of quiet and steady development. The administration has been sometimes in the hands of the Catholic and sometimes in those of the Liberal party, but the peace of the country has never seriously been disturbed, not even by the European revolution of 1848. See Juste, *Histoire de Belgique* (2 vols., 4th ed. 1868). Revised by C. K. ADAMS.

Belgorod: a town of Russia. See BIELGOROD.

Belgrade, bel-grayd' (anc. *Singidunum*; Servian *Bielgorod*, white town): an important fortified town; capital of Servia; on right bank of the Danube, at the mouth of the river Save, 42 miles S. E. of Peterwardein, 215 miles S. S. E. of Pesth, and 234 N. N. W. of Vranja (see map of Austria-Hungary, ref. 9-1). The citadel, which is very strong, is situated on a point of land between the rivers, behind which rises the city with antique German edifices, a cathedral, and a palace. Belgrade had formerly an Oriental appearance, but it has been abandoned by many wealthy Turks, and mosques are partly superseded by churches. Here are manufactures of arms, cutlery, silk goods, saddlery, and carpets. It has a good port and an active trade, being the entrepôt of the commerce between Austria and Turkey. It is the seat of the chief authorities of Servia. In consequence of its importance as a strategical point, Belgrade has been the scene of many famous sieges and battles. It was besieged without success by the Turks in 1456, and taken by the Sultan Solymán in 1522. In 1688 it was stormed and captured by the Elector of Bavaria, but it was recovered by the Turks in 1690. Prince Eugène here defeated 200,000 Turks in 1717, after which it changed owners several times. Taken by Austria in 1789, it was given up to Turkey in 1891. Insurgent Servians held it from 1806-12; the Turks bombarded the town from the citadel in 1862; made capital of Servia same year. The principality became independent on July 13, 1878. Pop. (1884) 35,726; (1891) 54,458.

Belgrand, bel'grān', EUGÈNE: civil engineer; constructor of the new water-supply and sewers of Paris; b. at Ervy, Aube, April 23, 1810. From the Polytechnic School he entered the Ponts et Chaussées, being made engineer in 1836, chief engineer in 1852, inspector-general first class in 1875, member of the Institute of France, director of water-supply and sewers of Paris, and commander of the Legion of Honor. The system of sewers designed and executed by him is a truly gigantic work. So also are the water-works, supplying Paris with spring water from points distant 80 and 100 miles. He has published *La Seine; The Basin of Paris in Prehistoric Times; The Subterranean Works of Paris*, etc. D. April 8, 1878, in the midst of his most important work, the sewerage of Paris, a work to cost \$8,000,000. W. R. II.

Be'lial [Heb., worthlessness]: a term used in the Bible; frequently occurring in the phrase "a son of Belial," which, by a common Hebrew idiom, signifies merely a worthless or very bad person; but in 2 Cor. vi. 15, the only New Testament occurrence, it is used as a proper name of Satan. According to Westcott and Hort and other critical texts the reading is Beliar.

Bélicor, bay'lčē-dōr', BERNARD FOREST, de: French military engineer and writer; b. in Catalonia in 1697. He served in the German campaign of 1742. He wrote *Hydraulic Architecture* (Paris, 1737); a *New Course of Mathematics for the Use of Artillery* (1757); and *La Science des Ingénieurs*. D. Sept. 8, 1761.

Belief and Faith: See the Appendix.

Belisarius [Slavie, white tsar or chief]: a celebrated general to whom Justinian was chiefly indebted for the military glory of his reign; b. in Germania, in Illyria, about 505 A. D. Having been appointed general-in-chief of the army of the East, he defeated the Persians at Dara in 530, and suppressed a formidable rising of the Green or anti-royal faction at Constantinople in 532. He gained two victories over the Vandals in Africa, and took their king, Geli-

mer, a prisoner, in 534 A. D., for which he obtained a triumphal procession, the first accorded to a subject since the reign of Tiberius. He obtained the office of consul in 535. He also commanded the army of Justinian in a long war against the Ostrogoths, who had made themselves masters of Italy. He occupied Rome in Dec., 536, and gained some other advantages, but was recalled in 540; after which he suffered adverse fortune through the enmity of the Empress Theodora. In 544 A. D. he was again sent to Italy to oppose the Gothic King Totila, but his army was so inferior in numbers that he could not gain a decisive victory, although he maintained the war for five years and reoccupied Rome. He resigned the command in 548, and passed nearly ten years in inaction. He served with success against the Bulgarians in 559, and was imprisoned in 563 on a charge of treason. D. Mar. 13, 565 A. D. He was distinguished for his loyalty, humanity, and other virtues. The tradition that he died poor and blind is without sufficient support, for after six months' incarceration he was restored to all his honors. See Lord Mahon, *Life of Belisarius* (1829); Gibbon, *Decline and Fall of the Roman Empire*; C. F. Zeller, *Belisarius* (Tübingen, 1809); C. L. Roth, *Ueber Belisavs Ungnade* (1846).

Belize, bel-eez' [a corruption of the Spanish *Wallis*, itself a corruption of the English *Wallace*, the name of an English pirate who infested that region]: See HONDURAS, BRITISH.

Belize: the capital of British Honduras; on the Bay of Honduras, at the mouth of the Belize river; lat. 17° 29' N., lon. 88° 8' W. There is no port in the proper sense of the word, as vessels have to lie far off from shore, and the only protection seaward is formed by the numerous cays which render navigation dangerous. The town is backed by swamps, and the land on which it is built is made from ballast and other like sources. The town, consisting of a principal street along the shore, with small offshoots, is generally well built, and, notwithstanding its surrounding, is healthful for the latitude. It has a considerable trade. Pop. about 6,000.

Belknap, bel'nap, GEORGE EUGENE: rear-admiral U. S. N.; b. in Newport, N. H., Jan. 22, 1832; entered the navy as a midshipman Oct. 7, 1847. In 1856, while attached to the sloop of war Plymouth, he took part in the assault and capture of the Barrier Forts at the mouth of the Canton river, China; was executive officer of the ironclad *New Ironsides* from 1862 to 1864 in her numerous engagements with the forts and batteries of Charleston harbor. He commanded the ironclad *Canonicus* in both attacks on Fort Fisher. In 1874 he commanded the *Tusearora* while surveying the bed of the North Pacific to find a submarine cable route to Japan, and he invented improvements in the apparatus for deep-soundings. In 1885 he became superintendent of the U. S. Naval Observatory, and later president of the Board of Inspection and Survey.

Belknap, JEREMY, D. D.: b. in Boston, Mass., June 4, 1744; graduated at Harvard 1762; taught school four years; studied theology; was pastor of the Congregational church at Dover, N. H., from Feb. 18, 1767, until 1786, and of the Federal Street church at Boston from Apr. 4, 1787, for the remainder of his life; kept a diary in interleaved almanacs from his fifteenth year, and a series of MS. books called *Quotidiana Miscellanea*, in which he jotted down abstracts of his reading; was an active patriot during the Revolution, but declined the chaplaincy of the New Hampshire troops at Cambridge 1775; projected in 1790 the Massachusetts Historical Society, which recognizes him as its founder; delivered before it, Oct. 23, 1792, a tercentennial discourse on the discovery of America; devoted much of his life to historical and biographical labors, making good use of the library left by his early pastor, Rev. Thomas Prince, to the Old South church at Boston; received from the Legislature of New Hampshire a grant of £50 in aid of his publications, and became in 1792 an overseer of Harvard College. D. in Boston, of paralysis, June 20, 1798. Author of a *History of New Hampshire* (3 vols., 1784-92; new ed. 1813), which "has long ranked at the head of the local State histories of the country"; *A Discourse Intended to Commemorate the Discovery of America by Columbus, with Four Dissertations* (1792); *An Historical Account of those Persons who have been Distinguished in America*, etc. (vol. i. 1792; vol. ii. 1798), generally known as the *American Biography* (new ed. 3 vols.); and of a *Collection of Psalms and Hymns* (1795), etc. To him was attributed by Mr. Bryant "the high merit of being the first to make American history attractive." *A Life, with Selections from his Correspondence*, was published by a granddaughter (New York, 1847).

Belknap, WILLIAM GOLDSMITH: soldier; b. in Newburg, N. Y., Sept. 7, 1794; entered the service of the U. S. in 1813 as third lieutenant of infantry, and rose through successive grades to be lieutenant-colonel of the Fifth Infantry in 1847. He served with marked gallantry in the war with Great Britain (1812-15), in the Florida war against hostile Seminoles, and in the war with Mexico. For his services in Florida he was breveted lieutenant-colonel, and for gallant conduct in Mexico he won the brevets of colonel and brigadier-general; served on frontier duty from 1848 to 1851. D. near Fort Washita, Nov. 10, 1851.

Belknap, WILLIAM WORTH: son of Gen. William G. Belknap; b. in Newburg, N. Y., Sept. 22, 1829; graduated at Princeton 1848; studied law; settled at Keokuk, Ia., 1851; elected to the Legislature as a "Douglas Democrat" 1857; entered the army as major of Fifteenth Iowa 1861; served under Grant at Shiloh, Corinth, and Vicksburg; and was in Sherman's "march to the sea." At the battle of Atlanta, under McPherson, he so distinguished himself that he was promoted over his superior officers to be brigadier-general of volunteers; breveted major-general 1865; collector of revenue in Iowa 1866-69; and Secretary of War under Grant from 1869 to 1876, when he resigned, having been impeached in Congress on a charge of corruption, but the Senate held that its jurisdiction ceased with his resignation. His case in the civil court was dismissed. Committed suicide in Washington, Oct. 13, 1890.

Bell [O. Eng. and Low Germ. *belle*. Etym. uncertain, perhaps connected with E. *bell*, O. Eng. *bellan*, roar]; a hollow percussion instrument, usually metallic, and cup-like in form; so constructed as to yield a single dominant note. The history of bells is involved in obscurity. In the time of Moses (Exod. xxviii. 32, 35) bells of gold were used; and Layard discovered small bronze bells in the ruins of Nineveh. The Hindu and Burmese priests, as well as the Greeks and Romans, made use of bells in their temples. It is probable, however, that all the bells so used were insignificant in size. The large bells used in churches are supposed to have been invented by Paulinus, Bishop of Nola, about the year A. D. 400. We infer that they were introduced into England soon after, as they are mentioned by Bede in the seventh century, and as the Abbot of Croyland gave a large bell to the abbey in 870. Pope John XIII. consecrated a very large new bell in the Lateran Church in 968. In the twelfth century bell-founding flourished in the monasteries, and, as the badness of the roads interfered with the transportation of the completed bells, traveling bell-founders went about casting bells wherever they were needed. In the fourteenth century bells first began to reach a large size. The famous bell at Rouen, cast in 1501, weighed 36,364 lb., and one at Toulouse, cast a little later, weighed 66,000 lb. The largest bell in the world was cast in 1734 at Moscow, and is no less than 448,000 lb. in weight. Though the most celebrated bells and chimes are in Belgium and the Netherlands, excellent examples of the bell-maker's art are to be found in large numbers in France and in Great Britain. Bells cast in the U. S. are usually shorter than those of the same weight cast in Europe, and consequently are characterized by a somewhat different quality of tone. In the American bell the dominant overtone is a major sixth above the tenor note, instead of the minor sixth, as is usually the case in Europe. The major sixth gives to the bell a louder and more penetrating tone, but it generally lacks the softness and sweetness so often noticeable in the best bells of Europe.

The art of bell-making seems not to be a progressive art. It is impossible at the present day to make better bells than those cast one, two, or even three centuries ago. This inability is probably owing to the fact that the tone of a bell is dependent in part at least upon certain conditions that can not be controlled or even fully understood. The meaning of this statement will be comprehended if it is realized that the quality of a bell depends not only upon the perfection of its materials and workmanship, but also upon the exact relations of the numerous harmonics that go to make up the dominant note. A sensitive musical ear can detect in an ordinary church bell seven and sometimes as many as ten or more distinct tones, all of which in their blending go to make up the quality of the bell. When these harmonics seem to have been perfectly adjusted the result is that rich, soft, and perfect tone which is so delightful to the ear. But the conditions on which the relations of the harmonics depend are for the most part unknown. After every technical re-

quirement is satisfied in the making of a bell, there is still a large element of uncertainty in the result. If a bell once cast utters a jangling sound, indicating that the harmonics are wildly discordant, it is conceded at present that the fault is irreparable. There are, however, certain conditions that are considered indispensable to success in the making of a bell. The metal should consist of about four parts of copper to one of tin, and the thickness at the bow should be about one-thirteenth of its diameter. There is a fullness and softness in the sound of a thick bell which is never characteristic of a thin one. If the proper form and thickness are maintained, the weight of bells varies as the cube of their diameters. In a peal or chime an individual bell can be tuned so as to lower or raise the pitch of its note, though, as above stated, the quality of its tone can not be materially changed. The tone will be flattened by turning or filing off a small portion of the metal from the inside of the soundboard or thickest part, and will be sharpened by a filing from the outer edge so as to reduce the diameter of the mouth. A very excellent authority on this subject is Sir Edmund Beckett's treatise on *Clocks, Watches, and Bells*. See also numerous works by H. T. Ellacombe. In his book entitled *Chiming* Mr. Ellacombe has given an exhaustive catalogue of bell literature. See BELL-RINGING. C. K. ADAMS.

Bell, ALEXANDER GRAHAM: inventor of the speaking telephone; son of Alexander Melville Bell; b. in Edinburgh, Scotland, Mar. 3, 1847; educated at the high school and the university, and specially trained to follow his father's and grandfather's profession for the removal of impediments of speech. In 1872 he took up his residence in the U. S., and introduced his father's invention of visible speech in institutions for deaf mutes, and was subsequently appointed Professor of Vocal Physiology in Boston University. He occupied his leisure during many years in working out his telephonic discovery, and first exhibited it publicly, but in an imperfect form, at the Centennial Exhibition in 1876. Its success is now established throughout the civilized world. He received in 1882 diploma and decoration of National Legion of Honor of France.

Bell, ALEXANDER MELVILLE: inventor of visible speech, a system of universal alphabets which has been successfully used for teaching the deaf (and dumb) to speak; b. at Edinburgh, Scotland, Mar. 1, 1819, and educated under his father, Alexander Bell, author of a method for the removal of impediments of speech. From 1843 to 1865 he held classes in connection with the Edinburgh colleges, and in 1865 was appointed lecturer in University College, London. In 1870 he removed to Canada, and was appointed register in Queen's College, Kingston, in 1877, but settled finally in Washington, D. C., in 1881.

Bell, ANDREW: a Scottish teacher; noted as the founder of the monitorial system (or Madras system) of education; b. at St. Andrews, Mar. 27, 1753, and studied at that university, from which in 1787 he received the degree of D. D., and after 1800 LL. D. from the same. He took orders in the Anglican Church, sailed for India in 1787, and in ten years obtained eight lucrative army chaplainships, all of which he held at the same time. Being appointed in 1789 superintendent of the Madras Male Orphan Asylum for the sons of military men, he employed the scholars in mutual instruction, and after his return to Britain published a treatise on his new method in 1797. He became rector of Swanage, Dorset, 1801; master of Sherburne Hospital, Durham, 1809; prebendary of Hereford 1818, and of Westminster 1819. His great rival was JOSEPH LANCASTER (*q. v.*), who had introduced a somewhat analogous system among the Dissenters, the success of which was the occasion for the formation of the National Society for Promoting the Education of the Poor in the Principles of the Established Church throughout England and Wales, of which Bell was the first superintendent. D. in Cheltenham, Jan. 27, 1832; and left £120,000 for educational purposes. See his *Life* by R. Southey (London, 1844, 3 vols.); better by J. M. D. Meiklejohn (1881).

Bell, SIR CHARLES, F. R. S.: British anatomist and physiologist; the youngest brother of Andrew Bell; b. in Edinburgh, Nov., 1774. He removed in 1804 to London, where he lectured on anatomy and surgery, and published a *System of Operative Surgery* (1807). In 1814 he was elected one of the surgeons of the Middlesex Hospital. He gained distinction as a surgical operator, and excelled in the treatment of nervous affections. He made the important discovery that the nerve filaments of sensation are distinct from those of motion, which is expounded in his *Anatomy*

of the *Brain* (1811) and *Nervous Systems* (1830), his greatest contributions to physiology. In 1836 he became Professor of Surgery in the University of Edinburgh. Among his works are an *Exposition of the Natural System of the Nerves of the Human Body* (1824), and *The Hand, its Mechanism and Vital Endowments as Evincing Design* (1834). The last is one of the Bridgewater Treatises. D. at Hallow Park, near Worcester, Apr. 28, 1842.

Bell, CLAIBORNE HAWLEY, D. D.: president of the Board of Missions of the Cumberland Presbyterian Church; b. near the present site of Aberdeen, Miss. He graduated from the Cumberland University in 1853; had three pastorates, combining with the first the principalship of an academy, and with the second the presidency of Union Female College at Oxford, Miss. Since 1881 he has given his time to the mission work of his Church, filling also the chair of Homiletics and Missions in Cumberland University, and being active in the general work of the Church. W. J. B.

Bell, Rev. GEORGE CHARLES, M. A.: educator and scholar; b. in Streatham, England, July 9, 1832; educated at Lincoln College, Oxford, 1851; mathematical lecturer of Worcester College 1857-65; head master of Christ's Hospital 1868-76; master of Marlborough College 1876, succeeding Archdeacon Farrar; has published two sermons, *Increase of Faith and Confidence in Christ*.

Bell, HENRY: Scottish engineer; b. in Linlithgowshire, Apr. 7, 1767; was the first who obtained success in steam navigation in Europe. He worked in London under Rennie. A small vessel called *The Comet*, with an engine constructed by himself, was launched on the Clyde in 1812. D. in Helensburgh, Nov. 14, 1830.

Bell, HENRY HAYWOOD: rear-admiral U. S. N.; b. in Orange co., North Carolina, Nov. 17, 1807; entered the navy as a midshipman Sept. 1, 1823; commanded a vessel in the attack on the Barrier Forts, Canton, in 1856. In 1861 he commanded the steamer *Brooklyn*, West Gulf blockading squadron. In 1862 he was selected as fleet captain by Rear-Admiral Farragut, and while acting in this capacity led the second division of gunboats at the attack upon Forts St. Philip and Jackson, and was deputed to take possession of New Orleans, where his sound judgment and coolness were conspicuously shown and highly commended by the whole fleet. In 1863 he commanded, during the temporary absence of Admiral Farragut, the West Gulf blockading squadron. In 1865 he was appointed to the command of the squadron in the East Indies. In 1866 he became rear-admiral, and was retired in 1867, but was drowned, Apr. 12, 1867, in an attempt to pass, in his barge, over the bar at the mouth of the Osaka river, Japan, before the arrival of Rear-Admiral Rowan, who was to succeed him.

Bell, JOHN: surgeon; b. in Edinburgh, May 12, 1763; elder brother of Sir Charles Bell. He began in 1786 to lecture on surgery, which he also practiced with success in his native city. He published, besides other works, a *System of the Anatomy of the Human Body* (2 vols., 1793-98), to which his brother Charles added two more volumes; and *The Principles of Surgery* (3 vols., 1801-07). He was a good classical scholar, and one of the most skillful operators of his time. D. in Rome, Apr. 15, 1820, leaving *Observations on Italy*, which was published by his widow in 1825.

Bell, JOHN: statesman; b. near Nashville, Tenn., Feb. 15, 1797. He graduated at the University of Nashville in 1814. He was elected a member of Congress in 1827, and by successive re-elections continued in that body about fourteen years. He supported Gen. Jackson for the presidency in 1832, but joined the Whig party in 1833, and was chosen Speaker of the House of Representatives in 1834. He was an earnest advocate of a protective tariff. In Mar., 1841, he was appointed Secretary of War by President Harrison; resigned that office with the most of the cabinet in Sept., 1841, because he disapproved the policy of Mr. Tyler. He was elected a Senator of the U. S. for Tennessee in 1847; re-elected in 1853; opposed the repeal of the Missouri Compromise in 1854, and the Kansas Lecompton constitution in 1858. He was nominated in 1860 for President of the U. S. by the Constitutional Union party, having Lincoln, Douglas, and Breckenridge as his competitors. He received thirty-nine electoral votes. D. at Cumberland Iron Works, Tenn., Sept. 10, 1869.

Bell, ROBERT: journalist; b. at Cork, in Ireland, Jan. 10, 1800; passed his mature life in London. In conjunction with Sir E. Bulwer and Dr. Lardner he founded in

1841 *The Monthly Chronicle*, which he edited. Among his numerous works are a *History of Russia* (3 vols., 1836-38); *Lives of the English Poets* (2 vols., 1839); a *Life of George Canning* (1846); and several dramas and tales. D. in London, Apr. 12, 1867.

Bell, ROBERT, LL. D.: Canadian surveyor; b. in the township of Toronto, June 3, 1841; graduated at McGill University as a civil engineer in 1861; received the degrees of M. D., C. M., from that university in 1878; and was Professor of Chemistry and Natural Science in Queen's University, Kingston, 1863-68. In 1883 he was appointed assistant director of the Geological Survey of Canada. His surveys and explorations have extended from Newfoundland to the Western plains, and from Lake Erie to Baffin's Bay. His reports to the Government have been published almost every year since 1857, about which time he was engaged as an assistant by Sir W. E. Logan. He acted as scientist and medical officer to the Hudson Bay expeditions of the *Neptune* in 1884, and of the *Alert* in 1885. In 1886 he went overland to Hudson Bay, being his ninth visit there, and made extensive surveys in the Albany and Severn districts. He is the author of numerous papers and essays in scientific journals; also annual reviews of mining in Canada from 1862, and of annual reviews of the progress of science in Canada, published in the *Dominion Annual Register* from 1878 to 1884. NEIL MACDONALD.

Bellacoo'la Indians: See SALISHAN INDIANS.

Belladonna [Ital., literally, beautiful lady, possibly from the use of the plant as a cosmetic]: an herbaceous perennial plant (*Atropa belladonna*) of the natural order *Solanaceae*; sometimes called **Deadly Night-shade**. It is a native of Europe, has ovate leaves, bell-shaped flowers of a lurid, purple color, and berries which when ripe are black, shining, and sweetish in taste. All parts of the plant are narcotic and very poisonous, and contain an alkaloid called *atropia* or *atropine*, on which its active properties depend. The belladonna is considered a valuable medicine and a powerful remedy for certain nervous diseases, neuralgia, paralysis, etc. It is administered both internally and externally. There is an antagonism between atropia and morphia. When applied to the eye it has the remarkable property of greatly dilating the pupil, and it is often used by oculists both in examinations and operations. The medicinal preparation of belladonna commonly used in the U. S. is an extract from the leaves.

Belladonna Lily (*Amaryllis belladonna*): a beautiful rose-colored flower which grows wild about the Cape of Good Hope, and is cultivated in gardens. The drooping flowers are clustered at the top of a leafless stem, which is about 18 inches high, and which springs from an elongated bulb. It may be grown either in the window garden or in the open.

Bellaire': city and railroad center; Belmont co., O. (for location of county, see map of Ohio, ref. 5-I); on the Baltimore and Ohio, the Bellaire, Zanesville and Cincinnati, the Cleveland and Pittsburg, the Cleveland, Lorain and Wheeling R. Rs., and the Ohio river; 5 miles S. of Wheeling and 137 miles E. of Columbus. It has water, gas-works, and electric lights, and manufactures of glass, steel, iron, nails, etc. Coal, iron, cement, paving-brick clays, and limestone are abundant. Pop. (1880) 8,025; (1890) 9,934; (1900) 9,912. EDITOR OF "TRIBUNE."

Bellamij, bel'laä-mi. JACOBUS: Dutch poet; b. in Flushing, Nov. 12, 1757. He published a collection of verses in 1782, and on the occasion of the war of 1785 a volume of patriotic poems (*Vaderlandsche Gezangen*). Among his most popular works is *Roosje*, a poem. He had good taste and a glowing fancy, and contributed largely to the improvement of the national literature. D. Mar. 11, 1786. See Q. Knipers, *Notice sur Bellamy*.

Bellamy, EDWARD: journalist and romancer; b. at Chicopee Falls, Mass., Mar. 26, 1850; educated at Union College and in Germany; engaged in newspaper work in New York and in Springfield, Mass., from 1871 to 1876. Among his romances, which are ingeniously psychological and somewhat resemble Hawthorne's, are *Dr. Heidenhoff's Process* (1879); *Miss Ludington's Sister* (1884); *Looking Backward* (1888), a kind of socialistic Utopia, which had a sale of some half a million copies and has been translated into many languages. It led to the establishment of "Nationalist" societies and "Bellamy" communities, to the propagation of which, by periodicals and lectures, the author devoted him-

self. It was written with no anticipation of originating a socialistic agitation. *Equality* (1897); *The Duke of Stockbridge* (1900). D. in Chicopee Falls, Mass., May 22, 1898.

Bellamy, JOSEPH, D. D.: b. in North Cheshire, Conn., Feb. 20, 1719; graduated at Yale College (1735); and was pastor of the Congregational church at Bethlehem, Conn. (1740-90). He was a powerful preacher and a renowned teacher of theology. Among his published works are *True Religion Delineated* (a refutation of Antinomianism, prefaced by Jonathan Edwards, Boston, 1750; repub. by Congregational Publication Society, Boston); *Theron, Paulinus, and Aspasia; or, Letters and dialogues upon the nature of love to God, faith in Christ, assurance of a little to eternal life* (1759); *An essay on the nature and glory of the Gospel of Jesus Christ* (a supplement to preceding, 1762); *Letters and Dialogues* (1761). D. in Bethlehem, Conn., Mar. 6, 1790. His *Complete Works* were published in 3 vols. (New York, 1811); also in 2 vols. (Boston, 1850), with a memoir by Rev. Dr. T. Edwards.

Bell-animalcule: a microscopic animal; a peritrichous ciliated infusorian, belonging to family *Vorticellidae*. The most common form consists of a bell-shaped portion attached to a stalk by the apex of the bell, the mouth of the bell being generally turned upward. When the bell is expanded its mouth is occupied by a broad disk, around the margin of which is a row of cilia. At the edge of the disk on one side is a funnel-shaped opening, by which food passes into the interior. The stalk can contract quickly, throwing itself into a spiral, thereby retracting the whole animal. The bell can so contract as to form a ball, the cilia being drawn in. When the bell is expanded the cilia keep up a rapid motion, by means of which currents of water are formed which drive particles of food into the funnel, from which from time to time they pass into the body. As complicated as is the animal, it consists of a single cell, which possesses a nucleus, a contractile vacuole, and reproduces itself by division. It is commonly found in water in which are decaying substances, and is frequently made use of in biological studies for illustration and experiments. D. S. JORDAN.

Bellarmino, ROBERT (in It. *Roberto Bellarmino*): a theologian and cardinal; b. at Monte Pulciano, near Florence, Oct. 4, 1542. He entered the order of Jesuits in 1560, and became Professor of Theology at Louvain in 1570, and in Rome 1576. He was a zealous champion of orthodoxy, and was highly distinguished as an able controversial writer against heretics. His principal work is *Disputatio de Controversiis christianæ Fidei adversus hujus Temporis Hæreticos* (Ingolstadt, 3 vols., 1581-92). He became a cardinal in 1599; Archbishop of Capua in 1602; resigned 1605, and became librarian of the Vatican. D. in Rome, Sept. 17, 1621. Complete editions of his works appeared in Cologne, 1619 (7 vols.), and in Naples (1872, 8 vols.), and Paris (1873-74, 12 vols.). He was a man of mild and pacific disposition. "The Church of Rome," says Hallam, "brought forward her most renowned and formidable champion, Bellarmine. . . . His abilities are best tested by Protestant theologians, not only in their terms of eulogy, but indirectly in the peculiar zeal with which they chose him as their worthiest adversary." (*Introduction to the Literature of Europe*.) See G. Fuligatti, *Vita del Cardinal R. Bellarmino* (Antwerp, 1621; Rome, 1624), a work based upon an autobiography; Daniello Bartoli, *Della Vita di R. Bellarmino* (Rome, 1678); P. Frizon, *Vie du Cardinal Bellarmin* (Nancy, 1708). Bellarmine's autobiography, which had been suppressed by the Jesuits, and had become very scarce, was republished by Döllinger and Reusch, with a German translation (Bonn, 1887).

Bellary, bel-laa'rēe, or Balla'ri': a town of India; capital of a district of the same name; province of Madras; 270 miles N. W. of Madras (see map of S. India, ref. 5-D); one of the chief military stations in the province, and has a fort on an abrupt rock 450 feet high. The climate is one of the worst in India. Pop. (1891) 59,770.

Bellay', JOACHIM, du: French poet; b. at Lyré, near Angers, 1525; d. in Paris, Jan. 1, 1560, and was buried in the cathedral of Notre Dame, of which he had been a canon. Though an interesting poet, he is chiefly famous as having issued the manifesto of the so-called Pléiade, the poetical school of which Ronsard was the chief. The title of the manifesto was: *La Deffence et illustration de la langue françoise* (1549, old style; Feb., 1550, new style). The treatise is a violent onslaught upon the mediævalism of the followers of MAROT (*q. v.*), and a recommendation to French poets to turn to the

Greeks and Latins for guidance (*Ly donques, et rely premièrement (ô Poète futur), feuillet de main nocturne et journalle, les exemplaires Grecz et Latins, puis me laisse toutes ces vieilles poésies françoises aux Jeux Floraux de Toulouze, et au Puy de Rouan*). Evidently this marks the triumph of the Renaissance in French literature. The application of the principle, however, both by Du Bellay and by Ronsard, was crude and often ridiculous, affording ample opportunity for the later satire of Boileau. Du Bellay made his *début* as poet, in the same year in which his *Deffence* appeared, with a volume entitled *Recueil de poésies*, in which the most notable things are certain odes in attempted illustration of the poet's doctrine as stated above. In 1551 he went with his cousin, Cardinal du Bellay, then French Ambassador at the Papal court, to Rome. His first pleasure at the sight of the remains of ancient Rome led to the composition of his *Premier livre des antiquitez de Rome* (publ. 1558; trans. into English by Edmund Spenser, 1591, under the title of *The Ruins of Rome*). Soon, however, the intrigues he saw about him turned his pleasure into sorrow, and he composed a series of satiric sonnets, entitled *Regrets* (first printed 1558), of real power. As if in contrast with this sad picture, he published in the same year (1558) his *Jeux rustiques*, full of the charm of country things as seen by the poet. In 1555 Du Bellay had returned to France, but toward 1557, rather than curry favor with the great, he consigned himself to poverty and study. His contempt for the opposite course appeared in his *Poète courtisan*, a sharp satire upon court-poets. Already his own health was broken, and he soon died.

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A. R. MARSH.

Bell-bird: a bird of the genus *Chasmorhynchus*, native to the West Indies and South America. The bell-birds belong to the family *Cotingidæ*, and are allied to the fly-catchers. Their voice has a metallic sound, resembling the tolling of a bell, and can be heard, it is said, at a distance of 3 miles. It is distinguished by a broad and depressed bill, which is soft and flexible at the base. One of the species, the "Campanero" (*C. niveus*), has on its forehead a curious horn-like and tubular appendage, which when empty is pendulous, but when the bird is excited is filled with air and rises to the height of 3 inches. The Australian bell-bird (*Myzantha melanophrys*), "one of the honey-eaters," produces a peculiar tinkling sound; it is an entirely different species from the above.

Bell, Book, and Candle: a form of greater excommunication from the Church, of which the first recorded instances occurred about 1190. The symbolism was much elaborated and of appalling significance. It was formerly used in the Western Church. The priest or ordinary read from a book the anathema which was largely founded on Deut. xviii. 15, *seq.*, with monkish additions which transcended the principles of canon law as to the effect of excommunications. The book being closed, attendants threw lighted candles to the ground, thus extinguishing them, to denote the going out of grace in the soul, and bells were jangled as a token of the disorder fallen upon the excommunicated. The practice has long been discontinued as a customary mode of discipline.

Belleau, bel'lō', REMI: French poet of the school of Ronsard; one of the Pléiade; b. at Nogent-le-Rotrou, 1528; d. 1577. He was tutor of Charles, son of Remi de Lorraine; and when his pupil became Duc d'Elbeuf and grand equerry of France, he continued to live with him—a splendid but quiet life. He was called "*le gentil Belleau*," and by Ronsard "*le peintre de la nature*." His merit is to have introduced into French literature charming, jewel-like descriptions of the external world. His first collection of poems, entitled *Petites Inventiones*, appeared in 1557. This was followed by his *Bergerie* (1565, and 2d part 1572), modeled upon the *Arcadia* of Sanazarro. His most original work, however, is his *Amours et nouveaux Eschanges des pierres precieuses, vertus et propriétés d'icelles* (1576), based upon the poems of the pseudo-Orpheus and the *Lapidarius* of Marbodius. Besides translations of little merit, Belleau wrote a comedy, *La Reconneue* (1577).

BIBLIOGRAPHY.—*Œuvres de R. Belleau*, ed. by Gouverneur

(3 vols. (Bibl. Elzéy.), Paris, 1867); Sainte-Beuve, *Tableau de la poésie française au XVI^e Siècle* (2 vols., Paris, 1876).
A. R. MARSH.

Bellefontaine: railroad junction; capital of Logan co., O. (for location of county, see map of Ohio, ref. 4-D); about 110 miles N. of Cincinnati, and 55 miles N. W. of Columbus. The Cleveland, Cincinnati, Chicago and St. Louis R. R. Co. has graded a tract of about 70 acres for car-shops, round-house, switch-yard, etc. It has the highest elevation of any town in the State, has a good trade, a fine court-house, and is noted for its healthfulness and beauty. Pop. (1880) 3,998; (1890) 4,245; (1900) 6,649. EDITOR OF "REPUBLICAN."

Bellefonte: borough; capital of Center co., Pa. (for location of county, see map of Pennsylvania, ref. 4-E); is beautifully situated at the foot of Bald Eagle Mountain, 87 miles N. W. of Harrisburg. It has a celebrated spring, and the surrounding scenery is very fine, and is a place of summer resort. It has 2 furnaces, 3 rolling-mills, 2 foundries, an axe-factory, car-works, glass-works, a number of smaller manufactories, and 7 newspapers. It is the starting-point of the Buffalo Run R. R., and the terminus of the Lewisburg R. R. Pop. (1880) 3,026; (1890) 3,946; (1900) 4,216.
EDITOR OF "NEWS."

Belle-Isle, bel'ee', CHARLES LOUIS AUGUSTE FOUQUET, Duke of: marshal of France; b. in Villefranche, Aveyron, Sept. 22, 1684; conducted the celebrated retreat of the French from Bohemia 1742; commander of the army of Italy 1748; Minister of War 1757. D. Jan. 26, 1761. He negotiated (1735) the treaty by which Lorraine was united to France.

Belle-Isle-en-Mer, bel'ee'-ään-mär': an island in the Atlantic belonging to the French department of Morbihan. It is 8 miles from the shore, and has an area of 32 sq. miles. Pop. 10,000, mostly engaged in the pilchard-fishery. Excellent horses and grain are raised here. Here is a fortified seaport named Le Palais.

Belle Isle: a fertile island, 9 miles long and 3 broad, in Conception Bay, Newfoundland. It has considerable fishing interests. Pop. 500. **BELLE ISLE, NORTH**: An island in the strait of the same name, between Newfoundland and Labrador; is 21 miles in circuit, and has a small harbor; lat. 52° 13' N., lon. 55° 19' 1" W. **BELLE ISLE, SOUTH**: an island at the entrance of White Bay, on the northeast side of Newfoundland; lat. 50° 49' N., lon. 55° 29' W. It is a fishing-station. Pop. 53.

Belle Isle, Strait of: between Labrador and Newfoundland; is 80 miles long, 12 miles wide, and dangerous of navigation.

Bellenden, or **Ballantyne**, JOHN: Scotch poet, whose personal history is obscure; b. near the close of the fifteenth century. D. about 1550; became Archdeacon of Moray about 1536; translated Boece's *History of Scotland* and the first five books of Livy from the Latin into Scotch prose, prefixing poetical prologues to both works. His works are interesting as specimens of the prose of the time.

Bellenden, WILLIAM: a Scottish author of whose personal history little is known. He was born probably in Lasswade, near Edinburgh, about 1555, and died about 1633; went to France in the train of Mary Queen of Scots, where he became a professor in the University of Paris, and was distinguished for the elegance of his Latin. He published in 1608 at Paris a compilation from the works of Cicero, entitled *Ciceronis Princeps*. Among his other works are *De Statu Prisci Orbis* (On the Condition of the Primitive World, 1615), and *De Tribus Luminibus Romanorum* (1634), his master-work, treating of Seneca, Cicero, and Pliny. Middleton plagiarized from him for his *Life of Cicero*, was accused of it by Warton, and convicted by Parr. Hallam regarded him as among the earliest of philosophical historians. His three principal works were reprinted in 1787, with a Latin preface by Dr. Parr. The preface was noted for its elegant Latin and its allusions to contemporary politics.

Belle Plaine: Benton co., Ia. (for location of county, see map of Iowa, ref. 5-1); on C. and N. W. R. R. Division and terminus of O. C. F. and M. R. R., and on Iowa river; 116 miles W. of Mississippi river, 257 miles W. of Chicago. Here are 3 school-buildings, 6 churches, 2 opera-houses, a city hall, numerous flowing wells (one the noted "gusher" "Jumbo"), round-house and machine-shops, furniture-factory, grist-mill, large creamery, foundry, house-heating manufactory, and broom-works. Founded 1862,

and named after the Indian trapper's name for the valley. Pop. (1880) 1,689; (1890) 2,623; (1900) 3,283.

EDITOR OF "UNION."

Bellerophon [Gr. Βελλεροφόντης, slayer of Bellerus]: originally called **Hipponous**, hip-pon'ō-ūs; a personage of the Greek mythology; son of Glaucus, King of Corinth. Having killed Bellerus by accident, he fled to Prætus, King of Argos, who was instigated by his wife in revenge for the rejection of her advances to send him to Iobates, King of Lycia. He carried a sealed letter requesting Iobates to kill him, but that king imposed on him the dangerous mission of fighting with the Chimæra. Mounted on the winged Pegasus, he slew the monster in mid-air, defeated the Amazons, and destroyed an ambush of Lycians, thus escaping three plotted snares. He figures in Homer and in Pindar, who tell the story of his attempted ascent to Olympus on Pegasus, his fall to the earth, and blindness. The myth of Bellerophon was worked over in the tragedies of Sophocles and Euripides.

Bellerophon: a genus of fossil univalve gasteropod mollusks. The shell is symmetrically convolute, with few and occasionally sculptured whorls, globular or discoidal, and having a dorsal keel, which terminates in a deep notch. Many species of it have been found in the Silurian, Devonian, and carboniferous rocks in various parts of the world.

Bellerose, JOSEPH HYACINTHE: Canadian senator; b. at Three Rivers, P. Q., July 12, 1820, and educated at the colleges of Nicolet and St. Hyacinthe. He held for a short time a captaincy in the 100th regiment; was commander of the whole militia force in military district No. 8 in 1859; subsequently commanded the Laval reserve militia. He represented Laval in the Canadian Assembly 1863-67, and the same constituency in the Dominion Parliament from that date until called to the Senate in 1873. He was member for Laval in Quebec Assembly 1867-75; on two occasions declined important appointments under the Government of Canada; refused a cabinet office after the death of Sir George L. Cartier. He was president of the Union Navigation Company, and was prominently connected with financial and other institutions.
NEIL MACDONALD.

Belle Vernon: borough; Fayette co., Pa. (for location of county, see map of Pennsylvania, ref. 6-B); on Pa. R. R., and on Monongahela river, 42 miles from Pittsburg. It has extensive manufactures, and is situated in an extensive natural gas region. Pop. (1880) 1,164; (1890) 1,147; (1900) 1,901.

Belleville, bel'veel': eastern suburb of Paris, now inclosed by the line of fortifications. Largely inhabited by the poorer classes, it is a center of communistic activity.

Belleville: a port of entry; the capital of Hastings co., Ontario, Canada; on the Bay of Quinté, and on the Grand Trunk Railway, 113 miles E. N. E. of Toronto, and in the heart of the dairying interests of Canada (see map of Ontario, ref. 3-F). It is a beautiful city, and has fine public buildings, including a court-house, a jail, numerous public and private schools, churches, and a custom-house. It is the seat of Albert University (Methodist Episcopal), which consists of Albert College for young men and Alexandra College for women. One mile W. of the town is the deaf and dumb asylum, a fine building opened in 1870. The river Moira furnishes water-power, and the lumber-trade is very extensive. There are various other manufactories. Pop. (1881) 9,516; (1891) 9,914. EDITOR OF "INTELLIGENCER."

Belleville: city and railroad center; capital of St. Clair co., Ill. (for location of county, see map of Illinois, ref. 9-D); 14 miles S. E. of St. Louis. It contains numerous manufactories of almost every description, and one of the largest rolling-mills in the West; also a fine convent, many churches, and splendid school-houses. It is in a region abounding in coal. Pop. (1880) 10,683; (1890) 15,361; (1900) 17,484.
EDITOR OF "NEWS DEMOCRAT."

Belleville: city; capital of Republic co., Kan. (for location of county, see map of Kansas, ref. 4-G); on Chicago and R. I. R. R., 206 miles from Kansas City; has 7 churches, 9 schools, and a court-house. The surrounding region is agricultural. Pop. (1880) 238; (1890) 1,868; (1900) 1,833.

EDITOR OF "FREEMAN."

Bellevue: city and railroad junction; Jackson co., Ia. (for location of county, see map of Iowa, ref. 4-L); beautifully situated on a high, gravelly bank of the Mississippi river, 24 miles below Dubuque, and 12 miles S. of Galena:

has beautiful high school building, five church buildings, manufactories of lumber, pumps, flour, wagons, baskets, butter, and iron-works. Water-works are now (1893) in course of construction. Founded in 1835. Pop. (1880) 1,581; (1890) 1,394; (1900) 1,607.

EDITOR OF "LEADER."

Bellevue: borough; Allegheny co., Pa. (for location of county, see map of Pennsylvania, ref. 5-B); on Pa. R. R., 6 miles N. W. of Pittsburg; is in a mining region. Pop. (1880) 915; (1890) 1,418; (1900) 3,416.

Bellevue: village; Huron co., O. (for location of county, see map of Ohio, ref. 2-F). It is situated at junction of three railroads, 45 miles S. E. of Toledo; is a manufacturing town, and a shipping-point for an extensive fruit and grain region. Pop. (1880) 2,169; (1890) 3,052; (1900) 4,101.

Belligerency: the state of being actually engaged in war. As regards its recognition by neutral states, no question will arise here in case of war between two sovereign powers; but when rebellion breaks out within a country, or a colony revolts against its mother country, every other power which regards the interests and trade of its subjects must define the new state of things. This state is somewhat indefinite. For this is a contest between a sovereign state, a friend of the neutral, and a revolutionary body which is not yet a state, but only trying to become one. It has therefore no international standing. Now, as has been said, the first duty of the neutral is to his own trade; to define on what terms it shall continue. It next owes the duties which humanity prescribes to both combatants. It will also possibly have to lay down the rules it intends to observe regarding the war operations of the non-sovereign combatant, how its ships shall be received, how its flag shall be regarded, whether or not the rights of war shall be accorded to it.

All such questions are settled by a proclamation which recognizes its belligerency. The expediency of this act must be governed by the seriousness of the struggle. The test is whether an actual state of hostilities exists, not trifling or localized, or likely to be temporary, but serious enough to affect the interests of other states. It thus becomes to a certain extent a question of probability, while the recognition of independence involves purely a question of fact, whether the attempt of the parent state to coerce its rebellious member has ceased.

The recognition of belligerency is by no means one-sided in its operation. It gives rights to both combatants. To the insurgent it grants the rights of belligerents, the recognition of its flag, a right to raise loans, a quasi-political status without diplomatic standing. The parent state, on the other hand, can no longer be held responsible for the acts of its rebellious subjects. It can employ the rights of blockade, of capture for carrying contraband, of search against its enemy, thus affecting neutral commerce. In short, all parties recognize as a fact that a war exists between two combatants, the subsequent question of independence being yet in abeyance. Judged by these tests, the recognition of the belligerency of the Southern Confederacy by Great Britain and France in 1861 was proper and necessary. The recognition of its independence was at no time justifiable.

THEODORE S. WOOLSEY.

Bel'lingham, RICHARD: lawyer; b. in England in 1592; emigrated to America in 1634. He was Lieutenant-Governor of Massachusetts for thirteen years, and Governor for ten years, first elected in 1641, in opposition to Gov. Winthrop; then in 1665 as successor to Endicott, continuing in office by annual elections until his death; refused in 1664 to obey a summons to England to give account of his administration; left his property to the support of a Congregational minister, but in the interests of his family the will was set aside. A widowed sister was hanged as a witch in 1650. D. Dec. 7, 1672.

Bellingham Bay: in the northern part of the State of Washington, Whatcom co.; is 14 miles long, 3 miles wide, with a depth of from 3 to 20 fathoms. Great quantities of lignitic coal are mined here, the shaft being only a quarter of a mile from the harbor. It is generally considered the best coal on the Pacific coast. Whatcom is the chief point of this coal-trade.

Bellini, bel-lee'něe, GENTILE: painter; b. in Venice in 1421; d. 1507; elder son of Jacopo. He was a pupil of his father and of Gentile da Fabriano, for whom he was named. He was employed by the Venetian Government in company with his brother. He went to Constantinople in 1479 on the invitation of the sultan, Mohammed II., and at the wish of

the Venetian authorities he returned to Venice bringing pictures of men and scenes in the Turkish empire of great, and at that time unique, interest. Some of these remain in tolerable preservation. We have also of his work several important scenes in Venice. Costume, splendid architecture, and stately ceremonies had great attractions for him. Perspective drawing, too, then a newly invented process, he had studied carefully, and excelled in. His paintings, though less lofty in character than his brother's, and marked with some of the stiffness and beauty of composition and color. His most noted picture was *The Preaching of St. Mark*, in the duomo of Venice.

RUSSELL STURGIS.

Bellini, GIOVANNI: painter; b. in Venice about 1428; d. 1516. He worked under his father Jacopo and his brother Gentile. During Gentile's absence in Turkey he continued the work in the ducal palace at Venice, which the two brothers had undertaken together, all of which was destroyed by a fire in 1577. Giovanni was especially a student of the art of oil-painting on canvas, which he was of the first to master completely. Moreover, he was a painter of religious subjects of the statelier and more monumental kind, in which he preserved a gentle and refined feeling, while combining it with splendor of color and grace of composition beyond his time. He was in this way the true forerunner of the still more powerful artists of the next generation, Titian, Paul Veronese, and Giorgione, and yet he kept much of the simple and frank religious concentration of earlier work, which those great men nearly abandoned. He is one of the small class of entirely great painters, an unsurpassed master of the art. Examples of his work may still be seen in Venice and Naples; his *Blood of the Redeemer* is in the London National Gallery.

RUSSELL STURGIS.

Bellini, JACOPO: painter; b. in Venice, 1395; d. 1470; he was a pupil of Gentile da Fabriano, who came to Venice when he was very young, and went thence to Florence in 1422, taking Bellini with him. During the first half of the fifteenth century the art of painting was backward in Venice, and it seems clear that Bellini was a powerful aid in its advance from about 1430 until his old age, although he can hardly have reached the skill of either of his sons, Gentile and Giovanni. Almost nothing of his larger work remains to us, but his style can be judged from the drawings contained in a book preserved in the British Museum, and admitted to be his own handiwork.

RUSSELL STURGIS.

Bellini, VINCENZO: Italian composer; son and grandson of musicians of moderate ability; b. at Catania, Sicily, Nov. 3, 1802. He was a pupil of Zingarelli. In 1827 he produced *Il Pirata*, an opera which was performed at Milan with great success. His fame was widely extended by *La Straniera* (1828); *La Sonnambula* (1831); and *La Norma* (1831); which latter two works were represented on every opera-stage in Europe. He afterward went to Paris and London, where he was warmly applauded, and composed *I Puritani* (1834). D. in Paris, Sept. 24, 1835. See A. Pougin, *Bellini, sa vie, ses œuvres* (Paris, 1868), and Miller's *Künstlerleben* (Cologne, 1880).

Bellinzo'na (Germ. *Bellenz*): a town of Switzerland; one of the capitals of the canton of Ticino; on the river Ticino, here crossed by a bridge; 16 miles N. of Lugano (see map of Switzerland, ref. 7-H). It is defended by several old castles, and has an active transit trade. Pop. (1882) 3,302.

Bellman, bel'mään, KARL MICHAEL: b. in Stockholm, Feb. 4 (15 N. S.) 1740; received a rather desultory education; vacillated for several years between business and literature; received in 1775 a small office in the state lottery from Gustavus III., but hired another to perform its duties, and gave himself up to his passion for gay company and poetry. D. in Stockholm in poverty and melancholy, Feb. 11, 1795. His works consist for the most part of songs, many of them set to music by Bellman himself. In some of these he gives a burlesque representation of the companions of his nightly revelries, and of their exploits. But these characters are drawn with the most exquisite elegance; their extravagances are blended with something which is exceedingly sweet and innocent; and the whole is remarkable for its joyous melody, in which, however, a peculiar undertone of romantic sadness now and then becomes very perceptible. These songs have made his name one of the most celebrated within the Scandinavian countries. They have been printed over and over again, and are sung at the courts and by the peasants. In Sweden they have given rise to a very rich song-literature of

considerable merit, both poetically and musically, and to innumerable and generally excellently trained singing associations which form a characteristic feature of Swedish social life. His statue has been raised in Djurgården, near Stockholm, and July 26 is celebrated there with an annual festival in his honor.

Revised by G. L. KITTREDGE.

Bell Metal: a hard, dense, brittle, and sonorous alloy of copper with tin, zinc, or some other metal. The proportion in English bells is usually 75 per cent. of copper and 25 of tin. The bell metal of commerce usually contains 80 of copper to 20 of tin, or else 78 of copper to 22 of tin.

Bello'na: the goddess of war in the ancient Roman mythology; was represented as the companion and sister or wife of Mars. She was described by poets as armed with a scourge and holding a torch in her hand. Her priests were called *Bellonarii*.

Bellot, bel'ō, JOSEPH RENÉ: Arctic explorer; b. in Paris, Mar. 18, 1826; lieutenant in the French navy; joined expedition in search of Sir John Franklin sent out by Lady Franklin, May, 1851; afterward joined Inglefield's expedition, and perished in a storm near Cape Bowden, Mar. 21, 1853. He discovered Bellot's Strait on the north coast of North America, 1852.

Bellotto, BERNARDO: See CANAL OF CANALETTO.

Bel'ows [M. Eng. *belu*, plur. *belves*; since the sixteenth century only the plural in use; the word is really an abbreviation of O. Eng. *blæstbelig*, cf. Germ. *Blasebalg*]: a very ancient contrivance for producing a blast of air. It consisted in its rudest form of a bag which was compressed, allowed to become full, compressed again, and so on. Representations of bellows have been found in some of the earliest Egyptian sculptures, and Sir Gardiner Wilkinson believes he has found a valve as early as the time of Moses. The natives of India and China have employed the bellows from time immemorial. Rude forms of the bellows are found in many of the lowest tribes of Africa. Ordinary bellows, as now used, are practically leather bags which are compressed and then expanded so as to allow air to enter through a valve opening inward, which on compression of the bellows allows no air to escape, except through the nozzle. The Chinese bellows consists of a rectangular chamber in which a close-fitting piston moves, and as it is withdrawn from the nozzle, valves open in the front of the chamber, admitting the air. The blacksmith's bellows supplies a continuous current. It consists of a top, center, and lower boards, the two latter being pierced with valves. The lower board is weighted, and automatically takes in air as it falls. The lever is attached to the lower board, and as it is raised the air is forced into the upper chamber, and the delivery continues while the lower chamber is again being replenished. See BLOWING-MACHINES.

Bellows, ALBERT F.: genre and landscape painter; b. at Milford, Mass., Nov. 29, 1829. D. in Auburndale, Mass., Nov. 24, 1883; pupil of the Antwerp Academy; also studied in Paris and in England. National Academician 1861; honorary member, Royal Belgian Water-color Society, 1868. His pictures in oil are mediocre productions technically considered, though interesting in their subjects, which are mostly drawn from scenes of New England life. His water-color painting was of better quality, and he was one of the first American artists who successfully practiced that branch of art.

W. A. C.

Bellows, HENRY WHITNEY, S. T. D., LL. D.: Unitarian minister; b. in Walpole, N. H., June 11, 1814; graduated at Harvard in 1832; in 1838 became pastor of the First Unitarian church in the city of New York, now called the Church of All Souls. He gained distinction as an eloquent public speaker, and lectured on a variety of subjects, especially social, educational, and patriotic enterprises. In 1846 he was one of the founders of the *Christian Inquirer*, and he was one of its editors for many years. Among his works are *Lectures on the Treatment of Social Diseases* (New York, 1857) and *The Old World in its New Face* (1868). He was the principal promoter and first president of the U. S. Sanitary Commission, established in 1862; was the prime mover in the organization of the "National Conference of Unitarian and other Christian Churches" in 1865, and later of the Unitarian Ministers' Institute. He had great organizing genius, and was an extemporaneous speaker of most brilliant power. There is a posthumous volume of his sermons (New York, 1886), and an earlier one, *Restatement of Christian Doctrine* (Boston, 1860). D. in New York city, Jan. 30, 1882.

Revised by JOHN W. CHADWICK.

Bellows Falls: railroad junction; Windham co., Vt. (for location of county, see map of Vermont, ref. 9-C); on west bank of the Connecticut river; 53 miles S. E. of Rutland, 114 miles N. W. of Boston, Mass. The location is picturesque and furnishes excellent water-power. Paper manufacturing is the chief industry, but there are here a very large dairy-utensil manufactory and a very fully equipped machine-shop. Communication by direct lines to important points gives good shipping facilities. Pop. (1880) 2,229; (1890) 3,092; (1900) 4,337.

EDITOR OF "TIMES."

Bellows-fish, or **Trumpet-fish** (*Macrorhamphosus scolopax*): a spiny-finned fish of the family *Centriscidae*; feeds upon small animals found at the bottom of the sea, chiefly



Bellows-fish.

in the Mediterranean and on the west coasts of Europe. It is good eating, though small, seldom exceeding 5 inches in length.

Bello y López, bel'yō-ee-lō'peth, ANDRES: Spanish American poet and writer; b. in Carácas, Venezuela, Nov. 29, 1781; undoubtedly the most important author Spanish America has had in the nineteenth century. His intellectual career dated from his acquaintance with Alexander von Humboldt during the latter's famous journey through South America in 1799. Bello shared several of Humboldt's expeditions in Venezuela, and through him his interest was aroused in the literary and scientific movements of Europe. He acquired the French, German, and English tongues, and was thus enabled in 1808 to serve as secretary and interpreter for the Governor and Council of Venezuela, then still under the control of Spain. In 1810 he took part in the revolt of Venezuela from Spain, along with his friend and former pupil, Bolívar. In the end of 1810 Bolívar was sent as representative of the country to Great Britain, and took Bello with him as secretary of legation. The next nineteen years of the latter's life were spent in Europe, chiefly in London. He endured great hardships, owing to the varying fortunes of his country's cause. At one time he was obliged to earn a living by giving lessons; at another he was employed by James Mill to decipher the MSS. left by Bentham. He made many interesting friends, however, among them Blanco White, Olmedo, and Fernández Madrid, and especially became known to the more influential of the large group of Spanish Americans then living in exile or quasi-exile in England. He was connected with several periodicals designed for these persons and to advance the cause of South American freedom, and thus he became a recognized leader of the Spanish American patriots. At the same time he was training himself to be a poet and scholar, studying the ancient literature of Spain and the new romantic literature of Europe. In 1829, after many hesitations, Bello decided to accept an offer made him by the Government of Chili, and thenceforth his career was indissolubly connected with that republic. He soon became a power in his new home, especially in everything connected with higher education. When the University of Chili was founded in 1843 he became its first rector—a position he held many years. He wrote extensively and on many different subjects, yet valuably upon all. As a lover and defender of the use of pure Castilian he wrote his *Principios de la Ortología y Métrica de la Lengua castellana* (1835); his *Análisis ideológica de los Tiempos de la Conjugación castellana* (1841); and his *Gramática castellana*, recognized in Spain itself as the best (1847). As jurist he published *Principios de Derecho de Gentes* (1832), and practically wrote the *Código Civil* adopted by Chili in 1855. His *Filosofía del Entendimiento* (published after his death, 1881) showed him to have reflected long and deeply upon philosophical questions. Finally, as poet (and this is his best title to fame) he has left a considerable body of work pure in style, elevated in manner, and full of a certain American spirit very distinct from anything to be found

in the poets of Spain or even in those romantic poets of France (André Chénier and Victor Hugo) whom Bello most loved and admired.

When Bello died the whole Chilian people mourned for him. In 1872 the Chilian Congress voted the publication of an edition of his works at the national expense (*Obras completas*, 8 vols., Santiago de Chili, 1881-85). In 1881 the hundredth anniversary of his birth was celebrated, especially in Santiago, with great splendor. A statue of him has been erected by popular subscription before the main entrance of the Congreso in Santiago. See *Vida de D. Andres Bello*, por Miguel Luis Amunátegui (Santiago de Chili, 1882). The poems and several prose works of Bello are also published in Madrid in the *Colección de Escritores castellanos* (1882, seq.). D. Oct. 15, 1865. A. R. MARSH.

Belloy, bel'wää', PIERRE LAURENT BUIRETTE, de: French dramatist; b. at St.-Flour 1727; went on the stage in St. Petersburg; returned to France and produced his tragedy *Titus* 1758; returned to St. Petersburg; again visited France 1762; wrote several successful tragedies. D. at Paris, Mar. 5, 1775.

Bell-ringing: There are two ways to ring a bell or a set of bells. In one the bells are stationary, and are struck either on the inside or outside near the rim with a hammer. In the other the bells are in motion, being swung with rope and wheel, or other contrivances, or being shaken by the hand. The desirable thing in ringing bells is to get a clear tone and a vibration that shall be resonant and shall reveal the full tone-qualities of these most common and most useful musical instruments. To obtain this tone circumstances alone must decide whether the bell shall be fixed or in motion. Bell-ringing requires a skill that comes only from long practice. It is an art also. The latter consists of making the vibrations constant and regular. This is especially sought for in ringing carillons, or peals of bells, known in the U. S. as chimes. In ringing one bell it is probable that a clearer note may be obtained by swinging it. Whether stationary or fixed, it is desirable that the hammer shall remain in contact with the bell for only the shortest space of time, and shall drop away or be lifted almost instantly after the sharp blow is given, so as not to dull or interfere with the vibrations that result. In ringing chimes it is therefore preferable that there shall be no long notes, or intervals between the notes, and it is better that a long note should be broken up into two or more shorter ones than that the vibrations should strike the ear of the listener at irregular intervals. The most successful bell-ringers employ this method, knowing that the finest effect is produced thereby.

On the Continent of Europe bells in sets are almost entirely stationary, and are called carillons, from the Italian *quadriglio*, or quadrille, "a dreamy kind of dance music" first played upon them. A carillon consists of from twelve to forty bells arranged in the diatonic scale. They are usually rung by one man. To ring them an instrument called the clavecin is often used. It is a sort of rough keyboard fashioned somewhat like that of a piano. The player strikes the keys with a gloved fist, and by a mechanical contrivance the hammer falls on the rim of the bell and at once is lifted away. In the U. S., where bells in sets are usually stationary, a series of levers is used. By pushing down the levers sharply the clapper or hammer inside the bell is drawn against the rim, and it drops away quickly of its own weight.

Another instrument in ringing carillons in general use on the Continent, and being developed greatly in England where the carillons rarely consist of more than twenty bells, is what is called the tambour, or "barrel." It is a contrivance on the principle of the cylinder of the well-known music-box. A large number of wooden pegs are fixed on a revolving drum, which loosens the hammers and drops each one on its bell at the proper time. This device is automatic, of course, and, although the resulting notes are not as clear as when struck by hand, it is possible to arrange more difficult music for it than one man can produce by the method of hand striking. The carillon, whether played by the clavecin or by the barrel, reached its highest development in the eighteenth century, in Belgium—still the home of the best bells—and probably the best performer that ever lived was the famous Matthias van den Gheyn, whose original music, found in Louvain long after his death, rivals in subtlety that of Bach, Mozart, and others, and which no one has since been able to play upon bells.

In England for several centuries the swinging method has

been used in ringing chimes, or peals, as they are known there. In the U. S. a peal would be a set of three or more bells, each bell tuned to itself and to the others. Eight or more bells similarly tuned would be called a chime. In England, with one man to each bell and a leader to give the signals for swinging, the development of that peculiar kind of bell-music called "changes" resulted. Changes (or change-ringing) consist of striking a set of bells in every possible order. Thus three bells may be struck in six ways without any repeat. Four bells may be struck in 24 ways without repetition; five bells in 120 ways, and so on until with ten bells we have 3,628,800 changes. To ring all these changes at the usual rate of speed would require one year and 105 days of constant performance. With twelve bells in the peal, to ring all the possible changes would require 37 years. These changes are based on that simple branch of mathematics known as combinations.

To many of these changes names have been given, and expert individual bell-ringers know just when and how often to strike their bells when any one of these figures is announced to be played. The most common of these changes are known as "plain-bobs," "bob-triples," "bob-majors," "bob-minors," "grandsire-triples," "grandsire bob-cators," and so on. In ringing the bells such methods as "hunting," "dodging," and "snapping" are used. Each man must not only ring his bell at the right time, but he must get the right expression and best tone from it.

In Great Britain the clavecin method of ringing bells, with electricity as the striking power, is now used to a considerable extent. With this contrivance perfected any ordinary piano performer may sit down at a keyboard, and by touching the keys ring the bells in the belfry and produce a high order of music.

In the U. S., as has been explained, the chimes are almost universally stationary, the usual number of bells being ten or twelve. When the levers connecting with the inside hammers of the bells are pushed down with skill, it is probable that better results follow than by any other method of ringing, except when there is a man to each bell.

In selecting a chime the fundamental bell, or key-note bell, must be first chosen. This must be true to itself first—that is to say, the note that results from striking it on the rim must be exactly an octave lower than the note obtained by striking it at the top at the center of the curve. The third and fifth octave tones, found by striking the bell at the required place along its length, must be true also. In addition to the combination of all these tones, the "drone" note or hum of the bell, a tone one-third lower usually than the key-note, and one usually overlooked, must be in harmony with the dominant note of the bell. Each of the other bells must be in harmony with the key-note bell and thus an approximately correct chime, peal, or carillon is secured.

ALBERT F. MATTHEWS.

Bells: in nautical language has a peculiar meaning, and is used as a substitute for those expressions by which people on land indicate the hour. The sailor's day or night is divided into watches or periods, each of four hours' duration, except the two "dog watches," which are two hours each, viz., from 4 to 6 and from 6 to 8 P. M., and the bell is struck once at the expiration of each half hour. The number of strokes denotes the number of half hours that have elapsed in that particular watch. If the watch commences at 8 P. M., eight bells would be a signal for the end of the watch at midnight.

Belluno, bel-loo'nō (anc. *Bellu'num*): a city of Italy; capital of province of same name; on the Piave: 49 miles N. of Venice (see map of Italy, ref. 2-D). It is a bishop's see; has a cathedral designed by Palladio, a rich hospital, a public library, a handsome aqueduct, and a beautiful triumphal arch; also manufactures of silk stuffs, hats, leather, and earthenware. Pop. 16,000.

Bellwood: borough (organized in 1888); Blair co., Pa. (for location of county, see map of Pennsylvania, ref. 5-D); on Penn. R. R. and Penn. and N. W. R. R.; 6 miles E. of Altoona; has a good school, six churches, and an opera-house. The chief industrial establishments are railroad-car repair-shops, foundries, etc. Pop. (1880) 366; (1890) 1,146; (1900) with suburbs, 1,545. EDITOR OF "BULLETIN."

Bellworts (*Campanulaceæ*): a family of mostly herbaceous dicotyledons, with inferior ovaries and gamopetalous corollas. They are related to the cucurbits, composites, honeysuckles, etc. There are about 1,000 species, very widely distributed. As here considered, this family includes the

lobelias, often separated as a distinct family (*Lobeliaceae*). *Campanula*, the principal genus, contains 230 species.

CHARLES E. BESSEY.

Bel'mont: a post-village of Mississippi co., Mo. (for location, see map of Missouri, ref. 7-K); on railroad and the Mississippi river, opposite Columbus, Ky., 197 miles S. S. E. of St. Louis. In 1861 this place was occupied as a Confederate camp. On Nov. 6 Gen. Grant, in command at Cairo, descended the river with about 4,000 troops, remaining overnight about 10 miles above Columbus, Ky. On the morning of the 7th this force was debarked on the Missouri shore a short distance above Belmont, and at once moved forward to the capture of the Confederate camp, supposed to contain about 3,000 men. After several hours' severe fighting, the Federal troops forced their way through the obstructions on either side. An irresistible charge carried the camp, drove the Confederates in all directions, and left the field in the possession of the Federals. The Confederate camp, with all its supplies, ammunition, and baggage, was fired and destroyed. The defeated Confederates were, however, strongly re-enforced by Maj.-Gen. Polk from Columbus, and in turn drove the Federal troops, fighting all the way against a now vastly superior force, back to their boats, while the batteries on the Kentucky side kept up a damaging fire which could not be returned. By 5 p. m. the troops were all on board their boats, without the loss of a gun, while they had with them two guns captured from the Confederates. The Federal loss was 120 killed, 383 wounded, and 104 captured or missing; total, 607. The Confederate loss is stated at from 500 to 600, killed and wounded.

Belmont: capital of Allegany co., N. Y. (for location of county, see map of New York, ref. 6-D); on the Genesee river and on Erie R. R., 92 miles W. by N. of Elmira, and 94 miles E. S. E. of Dunkirk. It contains a fine union school building, 6 churches, county court-house, 2 flouring-mills, machine-shop, and foundry. The surrounding country is principally agricultural. Pop. (1870) 795; (1880) 804; (1890) 950; (1900) 1,190.

EDITOR OF "DISPATCH."

Beloit': city and railroad junction; capital of Mitchell co., Kan. (for location of county, see map of Kansas, ref. 4-F); on Mo. Pac. and Union Pac. R. Rs., and on the north bank of Solomon river, 184 miles W. of Missouri river; has State Industrial School for Girls, excellent graded and high schools, extensive mills and manufactures, and is an important business center. Pop. of township (1880) 2,793, including 1,835 in city; of city (1885) 2,003; (1890) 2,455; (1900) 2,359.

EDITOR OF "GAZETTE."

Beloit: city; Rock co., Wis. (for location of county, see map of Wisconsin, ref. 7-E); on Northwestern and C., M. and St. P. R. Rs., and on Rock river, 91 miles N. W. of Chicago and 47 miles S. S. E. of Madison; is on the south boundary of the State. It is partly built on a plain which is about 70 feet higher than the river, and is the seat of Beloit College. It has considerable manufactures of paper, paper-machinery, windmills, steam-engines, shoes, plows, water-wheels, etc. Founded in 1836 by settlers from Colebrook, N. H. Pop. (1880) 4,790; (1890) 6,315; (1900) 10,436

EDITOR OF "FREE PRESS."

Beloit College: Beloit, Wis.; founded by the Congregationalists and Presbyterians of Wisconsin and Northern Illinois; received charter from Territorial Legislature of Wisconsin 1846. First building erected and first college class entered 1847. Jackson J. Bushnell (Yale, '41) and Joseph Emerson (Yale, '41) appointed professors 1848; Rev. Aaron L. Chapin (Yale, '37) elected president 1849; succeeded in 1886 by Rev. Edward D. Eaton (Beloit, '72); resigned Feb. 25, 1901.

The institution is of the New England type, and has from the first maintained a high standard of scholarship. About 3,500 young men have received education here, 649 having graduated.

The faculty numbers 26 members, besides lecturers. There are about 400 students. The college has a beautiful campus of 25 acres overlooking Rock river; also an athletic field of 16 acres. Of the ten buildings the most important are: Memorial Hall Library (erected 1868, containing 27,000 volumes); gymnasium (1874); Smith Observatory (1881); Scoville Hall (1889, for preparatory department); Chapel (1891); Chapin Hall (1891, dormitory); and Pearsons Hall (1892), containing extensive and well-equipped laboratories for physical science.

EDWARD D. EATON.

Belon, baŷ'lōn', PIERRE: French naturalist; b. at Soulletière, Maine, 1518; traveled extensively; murdered by robbers, April, 1564, in the Bois de Boulogne; established homologies of vertebrate skeletons. He formed two botanical gardens more than a century before the establishment of the Jardin des Plantes, and planted the first cedar in France.

Beloochistan: See BALUCHISTAN.

Belot, baŷ'lō', ADOLPHE: French dramatist and novelist; b. in Ponte à Pitre Nov. 6, 1829. Among his very numerous novels may be mentioned: *Mademoiselle Giraud, ma femme* (1870); *La Reine de Beauté* (1883); *La Princesse Sophie* (1883); *Alphonsine* (1887). Of his plays, *Le Testament de César Girodot* (1859) has been one of the most successful of modern plays, more than 800 representations having been given of it at the Odéon and the Comédie Française. Most of his novels have also been dramatized. D. in Paris, Dec. 18, 1889.

Bel'per: a market-town of Derbyshire, England; on the Midland Railway; 10 miles by rail N. of Derby (see map of England, ref. 8-H). It has several churches, a public library, and a stone bridge over the river Derwent. It has large manufactures of silk and cotton hosiery. Pop. (1891) 10,420.

Belpre': village; Washington co., O. (for location of county, see map of Ohio, ref. 7-H); on B. and O. S. W. R. R., 194 miles from Cincinnati, 36 miles from Athens. It has good schools and manufactures of wool, flour, etc. Pop. township (1890) 2,678; (1900) 2,761.

Belshaz'zar [*Bel-shar-uzur*; Fr. *Balthasar*]: son of Nabonidus (Labynetus), the sixth and last king of the second Babylonian period. His mother was a daughter of Nebuchadnezzar, and probably the widow of Neriglissar, the fourth king of the period. When of sufficient age he was associated with his father on the throne, and in the Book of Daniel is therefore called king. At the fall of Babylon in 538 B. C. he was slain, and his father, Nabonidus, then at Borsippa, was taken prisoner.

Bel'tane, or **Beltein** [Scottish from Gaelic *bealltainn*, May-day]: heathen festival once common to all Celtic nations, traces of which have survived to the present day. The great ceremony of this cult was held in the beginning of May, and a somewhat similar one apparently early in November, that is, at the beginning and end of summer. The ceremony was marked by the extinguishing of all the fires in the district, after which the *need fire* was kindled with great solemnity, and from it the domestic fires were relighted. The earliest mention of the Beltane is made by Cormac, Archbishop of Cashel, early in the tenth century. Two fires were lighted side by side. Men and cattle then passed between the fires, which were supposed to give them protection from accident and disease. Domestic animals are driven through the flames at Cornae in Brittany, and in the Irish South islands of Arran, at the present date with the same object. This worship of Beil is connected with similar worship among the Slavs, Scandinavians, and Teutons. Indeed, worship of the personification of the sun and light by kindling fires in similar ways was universal over all Europe in heathen times. The survival of this fire-worship is seen in the periodical lighting of bonfires.

C. H. THURBER.

Bel'ton: city; on R. R.; capital of Bell co., Tex. (for location of county, see map of Texas, ref. 4-H); situated on Leon river, 60 miles N. N. E. of Austin City; has cottonseed oil-mill, cotton compress, roller flouring-mills, and several small manufactories; also fine public and private schools. Baylor Female College, the oldest in the State, is here. Pop. (1880) 1,797; (1890) 3,000; (1900) 3,700. EDITOR OF "JOURNAL."

Belts, Great and Little: two straits which connect the Baltic with the Cattegat. The former separates the island of Fünen from Seeland, is 36 miles long, and has an average width of about 18 miles. The depth ranges between 6 and 26 fathoms, and the current is so strong that the Belt is seldom frozen over. The navigation of both Belts is dangerous or difficult. The Little Belt separates Fünen from Jutland. It is 32 miles long. The widest part of it is about 10 miles, and the narrowest about 2,500 feet. From these Belts (Lat. *balte*) the Baltic Sea is supposed to take its name.

Beluchistan: See BALUCHISTAN.

Belu'ga: a generic name formerly applied to dolphins of the genus *Delphinapterus*, distinguished by a blunt and broad head and the absence of a dorsal fin. They abound in the Arctic seas, are gregarious, and afford to the Green-

landers an important article of food. The white whale of the St. Lawrence (*Delphinapterus leucas*) is common in northern waters. It is caught in the St. Lawrence and the Saguenay, is from 10 to 15 feet long, and is prized for its excellent oil and its skin, which makes a very fine leather.

The name Beluga is often applied to a large sturgeon of Southern Russia (*Acipenser huso*), which affords great quantities of isinglass and caviare. See STURGEON.

Be'lus (in Gr. Βήλος): in classic mythology a King of Phœnicia; said to be a son of Neptune, a brother of Agenor, and the father of Egyptus. He is considered by some persons as identical with BAAL (*q. v.*).

Belus [in Gr. Βήλος, now called *Nahr Naaman*; perhaps the *Bealoth* of the Hebrew text of the Bible]: a small stream of Palestine, which enters the sea near Aere. On its banks it is said that the art of glass-making was invented by the Phœnicians.

Belus, Temple of: a famous temple of enormous size in the city of Babylon; rebuilt by Nebuchadnezzar shortly after 604 B. C. According to some authorities, it was destroyed by Xerxes, King of Persia. Some writers identify its ruins with *Birs-Nimrud* (a huge mound 6 miles S. W. of Hillah), which appears to have been originally about 156 feet high. Others identify its ruins with *Babil* (another mound some 6 miles N. of Hillah), whose height is about 140 feet.

Belvedere, bel-vě-deer', Ital. pron. bel-vaÿ-day'ray (i. e. fair view): an Italian word applied to a pavilion on the top of a house, or a structure designed to afford a fine prospect of the surrounding country; also an artificial eminence in a garden if so arranged as to command a prospect. In France and other countries of Europe the term is often used as the name of a palace, villa, or summer-house, but always with the general idea of something which commands a fine view. The famous statue called the Apollo Belvedere, also the Belvedere Torso, and other works of sculpture, derived their appellation from a court in the Vatican surrounded by galleries and bearing that name. RUSSELL STURGIS.

Bel'videre: city and railroad junction; capital of Boone co., Ill. (for location of county, see map of Illinois, ref. 1-E); on Chicago and N. W. R. R., and on the Kishwaukee river, 78 miles W. N. W. of Chicago. It has elegant churches, and fine schools, flouring-mills, and manufactories of butter, cheese, sewing-machines, woven-wire mattresses and springs, shoes, etc. Pop. (1880) 2,951; (1890) 3,867; (1900) 6,937.

EDITOR OF "NORTH-WESTERN."

Belvidere: town and railroad junction; capital of Warren co., N. J. (for location of county, see map of New Jersey, ref. 2-C); on the Delaware river, 13 miles above Easton, and 95 miles N. of Philadelphia. The Pequest creek enters the river here, and affords a valuable water-power. Belvidere has an academy, several mills, and a cotton-factory. Pop. (1880) 1,773; (1890) 1,768; (1900) 1,784.

Belvisia: See NAPOLEONA.

Belzo'ni, GIOVANNI BATTISTA: Italian traveler; b. at Padua, Nov. 5, 1778; emigrated to England in 1803, and gained a subsistence as an athlete. In 1815 he visited Egypt at the invitation of Mehemet Ali, who desired him to construct a hydraulic machine. He soon directed his attention to the exploration of Egyptian antiquities. He removed to England the colossal bust called *Young Memnon* which is now in the British Museum. He opened the temple of Ipsamboul and the pyramid of Cephren (or the second pyramid of Gizeh). He published in 1821 a very interesting *Narrative of the Operations and Recent Discoveries within the Pyramids, Temples, Tombs, etc., in Egypt and Nubia*. He undertook a journey to Timbuctu, but died near Benin, Dec. 3, 1823.

Bem, JOSEPH: a Polish general; b. at Tarnov, in Galicia, in 1795. He served in the Polish army in the revolution of 1830, after which he passed some years in France. In 1848 he joined the Hungarian patriots, and obtained command of the army of Transylvania. He defeated the Austrians in several actions, and took part in the battle of Temesvár (1849), which was disastrous to Hungary. Having fled to Turkey and conformed to Islamism, he was raised to the rank of pasha. D. Dec. 10, 1850. See Pataky, *Bem in Siebenbürgen* (1850); N. N. Lájos, *Le Général Bem* (Paris, 1851).

Bem'ba: African lake. See BANGWEOLO.

Bembecidæ, bem-bes'i-děe [from Gr. βέμβιξ, a top]: a family of hymenopterous insects, the popular name of which

is "sand-wasps"; mostly natives of warm climates. They resemble wasps or bees in appearance, and the females make burrows in sandy banks, in which they deposit their eggs. Some of them emit an odor like that of roses. The U. S. have several species.

Bem'bo, PIETRO: Italian scholar and cardinal; b. in Venice, May 20, 1470. He removed to Rome in 1512, and became secretary to Pope Leo X. 1513. There he met Morosina (d. 1535), who bore him two sons and a daughter. In 1520 he removed to Padua, and lived in princely style. In 1539 he was raised to the dignity of cardinal. He then entered the priesthood, radically altered his mode of life, and studied the Fathers and not the classics. He was made Bishop of Gubbio (1541) and of Bergamo, but he did not leave Rome. He wrote, besides other works, a Latin *History of Venice* (1551). D. in Rome, Jan. 18, 1547. As a humanist he is famed for his pure Latinity. His collected works were published at Venice in 4 vols., 1729. See L. Beccadelli, *Vita di P. Bembo* (Venice, 1718); J. delle Casa, *Vita Bembi* (same vol.); cf. J. A. Symonds, *Renaissance in Italy*, ii. pp. 409-15.

Bement': village (located in 1854); Piatt co., Ill. (for location of county, see map of Illinois, ref. 6-F); on Wabash R. R., 21 miles W. of Decatur. Bement has three large school-buildings, electric lights, creamery, brick, and tile works. The surrounding region is devoted to the raising of wheat, corn, oats, and broom-corn. Pop. (1880) 963; (1890) 1,129.

EDITOR OF "REGISTER."

Be'mis, EDWARD WEBSTER, Ph. D.: economist; b. at Springfield, Mass., Apr. 7, 1860; A. B., Amherst College, 1880, Ph. D., Johns Hopkins University, 1883; gave at Buffalo, St. Louis, and Canton, O., the first courses in the U. S. to which the term University Extension was applied, 1887-88; Professor of Economics and History, Vanderbilt University, Nashville, Tenn., 1889-92; Associate Professor of Economics, University of Chicago, 1892-95. Author of *History of Co-operation in the United States* (1888); *Municipal Ownership of Gas in the United States* (1891); *Relation of Labor Organization to the American Boy and to Trade Instruction* (Philadelphia, 1894), etc.

Be'mis's or Bemus Heights: a post-village of Stillwater township, Saratoga co., N. Y. (for location of county, see map of New York, ref. 4-J); on the Champlain Canal, and near the Hudson river; was the scene of the first battle of Stillwater with Burgoyne, Sept. 19, 1777.

Ben: a term derived from Gaelic *beann*, "peak," prefixed to the names of many mountains of Scotland, most important of which are: BEN LAWERS in Perthshire; flanking the northwest shore of Loch Tay; easy of ascent; rich in Alpine plants; height, 3,984 feet.—BEN LEDI in Perthshire; 4½ miles N. W. of Callender; celebrated in Scott's *Lady of the Lake*; height, 2,875 feet.—BEN LOMOND in the northwest of Stirlingshire; on the east side of Loch Lomond; the most famous of the Scotch mountains; summit commands a magnificent view, including the Lothians, the Firth of Clyde, the islands of Arran and Bute, the Irish coast, and Bens Lawers, Vuirlich, Ledi, Nevis, and others; height, 3,192 feet.—BEN MACDHU'1; one of the Cairngorms, in the S. W. of Aberdeenshire; height, 4,296 feet; formerly supposed to be higher than Ben Nevis.—BEN NEVIS; the highest point in Great Britain; in the county of Inverness; formerly very difficult of ascent; summit commands a magnificent view; height, 4,406 feet. A road was built in 1883 to the top, where a meteorological observatory was then erected. There is also at present a shelter for travelers. C. H. THURBER.

Ben: a Hebrew word signifying "son"; equivalent to the Arabic *Ibn*: forms the first syllable of many scriptural names, as Ben-hadad, Benjamin, etc. *Beni*, the plural of Ben, occurs in the names of many Arabian tribes.

Ben, OIL OF: a fixed oil extracted by pressure from the fruits of *Moringa aptera* and other species; leguminous trees growing in the Levant and the East and West Indies. It is colorless or slightly yellow, and odorless. It is used to extract the odoriferous principles of fragrant plants.

Benares, ben-aa'rez (anc. *Varanashi* and *Kasi*): a famous and populous city of Hindustan; capital of a division and district of the same name, and the most populous city in the Northwestern Provinces of British India; on the left bank of the Ganges; about 428 miles by rail N. W. of Calcutta, and 477 miles by rail S. E. of Delhi (see map of N. India, ref. 7-G). It is the holy city of the Brahmans, the chief seat of their science, and may be called the Hindu capital of

India. Flights of stone steps called *ghâts* lead down the steep banks of the Ganges, which is here about half a mile wide. The external appearance of the city, as seen from the river, is rendered very imposing by the minarets of about 300 mosques and the pinnacles of nearly 1,000 pagodas. The streets are very narrow, and the houses, which are mostly built of stone, are generally lofty, some of them six stories high. Among the remarkable public edifices are the great mosque of Auringzebe, 232 feet high, many Hindu temples, a vast and old astronomical observatory, and the Hindu Sanskrit College, the chief seat of native learning in India. As the holy city of the Hindus and the central seat of Brahmanical learning, Benares attracts on the occasion of certain festivals an immense multitude of pilgrims, estimated at 100,000. Benares is a wealthy and industrious city, having extensive manufactures of silk, cotton, and woolen stuffs. It is a great emporium for the shawls of the north and the diamonds of the south, and, when they were produced, it was the chief market for the famous native muslins of Dacca and the eastern provinces. The Hindu Sanskrit College was founded here in 1791, and an English department was added to it about 1827. The residences of the Europeans are mostly at Secrole, which is 3 miles from Benares, and contains many fine mansions. It is connected by a railway with Calcutta and Delhi. A mutiny of Sepoys broke out here in June, 1857, but was soon quelled. Pop. (1881) 207,570; (1891) 222,520.

Benbow, JOHN: an English admiral; b. in Shrewsbury, England, in 1653; entered the navy in 1678 as master's mate. He became a rear-admiral in the reign of William III., who reposed great confidence in him. On Aug. 19, 1702, he encountered a superior force under the French admiral Du Casse, near Jamaica. He maintained a running fight for four days with his own ship alone, the captains of the rest of the squadron refusing to support him, for which two of them were shot. He was mortally wounded, and died at Port Royal, Jamaica, Nov. 4, 1702. See Campbell, *Lives of the British Admirals*.

Bench [O. Eng. *benc*; O. H. Germ. *banch* > Mod. Germ. *Bank*; appears as loan-word in the Romance language; Ital. *banco, banca*; Fr. *ban, banque*]: in law—1. A court or tribunal for the administration of justice. The word originally meant the seat occupied by the judges in court. In England two of the leading courts are termed the king's or queen's bench and common bench. The latter tribunal is also called the court of common pleas. (See COURT.) The word is also used to designate the judges as contrasted with the practitioners in their court, as in the phrase "the bench and the bar." Revised by F. STURGES ALLEN.

Bench Warrant: an order issued by or from a bench for the arrest of a person, either in case of contempt or after an indictment has been found, or from a judge to apprehend a person charged with an offense.

Bench'ers: principal officers of the English inns of court, intrusted with their government and with the power of admitting persons to the bar, and of disbarring practitioners, though the exercise of these powers is subject to the supervision of the judges of the higher courts.

Bencoolen: a Dutch seaport-town on the southwest coast of Sumatra; lat. 3° 48' S., lon. 102° 3' E. (see map of East Indies, ref. 8-B). Pop. estimated at 5,000. It was founded by the English in 1685, but was ceded to Holland in 1825 in exchange for Malacca. The climate of the city is exceedingly unhealthful. Pepper is the chief article of export.

Ben'der, or Ben'dery: a fortified town of Russia; in Bessarabia; on the right bank of the Dniester; 65 miles N. W. of Odessa (see map of Russia, ref. 10-C). Bender has several paper-mills, forges, and tanneries. It was captured in 1770 by the Russians, who massacred the population; was restored to the Turks in 1774; stormed again and again by the Russians, into whose possession it permanently passed with Bessarabia in 1812. Pop. (1897) 32,934.

Bendigo: See SANDHURST.

Bendire, CHARLES EMIL: captain U. S. army; ornithologist; b. near Darmstadt, Germany, Apr. 27, 1836; removed to the U. S. in 1852; entered the army in 1854 as private in the First Dragoons. He remained in the army throughout the civil war, and during this time received his commission in the First Cavalry. At the close of the war he was transferred to the West, where he passed a great portion of the time until his retirement as captain, Apr. 24, 1886. During

this period he devoted much time to natural history, especially ornithology, and collected a large amount of material in various branches of natural history, most of which was presented to the U. S. National Museum. In 1870 he began the formation of a collection of eggs of North American birds, which ultimately contained over 8,000 specimens, and this unrivaled collection he presented to the U. S. National Museum, the only condition being that it should remain intact. Capt. Bendire was the leading authority on North American oölogy, and honorary curator of the section of oölogy U. S. National Museum. He published many ornithological papers, and since his retirement from service had devoted his time to the preparation of a comprehensive work entitled *The Life Histories of North American Birds, with Special Reference to their Breeding Habits and Eggs*. The first volume, published by the Smithsonian Institution and U. S. National Museum, appeared in 1892. D. Feb. 4, 1897. FREDERIC A. LUCAS.

Bendix, JOHN E.: b. on board the steamer Sarah on the St. Lawrence river, Aug. 28, 1818; learned the trade of a machinist in New York; joined the Ninth regiment, State militia, in 1847; organized the Seventh regiment of volunteers in 1860; took part in the battles of the Wilderness, Antietam, Fredericksburg, etc., and was made a brigadier-general in 1865. D. in New York, Oct. 8, 1877.

Bendix, MAX: See the Appendix.

Bend Sin'ister: a heraldic bearing, like the bend, but reversed, and reaching from the sinister chief to the dexter base. It is the mark of illegitimate descent, and the only abatement in use. See ABATEMENT and HERALDRY.

Benedek, bay'ne-dek, LUDWIG, von: an Austrian general; b. at Ödenburg, Hungary, in 1804; fought with the rank of colonel against the Italians in 1848; became a major-general in April, 1849; after which he served with distinction against the Hungarian patriots. He directed a corps in the Italian campaign of 1859 and at Solferino. In June, 1866, he took the command of the operations of the grand Austrian army in Bohemia, and was defeated by the Prussians at the decisive battle of Sadowa, July 3, 1866. D. Apr. 27, 1881.

Benedetti, bay'ne-det'tee, VINCENT, Count: a French diplomatist; b. in Bastia, Corsica, Apr. 29, 1817; entered the diplomatic service, and held consulates in Cairo, Palermo, Malta, and Tunis. He was sent as ambassador to the kingdom of Italy in 1861, and to Berlin 1864. In 1870 he was employed by Napoleon III. in secret negotiations with the court of Prussia, and it was an alleged affront from William I. of Prussia, offered him at Ems, which Napoleon made a pretext for declaring war.

Benedicite, ben-e-dis'i-te: the Latin title of the hymn which is found in the Septuagint version of the Book of Daniel and also in the Apocrypha, and is said to have been sung by Ananias, Azarias, and Mishael (called in Daniel, Shadrach, Meshach, and Abednego), when they were cast into the furnace of fire (Dan. iii.). The *Benedicite* bears a close resemblance to the 148th Psalm, and is considered by some to be its expansion. It was probably used in the Jewish worship, and so passed into use in the early Church. It was liturgically used in the days of St. Athanasius (A. D. 325-60); and St. Chrysostom (A. D. 425) calls it "that admirable and marvelous song, which from that day to this has been sung everywhere throughout the world, and shall yet be sung by future generations." It is found in the *Book of Common Prayer* of 1549, with the following rubric prefixed: "After the first lesson shall follow *Te Deum laudamus* in English daily throughout the year, except in Lent, all the which time in the place of *Te Deum* shall be used *Benedicite omnia opera Domini* in English, as followeth." In the first Prayer-book of King Edward VI. the hymn ran thus: "O all ye works of the Lord, speak good of the Lord; praise Him and set Him up forever." In the second Prayer-book of King Edward VI. (A. D. 1552) it was changed to its present form, and the restriction as to its use removed. It is generally sung from Septuagesima to Easter, and also during Advent. W. S. PERRY.

Ben'ediet (in Lat. *Benedictus*), SAINT: an Italian ascetic; called the founder of monachism in the West; b. in Nursia, Umbria, in 480 A. D. He renounced the world in early youth (494), passed three years in solitude in a cave, hence called The Holy Grotto, near Subiaco. His hiding-place was discovered, and he acquired a wide reputation for sanctity. He was compelled to undertake the spiritual direction of hundreds, whom he organized into separate societies of twelve,

each with an abbot. In 515 he composed as a substitute for the Oriental rule of Basil a system of monastic rules, which was largely adopted by the Western monks, and was known as the Rule of St. Benedict. Under this system the monks were employed in manual labor and in the instruction of the young. In 529 he founded the famous monastery of Monte Cassino, near Naples, and died there Mar. 21, 543 A. D. His life was written by Gregory the Great (Eng. trans. by P. W. Luck, London, 1880). His *Rule* has been several times translated (e. g. London, 1886). Cf. F. C. Doyle, *The Teachings of St. Benedict* (1887), and J. G. Waitzmann, *Leben und Wirken des heiligen Benedict* (Augsburg, 1835). See BENEDICTINES.

Benedict I. became Pope of Rome in 574 A. D. D. in 578.—**BENEDICT II.**, a native of Rome; was elected pope in 683 A. D. D. in 685.—**BENEDICT III.** succeeded Pope Leo IV. in 855. D. in 858, leaving a good reputation for piety.—**BENEDICT IV.** was elected pope in 900, as the successor of John IX. D. in 903.—**BENEDICT V.** was chosen pope in 964, but was banished from Rome by the Emperor Otho I. Leo VIII. was pope at the same time with him, and both are recognized by Roman Catholic historians. D. in 966.—**BENEDICT VI.** was elected pope in 972, and was killed by the rebellious Romans in 974.—**BENEDICT VII.** succeeded Pope Benedict VI. in 974. He is said to have ruled with ability. D. in 983.—**BENEDICT VIII.**, a son of the Count of Tusculum, became pope in 1012. He crowned the Emperor Henry II. in 1013, and defeated the Saracens, who had invaded the papal states. D. in 1024.—**BENEDICT IX.** (THEOPHILACTUS OF TUSCULUM), sometimes called the "boy-pope," was chosen pope in 1033. He was extremely licentious, and was expelled by the Romans. Sylvester III. became anti-pope. Benedict was deposed by the Emperor Henry III. about 1048. D. 1055.—**BENEDICT X.**, called THE STUPID, was chosen pope in 1058, removed through the influence of Hildebrand in 1059, and died in prison in the same year.—**BENEDICT XI.** (Saint), b. in 1240; native of Treviso; succeeded Boniface VIII. in 1303; noted for humility. D. in 1304.—**BENEDICT XII.** (originally JACQUES FOURNIER, native of France; chosen pope in 1334. He was the third pope who reigned at Avignon, and was eminent as a canonist and theologian. He wrote several works. D. in 1342, and was succeeded by Clement VI. Pope Benedict XII. was an excellent man.—**BENEDICT XIII.** succeeded Innocent XIII. in 1724. He was distinguished for moderation and other virtues, and promoted the peace of Europe. D. in 1730. (See Clemente da Cruz, *Vida de Benedicto XIII.*, 1739.)—**BENEDICT XIII.** (anti-pope) (PEDRO DE LUNA), b. in Aragon; elected pope by certain cardinals at Avignon in 1394. Another party elected Boniface IX. at Rome, and a schism of the Church ensued. This Benedict was deposed by the Council of Constance in 1417. D. in 1424.—**BENEDICT XIV.** (PROSPERO LAMBERTINI); b. at Bologna in 1675; was a man of superior talents. He was well versed in history, theology, and classical learning. He succeeded Clement XII. in 1740, and showed himself a liberal patron of literature and science. He was also distinguished for his moderation and enlightened piety, and was the author of several esteemed religious works, and especially of the standard authority on beatification, *De beatificatione* (Bologna, 1734-38; Eng. trans. in parts, *Heroic Virtue*, London, 1850, 3 vols.). D. in 1758. See Fabroni, *Vita di Benedetto XIV.*, 1787.

Benedict, Sir JULIUS: musician: b. at Stuttgart, Nov. 27, 1804; studied under Hummel at Weimar, and also under Weber. When nineteen years old conducted a series of opera performances at Vienna, and next at Naples, where his first work, *Giacinto ed Ernesto*, was produced in 1827. His second opera, *I Portoghesi in Goa*, was produced in Stuttgart in 1830. In 1836, on the advice of Malibran, visited London, where he remained till his death, as conductor, composer, pianist, and teacher. When Jenny Lind came to the U. S., Benedict came with her as pianist and accompanist. As a composer he was prolific and successful. His principal works are *A Year and a Day* (1836); *The Gypsy's Warning* (1838); *The Bride of Venice*, *The Crusaders*, *The Lily of Killarney* (1862), *The Bride of Song* (1864), all operas produced in England; *Undine*, a cantata for the Norwich festival (1860); *Richard Cœur de Lion*, cantata for the Norwich festival (1863); *St. Cecilia*, cantata for the Norwich festival (1866); *St. Peter*, oratorio for the Birmingham festival (1870); *Graziella*, cantata for the Birmingham festival (1882); besides several symphonies and overtures, many songs, part songs, and much piano music. He was knighted Mar. 24,

1871. He also received numerous orders and decorations from European sovereigns. D. in London, June 5, 1885.

D. E. HERVEY.

Benedict, LEWIS: lawyer and general of volunteers; b. in Albany, N. Y., Sept. 2, 1817; graduated at Williams College; studied law, and was admitted to the bar in 1841. He was actively engaged in politics for many years and held various important local offices. He entered the army as lieutenant-colonel Seventy-third New York volunteers; engaged at Yorktown; captured at Williamsburg; exchanged Sept., 1862; appointed colonel 162d New York volunteers, and was attached to the Army of the Gulf. He was in command of a brigade at the battle of Port Hudson and during the Red river expedition, where he greatly distinguished himself. Killed at battle of Pleasant Hill, La., Apr. 9, 1864, while leading his brigade to a charge. Brevet brigadier-general U. S. volunteers for gallant conduct.

Benedict, MORIZ: German neurologist: b. at Eisenstadt, Hungary, July 6, 1835; M. D., University of Vienna, 1859; Professor of Nervous Pathology, University of Vienna, 1868; author of *Elektrotherapie* (1868); *Nervenpathologie* (1874); *Anatomische Studien au Verbrechergehirnen* (1881); and a large number of monographs and articles on neurological subjects.

Benedic'tine Editions of the Fathers: The following is a complete list of these highly esteemed and now very costly works: 1, *Barnabas* (Menard), 4to, 1642; 2, *Lanfranc* (D'Achery), fol., 1648; 3, *Bernard* (Mabillon), 2 vols. fol., 1667; 4, *Anselm* (Gerberon), fol., 1675; 5, *Augustine* (Delfan and others), 11 vols. fol., 1679-1700; 6, *Cassiodorus* (Garet), 2 vols. fol., 1679; 7, *Ambrose* (Du Frisehe and Le Nourri), 2 vols., 1686-90; 8, *Hilary* (Constant), fol., 1693; 9, *Jerome* (Martian and others), 5 vols. fol., 1693-1706; 10, *Athanasius* (Montfaucon), 3 vols. fol., 1698; 11, *Gregory of Tours* (Ruinart), fol., 1699; 12, *Gregory the Great* (De Sainte-Marthe), 4 vols. fol., 1705; 13, *Hildebert* (Beaugendre), fol., 1708; 14, *Irenæus* (Massuet), fol., 1710; 15, *Lucius Cæcilius* (Le Nourri), 8vo, 1710; 16, *Prosper Aquitanus* (Marette and Mangeant), fol., 1711; 17, *Chrysostom* (Montfaucon), 13 vols. fol., 1718-38; 18, *Cyril of Jerusalem* (Toultée and Maran), fol., 1720; 19, *Basil* (Garnier and Maran), 3 vols. fol., 1721-30; 20, *Cyprian* (Maran), fol., 1726; 21, *Justin Martyr* (Maran), fol., 1742; 22, *Origen* (De la Rue), 4 vols. fol., 1733-59; 23, *Gregory Nazianzen* (Clemencet), 1 vol. fol., 1778; 2d vol., 1842.

Benedictines, or **Benedictine Order:** monks who observe the rule of St. Benedict. This order was one of the most ancient and learned religious orders of Western Europe. The first Benedictine monastery was that founded by St. Benedict on Monte Cassino, near Naples, in 529 A. D. The order spread rapidly and widely in several countries of Europe, and it is said had at one period 37,000 monasteries. The Benedictines boasted that their order had produced 24 popes, 200 cardinals, 4,000 bishops, 1,500 saints. The rule of St. Benedict was less severe than that which the Eastern ascetics practiced. It required that the monks should live frugally, avoid laughter, hold no private property, and be industrious. To them we are especially indebted for the preservation and transmission of many of the ancient classics through the Dark Ages down to the present time. Among the most celebrated houses or societies of this order was the Congregation of Saint-Maur (dating from 1621), on the river Loire, to which all the Benedictine houses in France were affiliated. Connected with it were many learned men, including Mabillon, Montfaucon, and Sainte-Marthe. They published good editions of the Fathers (see above), and numerous valuable works, among which are *L'Antiquité Expliquée* (15 vols. fol., 1719-24); *Veterum Scriptorum Spicilegium* (13 vols., 1653-77); *Acta Sanctorum S. Benedicti* (9 vols., 1688-1702); and *Histoire Littéraire de la France* (9 vols. 4to, 1733-49). The Cistercians, Carthusians, Camaldules, Clunians, Celestines, and Trappists were branches of the Benedictine order. There are also Benedictine nuns, with twelve convents, in the U. S. See *Annales Ordinis S. Benedicti* (6 vols., 1713-39); Tassin, *Histoire de la Congrégation de Saint-Maur* (1770); Montalembert, *The Monks of the West* (5 vols., 1860).

Benediction [from Lat. *benedic'tio*, deriv. of *benedi'cere*, praise, wish well, bless; *bene*, well + *di'cere*, speak. *Benison* is from the same Lat. source viâ O. Fr. *beneïsson*]: a solemn invocation of the divine blessing upon men or things; the ceremony is as ancient as religious feeling. The custom

was sanctioned by Christ, and in the primitive Church was greatly developed in various forms. In Protestant churches some form of benediction usually closes religious services. In the Roman Catholic Church the ceremony is more elaborate, and generally accompanied with the sprinkling of holy water, use of incense, and making the sign of the cross. On Easter Sunday in Rome the Pope pronounces after mass a solemn benediction *urbi et orbi* (on the city and the world). The papal benediction conveyed to a dying person carries with it a plenary indulgence. The name is also given in some countries to a brief and popular service of comparatively modern origin in the Roman Catholic Church.

C. H. THURBER.

Ben'edix, JULIUS RODERICK: a German author; b. in Leipzig, Jan. 21, 1811. He wrote very many successful plays, mostly humorous, among them *Bemoostes Haupt*; *Der Steckbrief*; *Der Störenfried*; *Mathilde*, etc., and a novel, *Bilder aus dem Schauspielerleben*. D. in Leipzig, Sept. 26, 1873.

Ben'efice [O. Fr., from Lat. *beneficium*, favor]: originally a bounty in land given to a meritorious Roman soldier. In mediæval history the term denoted an estate in land conferred by a superior by way of recompense for service. As late as the twelfth century the word was used synonymously with *fœdum*. The earlier historians of the Middle Ages adopted the view that benefices were given successively, as revocable, as temporary, as estates for life, and finally as estates in perpetuity. This view has been refuted by Guizot (see *Civilization in France*, vol. iii.). In the canon law the word "benefice" designates a right inhering in a clergyman of sharing the income of church property in return for the performance of spiritual duties. The Roman Catholic Church includes all clerical offices, even the papal, among benefices; but the Church of England, which long made the term include all preferments except bishoprics, now excludes also all cathedral preferments, such as deaneries, canonries, archdeaconries, etc. The term "dignity" is applied to bishoprics, deaneries, archdeaconries, and prebends; the term "benefice" to parsonages, vicarages, and donatives. For the right of presentation to benefices, see ADVOWSON.

Benefit of Clergy: in English criminal law the privilege of the clergy, a clerk's privilege. During the Middle Ages benefit of clergy in various European countries extended to a total exemption in favor of clergymen from the process of a secular judge in criminal cases. In England, however, it was not carried beyond an exemption from capital punishment in felony and petit treason. It was never granted in cases of high treason or offenses below felonies. Offenses were thus divided into those which were clergyable and not clergyable. This exemption, at first allowed only to clergymen, soon was extended to all the officers and clerks of the church, and then to every one who could read, an ability to read being confined almost wholly to those in the service of the church. But when learning became more generally diffused, a distinction was made between those in orders and laymen who could read, the latter being allowed the privilege only once, and then (unless they were peers or peeresses) being branded in the left thumb. A woman, unless she was a peeress, could not claim this exemption, though this inequality was rectified by statute. At first, the criminals who were allowed this privilege were handed over to the ordinary or bishop to be dealt with according to the canons of the Church; but in the reign of Elizabeth it was enacted that they should be discharged from prison, with the proviso that the court might in its discretion keep the offender in prison for a year; and by subsequent statutes various punishments, such as whipping, fine, and imprisonment, were imposed on criminals entitled to benefit of clergy, who were practically all convicts. Whenever Parliament desired to make an offense strictly capital, the practice was to introduce into the enactment the words "without benefit of clergy." By statute of 7 Geo. IV., c. 28, s. 6, benefit of clergy was abolished. Its retention for so long a time was plainly owing to the fact that it could be used to mitigate the rigor of the English criminal law. For details as to this exemption, consult 4 Blackstone's *Commentaries*, 365.

T. W. DWIGHT.

Benefit Societies: See CO-OPERATIVE INSURANCE SOCIETIES.

Beneke, bay'ne-ke, FRIEDRICH EDUARD: a German philosopher; b. in Berlin, Feb. 17, 1798. He became Extraordinary

Professor of Philosophy in the University of Berlin in 1832. Among his works are *Psychological Sketches* (2 vols., 1825-27); a *System of Logic* (2 vols., 1842); and *Pragmatic Psychology* (1850). His system of psychology is called "empirical." Raue's *Elements of Psychology* gives a good view of his system. He disappeared Mar. 1, 1854, and his body was found in a canal in June of the same year.

Revised by W. T. HARRIS.

Benét, ben-ay', STEPHEN VINCENT: b. at St. Augustine, Fla., Jan. 22, 1827; educated in Alexandria, Va., at the University of Georgia, and the U. S. Military Academy at West Point, N. Y., where he was graduated July 1, 1849. In 1853 he published a translation of Jomini's *Political and Military History of the Campaign of Waterloo*; assistant Professor of Ethics and Law at West Point (1859-61); instructor of ordnance (1861-64); inspector of ordnance (1864); commander of Frankford arsenal; major of ordnance corps (1866); chief in 1874; retired Jan. 22, 1891. Published *Military Law and the Practice of Courts Martial* (1862), a text-book at West Point; and *Electro-ballistic Machines and the Schultze Chronoscope* (1866).

Benevento, bay'-nay'-ven'tō: a province of Italy; bounded N. by Campobasso, E. by Foggia, S. by Avellino, W. by Caserta. Area, 688 sq. miles. The country is level, and the soil generally fertile. The chief articles of export are cattle, grain, wine, oil, etc. It has changed masters very often, and was annexed by Italy at the same time as Naples. Pop. (1890) 244,464.

Benevento (Lat. *Beneventum*): a walled city of Southern Italy; capital of the province of the same name; situated on a hill or declivity by the river Calore; 33 miles N. E. of Naples (see map of Italy, ref. 6-F). Pop. 22,700. It has a citadel or castle, a fine old cathedral, several palaces, and churches. It is the see of an archbishop, and has several annual fairs. Among the many ancient remains found here is the magnificent Arch of Trajan, erected in 114 A. D., now nearly perfect. Benevento is a place of great antiquity, having become a Roman town as early as 274 B. C., and it was an important city during the Roman empire. It was conquered in the sixth century by the Lombards, under whom it continued to flourish, and became the capital of the powerful duchy of Benevento. The city, with some adjacent territory, was given to the pope in 1053, and governed by a cardinal-legate with but small intermissions until 1860, when it was united to the kingdom of Italy. In 1806 it was erected into a principality by Napoleon, who gave Talleyrand the title of Prince of Benevento.

Benezet', ANTHONY: a philanthropist; b. in St.-Quentin, France, Jan. 31, 1713. He joined the Society of Friends, and emigrated in 1731 to Philadelphia, where he taught school for many years. He was eminent as an opponent of the slave-trade and slave-holding, and as a benefactor of the Negroes. He wrote several tracts on the subjects. D. in Philadelphia, May 3, 1784. See Vaux, *Memoir of A. Benezet* (1817).

Ben'fey, THEODOR: Sanskrit scholar; b. at Nörten, near Göttingen, of Jewish parents, Jan. 28, 1809; became privat-docent of Sanskrit at Göttingen in 1834, and in 1848 extraordinary professor; full professor in 1862. He published *The Hymns of the Sama-Veda* (1848); a Sanskrit reader and grammar; *Pantschatantra* (Leipzig, 1859), a work of prime importance for the origin and spread of the fables and tales of India; a great *Sanskrit-English Dictionary* (London, 1866); a *History of Philology (especially Oriental) in Germany* (Munich, 1869); and other books; also very many minor treatises. Many of the last, selected and edited by Bezzenberger, have been republished (Berlin, 1890-92) as *Kleinere Schriften* (with biography). He was a man of vast learning; but a lack of terse, lucid, and orderly statement lessens the usefulness of much of his work. D. in Göttingen, June 26, 1881.

C. R. LANMAN.

Bengal, ben-gawl': the largest and most populous of the local governments of British India; bounded N. by Nepal and Bhutan, E. by Assam and Burma, S. by the Bay of Bengal and Madras, and W. by the Northwestern and the Central Provinces. Area, 149,725 sq. miles. The greater part of Bengal consists of the alluvial plain or valley of the Ganges and Brahmaputra. The combined delta of these great rivers commences 280 miles from the sea, near which the delta islands, here called Sunderbunds, are covered with a very dense vegetation, and infested by serpents, crocodiles, and tigers. Farther N. the country is marvelously prolific of

rice, cotton, opium, sugar, indigo, and a great variety of tropical fruits. The chief exports are opium, saltpeter, rice, hides, and indigo. The climate of Bengal is subject to great extremes of heat, and is very destructive to the health of both Europeans and natives; but in this respect great improvement is reported in the last few years. Pop. (1901) 74,713,020. See FAMINE.

Among the most important cities of Bengal province are Calcutta, the capital, Delhi, Benares, Patna, Agra, and Murshidâbâd. The people are Hindus, Mohammedans, Sikhs, and various wild tribes in the hill-country. The native Bengalese are a facile, deceitful, cowardly race. Their morals are much debased. The English first established themselves in Bengal in 1656. From the smallest beginnings their great empire of the East has grown up. The Bengalese language has a basis of Sanskrit, but is modified by words of Arabic, Malay, and Persian origin. Its literature has been much neglected till of late. Since 1858 the history of Bengal has been one of steady and peaceful progress. Its external trade is practically confined to Calcutta. Chittagong is the rice port.

Bengal, Bay of (anc. *Ganget'ieus Si'nus*): a part of the Indian Ocean extending between Hindustan and Farther India. Its southern boundary is variously placed by geographers. According to some it is a line about 1,200 miles long drawn from Coromandel to the peninsula of Malacca. Others assign as its southern limit a line drawn from the delta of the Godavery to Cape Negrals. Its chief affluents are the Ganges, the Brahmaputra, and the Irrawaddy. There are no good harbors on the western coast, but several safe ports occur on the east side, as Aracan, Cheduba, Negrals, etc. The tide sometimes rises to the height of 70 feet in this bay. The northeast monsoon prevails here in summer and the southwest monsoon in winter. In this bay are the Andaman and the Nicobar islands.

Bengali, ben-gaw'leë, **Lan'guage**: the Aryan language of Eastern Bengal, the district about the mouths of the Ganges, of which Calcutta is the metropolis. It belongs to that group of neo-Sanskrit languages now spoken in Northern and Central Hindustan, which bear a relation to the Sanskrit quite similar to that of the Romance languages to Latin. These languages are: 1. The Bengâli (or Bangâli). 2. The Hindi, occupying a vast territory in Northern Hindustan, stretching from the Himalayas south to the Nerbudda and from the lower Ganges westward nearly 1,200 miles to the valley of the Indus, estimated in all at about 248,000 sq. miles. Hindustani is a *lingua franca* based largely on Hindi. 3. The Uriya, the language of Orissa, to the south of Calcutta. 4. The Marâthi, the language of ten million people in the province of Bombay, and to the eastward in the Nizam's Dominions and the Central Provinces. 5. The Gujarâti of Gujerat, on the west coast, north of Bombay. 6. The Sindhi along the lower Indus. 7. The Panjâbi in the Punjab, the district of the "five rivers." 8. The Cashmiri of Cashmere. 9. The Sinhalese of Southern Ceylon. Other divisions are of secondary importance, or may be like Nepâli and Assamese, subdivisions merely. Among all these the Bengâli ranks next to Hindi in extent and importance. It is spoken by about seventeen million people. Its colloquial form appears in many rather ill-defined dialects, from which the literary language of Calcutta has widely departed under the influence of a strong archaizing tendency. The necessities of its vocabulary in meeting the demands of modern life have been supplied by free recourse to the Sanskrit, which has also exercised an influence upon inflexion and syntax.

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BENJAMIN IDE WHEELER.

Bengal Light, or **Blue Light**: a brilliant signal-light used at sea during shipwreck, and in ordinary pyrotechny for illuminating a tract of country. It is produced by the combustion of a mixture of niter, sulphur, and trisulphide of antimony. These materials are first reduced to a fine powder, then dried and mixed in the proportions of 6 lb. of niter, 2 of sulphur, and 1 of the trisulphide.

Bengel, beng'el, JOHANN ALBRECHT, D. D.: German Lutheran theologian; b. at Winnenden, in Württemberg, June 24, 1687. He was probably the first Protestant who treated the exegesis of the New Testament in a thoroughly critical spirit. His edition of the Greek Testament (1734) is the foundation of modern criticism of the New Testament text. He wrote the celebrated *Gnomon Novi Testamenti* (1742) and an *Exposition of the Revelation of St. John* (1740), etc. D. in Stuttgart, Nov. 2, 1752.

Benghazi, ben-gaa'zëe (anc. *Beren'ce*): a seaport-town of Northern Africa; capital of Barca; on the east coast of the Gulf of Sidra; 420 miles E. S. E. of Tripoli (see map of Africa, ref. 2-E). The port is shallow, and nearly filled with sand. It has some trade in oxen, sheep, corn, and wool. It is supposed by some to be the site of the ancient *Hesperis* and the Gardens of the Hesperides. Pop. estimated at from 6,000 to 7,000.

Benguela, ben-gay'lää: a district of the Portuguese West African province of Angola. It is bounded on the N. by the Coanza river, which separates it from Angola proper, S. by Mossamedes, and W. by the Atlantic Ocean. The eastern limit is not definitely fixed. It is watered by numerous small rivers, which flow westward into the Atlantic. The surface is mountainous. The soil is fertile, and produces a very luxuriant and varied vegetation. The climate is hot, humid, and unhealthy, especially near the coast. The forests are infested by lions and other beasts of prey. Capital, Benguela (see map of Africa, ref. 7-D).

Benham, ANDREW E. K.: See the Appendix.

Benham, HENRY W.: military engineer; b. at Cheshire, Conn., 1816; graduated at West Point in 1837; colonel of engineers, brevet major-general U. S. A.; had charge of the principal engineer works on the Atlantic coast, of the Potomac aqueduct, and of the coast survey office; member of commission for New York docks 1855; engineer of New York quarantine commission 1859; breveted colonel as commanding at the rout of Garnett, Carrick's Ford, July, 1861; as brigadier-general volunteers commanding leading brigade at Carnifex Ferry, Sept., and at rout of Floyd through Fayetteville Nov., 1861; commanding district and troops at capture of Fort Pulaski, Apr., 1862; commanding engineer brigade, laid several pontoon-bridges under fire during Chancellorsville battles, his horse being shot under him; constructed and commanded defenses at City Point, 1864; breveted major-general volunteers and brigadier and major-general U. S. army for gallant conduct, etc., Mar., 1865; senior engineer Boston; president of engineer boards; devised pieket shovel and rapid construction of pontoon-bridges by "simultaneous bays." Retired 1882. D. in New York, June 1, 1884.

Beni, bay'nëe: a river of South America; in Bolivia; rises on the east slope of the Andes, and is formed by the junction of the Chuqueapo and Mapiri. It flows northward into the Madeira or Mamore after a course of about 650 miles.

Beni: a department of Bolivia; bounded N. and E. by Brazil, S. by La Paz, Cochabamba, and Santa Cruz, and W. by Peru. Area, 100,551 sq. miles. It comprises the whole northern part of the republic, and with the exception of a small part in the southwest corner, and a part of the province of Menos in the E., is entirely an unknown region, inhabited only by wild Indians. Chief town, Trinidad. Pop. (1888) 16,744 whites, and about 100,000 Indians.

Benicarlo, bay'nëe-kaar'lô: a seaport-town of Spain; province of Valencia; on the Mediterranean; about 82 miles N. N. E. of Valencia (see map of Spain, ref. 15-J). It is meanly built, and has a ruined castle and a fishing-port. A strong wine is made here and exported to Bordeaux, where it is used to adulterate claret. Pop. (1887) 7,916.

Benicia, bëe-nis'i-a: city; on railroad; Solano co., Cal. (for location of county, see map of California, ref. 7-C); on the north side of the Strait of Carquinez (which connects San Pablo and Suisun bays); 30 miles by rail and 28 miles by water N. E. of San Francisco. It was incorporated in 1850, and was formerly the capital of the State. The strait is nearly 2 miles wide, and is navigable for large vessels. Benicia has a law school, a girl's seminary, a convent, a U. S. arsenal and barracks, ship-yards, two very large tanneries, fruit and fish packing establishments, pottery and cement works, gas and electric lights. It is the seat of St. Augustine College (Episcopalian). The land in the vicinity is adapted to the growing of almonds and grapes. Pop. (1880) 1,794; (1890) 2,361; (1900) 2,751. EDITOR OF "NEW ERA."

Benign Growths, or Tumors: See TUMORS.

Beni-Hassan, bay'nēe-hāās'san: a village of Central Egypt; on the right bank of the Nile; 23 miles S. S. E. of Minieh. Here are twenty-two grottoes or catacombs excavated in a calcareous bank or hill. They are supposed to have been used as tombs by the people of Hermopolis, which stood on the opposite side of the river. Here are apartments 60 feet long and 40 feet wide, in which are pillars of the native rock 16 ft. 8½ in. in height and 5 feet in diameter. The sides of the grottoes are covered with paintings designed with skill and good taste. These tombs are among the most remarkable in Egypt. The earliest bears the date of the forty-third year of Ositarsen I., not far from 1800 B. C. Says J. P. Thompson: "I found one tomb, some 200 feet above the level of the river, almost a Doric temple hewn from the solid rock. . . . This chamber was cut from the solid rock with perfect precision: no modern square or line or plummet could make it more true."

Beni-Israel (sons of Israel): remarkable people, apparently of Jewish origin, in the W. of India, chiefly in Bombay and some coast towns. They acknowledge the law of Moses and retain many of the Jewish customs, although conforming to some of the idolatrous practices of the Hindus. Some of them know Hebrew, but Marathi is their ordinary language, and in it they have some literature. They rarely intermarry with ordinary Jews or with the Hindus.

Beni Khaibir': a tribe in Arabia, supposed by some, but without sufficient reason, to be a remnant of the ancient ascetic Rechabites. They number about 60,000. See RECHABITES.

Benin, beu-ēen': a maritime district of Western Africa; in Upper Guinea; W. of the river Niger, N. E. of the Bay of Benin; in the territory of the Royal Niger Company. Its limits in some directions are not well defined or ascertained. The interior is elevated and hilly, and mostly covered with forests. The soil is fertile, and supports a dense population. Sugar, rice, yams, palm oil, and cotton are the staple productions.

Benin: a town of Africa; on a river of the same name; 73 miles from the ocean (see map of Africa, ref. 5-C). The houses are built of clay. Pop. estimated at 15,000. Belzoni died near this town in 1823.

Benin, Bight of: portion of the Gulf of Guinea (*q. v.*), bordering on the above district.

Beni-Souef, ben'ēē-swef': a town of Central Egypt; on the Nile; 62 miles S. S. W. of Cairo. It has cotton-mills and quarries of alabaster, and is the entrepôt of the produce of the fertile valley of Fayoom. Pop. 7,000.

Ben'jamin: youngest son of the patriarch Jacob and of Rachel (who called him BEXONI). He was his father's favorite child, and the head of one of the twelve tribes of Israel. The territory of this tribe was bounded on the N. by that of Ephraim, on the E. by the Jordan, on the S. by the land of Judah, and on the W. by that of Dan. Its soldiers were distinguished as archers and noted for left-handed slingers. The tribe was nearly extirpated in the days of Phinehas, son of Aaron, by the other confederate tribes, for a gross breach of hospitality, but 600 men who had escaped were supplied with wives, partly by rapine at Shiloh, and thus it was re-established (Judges xix.-xxi). The first King of Israel, Saul, was a Benjamite. After the death of Solomon the tribes of Benjamin and Judah remained loyal to his dynasty when the other ten tribes revolted.

Benjamin, JUDAH PHILIP: a jurist and politician of Jewish extraction; b. in St. Croix, West Indies, Aug. 11, 1811. He practiced law in New Orleans; was elected a Senator of the U. S. for Louisiana in 1852; and re-elected in 1859. He acted with the Democrats, and became a secessionist. He was Secretary of War (1861), and Secretary of State of the Confederate States 1862-65. At the close of the civil war he fled to England and began the practice of law in London, where he rose to great fame and fortune. His *Law of Sale* (1883) is an authority in English courts. D. in Paris, May 7, 1884.

Benjamin, MARCUS: See the Appendix.

Benjamin, PARK: poet, journalist, and lecturer; b. at Demerara, in Guiana, Aug. 14, 1809. He graduated at Trinity College, Hartford, Conn., in 1829; and in 1840 became associated with R. W. Griswold as editor of the *New World*, a literary journal published in New York. He

wrote, besides many lyrical poems, a *Poem on the Meditation of Nature*. D. in New York, Sept. 12, 1864.—His son, PARK: b. in New York, May 11, 1849; entered the navy (1867); became a lawyer (1870); then a patent expert. Besides some tales and slight humorous essays, he edited *Appleton's Cyclopaedia of Applied Mechanics* (1880).

Benjamin, SAMUEL GREENE WHEELER: traveler, artist, and author; b. at Argos, Greece, Feb. 13, 1837. He was educated at Williams College; was for some time assistant librarian in the State Library, Albany, N. Y.; and from 1883 to 1885 U. S. minister to Persia. Has published a number of works on art, including *Art in America* and *Contemporary Art in Europe* (1877), as well as poetry; *Constantinople* (1860); *Persia and the Persians* (1886), etc.

HENRY A. BEERS.

Benjamin-Constant, baān'zha-mān' kōn'stāān', JEAN JOSEPH: painter of portraits and of Oriental subjects; b. in Paris, June 10, 1845; pupil of Cabanel; officer Legion of Honor 1884; awarded a first-class medal at the Paris Exposition of 1889, but refused to accept it. He has visited the U. S. several times, and has painted portraits in New York and other cities. He is an artist with a strong sense of color and a brilliant technician. *The Cherifas*, exhibited at the Salon of 1885, is one of the best of his pictures of life in the East, and is in the museum at Carcassonne. He painted three large decorative panels for the New Sorbonne in Paris, viz., *Literature*, *The Academy of Paris*, and *Science*, which show intelligent artistic intention and a desire to obtain color-harmony in painting on a large scale without sacrificing local tints. He has painted a large number of pictures, and in some of them has not attained the level that made his earlier works so notable. Many of his pictures are owned in the U. S. Studio in Paris.

WILLIAM A. COFFIN.

Benjamin Gum: See BENZOIN GUM.

Benjamin of Tudela: a Jewish rabbi and traveler; commenced about 1159 a journey through Palestine, Persia, and Egypt, in which he passed fourteen years. He wrote an account of his travels, which was translated into Latin, English (London, 1840), and French. D. in 1173. See E. Carmoly, *Notice sur B. de Tudèle et ses Voyages* (Brussels, 1837, 2d ed., 1852, 2 parts).

Benjamin-tree: See BENZOIN ODORIFERUM.

Ben'kelman: capital of Dundy co., Neb. (for location of county, see map of Nebraska, ref. 11-C); situated in a rich agricultural district; on Bur. and Mo. R. R., and on Republican river; 89 miles from Akron, Col.; has fine school-building, and three churches. Was first settled about 1880. Pop. (1890) 357; (1892) estimated, 600.

Benloew, LOUIS: philologist; b. in Erfurt, Germany, Nov. 15, 1818; studied at the universities of Berlin, Leipzig, and Göttingen. Most of his life was, however, spent in France, and from 1847 he was connected with the Faculty of Letters of Dijon, becoming later the dean of the faculty. D. in 1884. His works are numerous. Among them may be mentioned *De l'accentuation dans les langues indo-européennes, tant anciennes que modernes* (1847); *Théorie de l'accentuation latine* (with Weil, 1855); *Aperçu général de la science comparative des langues* (1858); *Précis d'une théorie des rythmes* (1862); *De quelques caractères du monde primitif* (1862); *Les Sémites à Ilion* (1863); *La Grèce avant les Grecs, étude linguistique et ethnographique* (1877); *Les lois de l'histoire* (1881).

B. I. W.

Benne-plant: See SESAME.

Bennett, CHARLES WESLEY, D. D., LL. D.: Methodist Episcopal minister and educator; b. at East Bethany, N. Y., July 18, 1828; educated at Wesleyan University, where he graduated in 1852; was teacher and principal in several schools 1852-61; joined East Genesee Conference 1862; studied in Berlin 1866-69; principal for the second time of Genesee Wesleyan Seminary 1869-71; Professor of History and Logic in Syracuse University 1871-85; and Professor of Historical Theology in Garrett Biblical Institute, Evanston, Ill., 1885-91. He published *National Education in Italy, France, Germany, England, and Wales, Popularly Considered* (Syracuse, 1878), and *Christian Art and Archaeology of the First Six Centuries* (New York, 1888). D. at Evanston, Apr. 17, 1891.

ALBERT OSBORN.

Bennett, EDMUND HATCH, LL. D.: jurist; b. at Manchester, Vt., Apr. 6, 1824; graduated at the University of Vermont 1843; admitted to the bar 1847; resided at Taun-

ton, Mass., 1848-84; judge of probate and insolvency for Bristol County 1858-83; mayor of Taunton 1865 and 1867; lecturer in Harvard Law School 1870-72; since 1876 professor in and dean of the Boston University Law School; has published *Bingham on Infancy*; *Greenleaf's Reports* (9 vols.); *English Law and Equity Reports* (3 vols.); seven editions of Justin Story's works; *Massachusetts Digest of Decisions* (3 vols.); *Fire Insurance Cases* (5 vols.); *Blackwell on Tax Titles*; *Goddard on Easements*; *Pomeroy's Constitutional Law*; *Inderman's Principles of the Common Law*; *Cushing's Reports of Massachusetts Decisions* (3 vols.); *Benjamin on Sales*; *Story on Sales*; *Leading Cases in Criminal Law*, etc. D. in Boston, Mass., Jan. 2, 1898.

Bennett, JAMES GORDON: journalist; b. near Keith, Scotland, Sept. 1, 1795; educated for the Roman Catholic priesthood; emigrated to the U. S. in 1819; took to newspaper work, and was for several years connected with several journals published in the city of New York; became chief editor in 1833 of the *Pennsylvanian*, a daily paper of Philadelphia. In 1835 he founded the *New York Herald* as a penny paper, into which he introduced the features of news-gathering, special correspondence, telegraphic reporting, and distribution by carriers, subsequently common features of journalism. D. in New York, June 1, 1872.—His only son, of the same name, b. in New York, May 10, 1841, who resides chiefly in Paris, is distinguished for fitting out the Jeanette polar expedition, for sending H. M. Stanley to search in Africa for Livingstone, and for establishing in connection with J. W. Mackay a new line of submarine cable between Europe and the U. S.

Bennett, Sir JAMES RISDON, M. D., F. R. S., LL. D.: ex-president of the Royal College of Physicians; b. at Romsey, Hampshire, England, in 1809; M. D., University of Edinburgh, 1833; appointed assistant physician to St. Thomas's Hospital, London, 1843; elected president of the College of Physicians in 1876, and annually re-elected until 1881; knighted in 1881; has published translations from the German of Kramer on *Diseases of the Ear*; *An Essay on Acute Hydrocephalus*, etc. C. H. THURBER.

Bennett, JOHN HUGHES, M. D.: physician and medical writer of Edinburgh; b. in London, Aug. 31, 1812; took his degree at Edinburgh in 1837, and in 1848 was made Professor of the Institutes of Medicine in that city. Dr. Bennett was especially distinguished for his studies in histology and therapeutics, and his advocacy of the expectant treatment of disease. Among his works are *Clinical Medicine* (1856); *Practice of Medicine*; *Treatment of Pulmonary Consumption*; *Text-book of Physiology* (Edinburgh, 1871). D. at Norwich, Sept. 25, 1875.

Bennett, JOSEPH: journalist and music-critic; b. in Berkeley, Gloucestershire, England, Nov. 29, 1831; studied music in early life, especially the organ, violin, viola, and violoncello; went to London in 1855, and wrote for the *Sunday Times*, the *Musical Standard*, and since 1870 to the present for the *Daily Telegraph*. He edited Novello's *Concordia* (May 1, 1875, to Apr. 22, 1876), and has for years written largely for Novello's *Musical Times*. He has furnished the librettos for Barnett's *Good Shepherd*; Mackenzie's *Rose of Sharon*, *Story of Sayid*, *Dream of Jubal*; Cowen's *Ruth*, *Thorgrim*, and *St. John's Eve*; Bottesini's *Garden of Olivet*; Madame Sainton-Dolby's *Thalassa*; Williams's *Gethsemane* and *Last Night at Bethany*; and Sullivan's *Golden Legend*, adapted from Longfellow. Some of his studies of The Great Composers in the *Musical Times* have been put in book form. In 1885 he visited the U. S., and made a music-literary tour, afterward publishing his impressions in London. D. E. HERVEY.

Bennett, Sir WILLIAM STERNDALÉ: musician; b. in Sheffield, England, Apr. 13, 1816. When eight years old he became a choir-boy at King's College, Cambridge, and two years later was taken to London to study in the Royal Academy of Music, remaining there from 1826 to 1836. He was then sent to Leipzig, and associated with Mendelssohn, Schumann, and Ferdinand Hiller. While there he composed considerable music, including his very beautiful *Naiades* overture. In 1856 he was appointed conductor of the London Philharmonic Society, but soon relinquished the post. In the same year he was appointed Professor of Music in Cambridge University, from which he received the Bachelor and Musical Doctor's degrees. Oxford made him a D. C. L. In 1858 he produced his cantata *The May Queen*, for the Leeds festival, and in 1867 his *Women of Samaria*

was produced at the Birmingham festival. In 1871 he was knighted, and on Feb. 1, 1875, he died in London at the early age of fifty-nine. He composed much, mostly in the instrumental field. His two cantatas mentioned, four church anthems, and a setting of Tennyson's *Ode on the Death of the Duke of Wellington*, and Charles Kingsley's *Ode on the Duke of Devonshire*, comprise most of his vocal music, but his works for orchestra and solo instruments are in the front rank. From 1868 till his death he was the principal of the Royal Academy of Music. D. E. HERVEY.

Ben Nevis: a mountain of Scotland. See BEN.

Ben'nigsen, or Benningsen, LEVIN AUGUST THEOPIL, Count: Russian field-marshal; seion of a noble Hanover family; b. in Brunswiek (Lüneburg) in 1745; brought up at court; married an Austrian and lost his employment; became an adventurer, and obtained a commission in the Russian army in 1773. Catherine II. employed him in Poland and promoted him. He joined the Pahlen conspiracy against Paul I., and actually strangled him. He distinguished himself at the head of an army-corps at Pultusk (1806); was given the command of the army opposing Napoleon in the following winter, broke through the French lines, separating his foes, and forcing Napoleon to take the field with reinforcements. He chose the position at Eylau, and at night, after the desperate battle of Feb. 8, 1807, held his position. He retired for the sake of supplies. He fought as a subordinate commander at Friedland and Borodino; beat Murat at Tarantino, Oct. 12, 1812; commanded the Russian army of reserve at Leipzig, and for his impetuosity and skill in the great battle was made a count on the field. In 1818 he retired to his Hanover estates. D. in 1826.

Bennington: on railroad; capital of Bennington co., Vt. (for location of county, see map of Vermont, ref. 9-B); 55 miles S. W. of Rutland, and 36 miles from the Hudson river at Troy. The town contains three villages—Bennington, North Bennington, and Bennington Centre—the latter being Station A of the Bennington post-office. Gen. Stark, at the head of a column of "Green Mountain Boys" (New Hampshire and Massachusetts troops), defeated a British detachment in force, commanded by Lieut.-Col. Baum, sent from Gen. Burgoyne's army to capture the public stores near North Bennington, Aug. 16, 1777; 600 British prisoners were captured. The dedication ceremonies of the Bennington Battle Monument (301 ft. 10½ in. high) and centennial of the admission of Vermont into the Union were celebrated Aug. 19, 1891. The town contains extensive graded schools, large manufactories of knit goods, and one of the largest woolen-factories in the country. Bennington is one of the largest manufacturing villages in the State, and has a soldiers' home. Pop. of township, including village (1880) 6,333; (1890) 6,391; (1900) 8,033; of village (1890) 3,971; (1900) 5,656.

EDITOR OF THE "BANNER."

Benoit, baý' nwaã', PIERRE LEOPOLD LEONARD: musician; b. in Harelbeke, West Flanders, Belgium, Aug. 17, 1834; one of the most remarkable of the extreme modern school composers. Educated at the Brussels Conservatory, studying under Féti's; composed his first opera in 1857. Produced his opera *Le Roi des Autnes* in Paris 1861; returned to Belgium, and has since produced many important and remarkable works, both sacred and operatic; was appointed in 1867 director of the Flemish School of Music in Antwerp, which position he still retains. His *Lucifer* (1866); *L'Escaut* (1869); *Drama Christi* (1871); *La Guerre* (1873), are among his greatest oratorios; besides which he has composed several cantatas and operas. He is a strong advocate of a strictly national Flemish school of music. D. E. HERVEY.

Benoît de Sainte-More, or Sainte-Maure: mediæval French poet. Little is known of his life. He was probably a Norman by birth, although attempts have been made to prove him a native of Sainte-More in Champagne, and also of Sainte-More in Touraine. He attached himself to the court of Henry II. of England; and he is probably the Beneit of whom Wace somewhat enviously speaks (*Roman de Rou*, vv. 16526-31) as having at Henry's command written the long versified history, of some 43,000 lines, known as the *Chronique des ducs de Normandie*—being preferred for the task to his older contemporary and rival, Wace himself (*q. v.*). He is chiefly famous, however, for his *Roman de Troie*, one of the most popular poems of the Middle Ages. Though Benoît in this work speaks admiringly of Homer, he really found his material in the *De excidio Trojæ* of DARES (*q. v.*) and the *Ephemerides belti Trojani* of DICTYS (*q. v.*). He by no means, however, followed closely even

these authorities. He gave to the whole story a frankly mediæval and chivalric character; and he enlarged, or even added, wherever his fancy suggested. Some of these additions proved the most attractive parts of his poem—e. g. the episode of Troilus and Briseida (vv. 13235, *seq.*)—and were subsequently used by famous writers. Boccaccio told the tale of Troilus in his *Filostrato* (Briseida becoming Griseida); Chaucer also in his *Troilus and Criseyde*. Shakspeare made, or helped make, a play on the subject. But the whole *Roman de Troie* was also imitated and translated into other languages. The German poet, Herbolt von Fritzlar, made it the basis of his *Lied von Troie* (twelfth century); the Sicilian Guido delle Colonne (thirteenth century) rendered it into poor Latin, but without naming his original, and succeeded in passing for many centuries as the true author; Binduccio dello Scelto turned it into Italian (thirteenth century); and there were at least two Italian versions of Guido's Latin. A Dutch version was made by Jacob van Maerlant (thirteenth century), and it was even translated into Greek (fourteenth century). In the fifteenth century, perhaps earlier, it was turned into French prose, and supplied material for dramatic compositions—e. g. *Le Mystère de la destruction de Troie la Grant*, by Jacques Millet.

Another poem of 10,000 verses, the *Roman d'Énéas*, though anonymous in the MSS., is so similar in language, style, and execution to the *Chanson de Troie* that it is commonly attributed to Benoît. It is based upon the *Æneid* of Vergil, but again freely mediævalized. This work also had great popularity, and was translated into German (1175-84) by Heinrich von Veldeke, the first poet of courtesy (*courtoisie*) north of the Rhine.

The *Roman de Thèbes*, based upon the *Thebais* of Statius, has also been assigned to Benoît. In all probability, however, it was written by some poet eager to win fame by imitating the assured success of the *Roman de Troie*. Nor is it correct to attribute to Benoît, as has sometimes been done, the metrical *Life* of St. Thomas of Canterbury.

BIBLIOGRAPHY.—*La Chronique des ducs de Normandie, par Benoît, etc.*, ed. by Fr. Michel (3 vols., Paris, 1836-44); *Benoît de Sainte-More et la Roman de Troie, etc.*, ed. by A. Joly (2 vols., Paris, 1870-71); Fr. Settegast, *Benoît de Sainte-More, etc.* (Breslau, 1876); G. Paris, in *Romania*, v. p. 389, and viii. p. 300; K. Frohmann, *Herbolt von Fritzlar und Benoît de Sainte-More*, in *Germania*, ii. (1857); Hertzberg, *Der Troilus-Fabel von Homer bis zu Shakespeare*, in *Shakespeare Jahrbuch*, bd. vi. (1871) pp. 169-225; W. Greif, *Die mittelalterlichen Bearbeitungen der Trojanersage* (Munich, 1886).
A. R. MARSH.

Benouville, băy'noo'veel', JEAN ACHILLE: French landscape-painter; pupil of Picot; b. in Paris, July 15, 1815; celebrated for his pictures of views of the Campagna. First-class medal, Paris Salon, 1863; Legion of Honor 1863. D. in Paris, Feb. 6, 1891.
W. A. C.

Benozzo Gozzoli: See GOZZOLI.

Benseler, ben'se-ler, GUSTAV EDUARD: Greek scholar and lexicographer; b. in Freiberg, Saxony, Feb. 28, 1806; d. in Leipzig, Feb. 1, 1868. Best known by his work on the Attic orators (especially Isocrates, Demosthenes, and Æschines), and as the author of *Hiatus in the Attic Orators* (1841).

Ben'son, EDWARD WHITE, D. D.: Archbishop of Canterbury and Primate of all England; b. near Birmingham, England, July 14, 1829; graduated at Cambridge in 1852; was for several years assistant in Rugby School; head-master of Wellington College from its establishment in 1858 to 1872; chancellor of Lincoln Cathedral 1872; consecrated Bishop of Truro 1877, where he raised nearly \$500,000 for the erection of his cathedral; became Archbishop of Canterbury, England, Dec., 1882; author of various sermons and essays: *Work, Friendship, Worship* (1871); *Boy Life, or Sundays at Wellington College* (1874); *Single-heart* (1877); *The Cathedral, its Necessary Place in the Life and Work of the Church* (1879); *The Seven Gifts* (1885); *Communings of a Day* (1886); *Christ and His Times* (1889). D. at Hawarden, while on a visit to Gladstone, Oct. 11, 1896.

Benson, EGBERT, LL. D.: born in New York city, June 21, 1746; graduated at Columbia College in 1765; was an eminent lawyer; a member of Congress (1784-88, 1789-93, and 1813-15); a regent of the university (1789-1802); judge of the Supreme Court of New York (1794-1801); and of the U. S. Circuit Court. He published a *Vindication* of the captors of André (1817), and a *Memoir on Dutch Names*. D. in Jamaica, L. I., Aug. 24, 1833.

Benson, FRANK WESTON: genre and portrait painter; b. at Salem, Mass., Mar. 24, 1862; pupil of the Museum of Fine Arts, Boston, and of Boulanger and of Lefebvre, Paris; third Hallgarten prize, National Academy (1889); Clarke prize, National Academy (1891); member of the Society of American Artists (1888). His pictures, which are principally of figures painted in out-of-doors effects, are marked by good qualities of color, and show truth of observation in the study of nature; his portraits are good in drawing and refined in character. Studio in Salem.
W. A. C.

Benson, HENRY C., D. D.: preacher and writer in the Methodist Episcopal Church; b. near Xenia, O., in 1815; joined the Indiana Conference in 1842; was elected Professor of Greek in Indiana Asbury University in 1850; went to California in 1852; was editor of the *Pacific Christian Advocate* at Portland, Or., from 1864 to 1868; elected editor of the *California Advocate* in 1868, in which office he long continued. He is author of *Life among the Choctaws*, among whom he labored for some time as a missionary.

Benson, JOSEPH: Methodist minister; b. in Cumberland, England, Jan. 25, 1748; acquired much influence in the Church. He was a popular preacher, and author of numerous works, among which are an *Apology for the Methodists* (1801); a *Life of the Rev. John Fletcher*; and a *Commentary on the Holy Scriptures* (1811-18). D. Feb. 16, 1821.

Bent, JAMES THEODORE: See the Appendix.

Bent-grass: any grass of the genus *Agrostis*, which comprises numerous species, natives of Europe, the U. S., and many other countries. The *Agrostis vulgaris* or *A. alba*, forms a principal part of the pasture in the more elevated districts of England, and resists drought better than some other grasses. It is called "fiorin" or "redtop" in the U. S., where it is an important meadow grass.

Bentham, ben'tam or ben'tham, GEORGE, F. L. S., F. R. S.: English botanist, and nephew of Jeremy; b. in what is now a part of Portsmouth, Sept. 22, 1800; educated on the Continent of Europe; secretary to his uncle (1826-32); wrote a *New System of Logic* (1827), in which he clearly anticipated Hamilton's doctrine of the "quantification of the predicate," but the publishers failed, and the credit of the discovery was delayed until 1850. He abandoned law for botany; catalogued the flora of the Pyrenees, of Hongkong, and of Australia. Gave his collections to the Kew Gardens, and passed his later years there. The *Genera Plantarum* (1862-83) was the joint work of Bentham and Sir Joseph Hooker, and is an exhaustive summary of botanical science to its date. His most important publications are *Labiatarum Genera et Species* (1832-36); *Flora Hongkongensis* (1861); *Flora Australiensis* (1863-70). D. in London, Sept. 10, 1884.

Bentham, JEREMY: philosopher and reformer; apostle of the modern school of utilitarianism; b. in London, Feb. 15, 1748. He graduated at Queen's College, Oxford, in 1766; studied law and was called to the bar in 1772, but he never practiced that profession. He published in 1776 an acute and critical *Fragment on Government*, which abounds in sound and original ideas, and in 1787 an exhaustive argument entitled a *Defense of Usury*. His next important work was his *Introduction to the Principles of Morals and Legislation* (1789). He adopted the theory that "utility is the test and measure of virtue," and that laws should promote "the greatest happiness of the greatest number." He devoted his time and talents chiefly to the reform of legislation and government, and advocated universal suffrage, the vote by ballot, etc. He inherited from his father an easy fortune. About 1792 he formed a friendship and literary partnership with M. Dumont, who translated into French several of Bentham's works—namely, *Treatise on Civil and Penal Legislation* (3 vols., 1802) and *Theory of Penalties and Rewards* (1811). Among his other works are *Panopticon* (1791), which treats on prison discipline, and *The Rationale of Judicial Evidence* (5 vols., 1827). By habitual temperance, activity, and self-control he prolonged his life to the age of eighty-four. D. in London, June 6, 1832. He has great merits in the English jurisprudence, "which," as Macaulay says, "he found a gibberish and left a science." But on the public in general his influence was small, on account of the unreadableness of his writings. He represents French ideas, especially those of the French Revolution. His works were more admired on the Continent than in England. See *Memoirs of Jeremy Bentham*, prefixed to his works by Dr. Bowring; John Hill Burton, *Benthamiana*; Sir James

Mackintosh, *View of the Progress of Ethical Philosophy*; *Edinburgh Review* for Oct., 1843.

Ben'tinck: English noble family; the most notable members were: WILLIAM, first Earl of Portland; b. in Holland, 1649, of a noble family which had migrated from the Palatinate to Gelderland in the fourteenth century, where it is still represented by a younger line. He was the favorite and friend of William III., by whom he was constantly employed in military and diplomatic services. D. 1709.—WILLIAM HENRY CAVENDISH, third Duke of Portland; b. Apr. 14, 1738; became Prime Minister and First Lord of the Treasury 1783; distinguished as Pitt's Home Secretary, and as charged with Irish affairs in the turbulent times of 1794–1801; again Prime Minister in succession to Grenville, and First Lord of the Treasury 1807; d. Oct. 30, 1809.—WILLIAM HENRY CAVENDISH, son of the preceding; b. Sept. 14, 1774; served with distinction as an army officer in Flanders, Egypt, Italy, Portugal, and Sicily; Governor of Madras (1803–07), of Bengal (1827–33), when he was made Governor-General of India, and served till 1835; distinguished in India for suppressing suttee and thuggism, for developing systems of internal transportation, and for engaging natives in Government service; d. in Paris, June 17, 1839.—WILLIAM GEORGE FREDERICK CAVENDISH, nephew of the preceding; b. Feb. 27, 1802; entered the army; private secretary to his uncle, George Canning; member of Parliament 1826; was greatly engrossed in horse-racing, which he did much to make respectable, and to other field-sports. He joined the party of country squires, who were Conservative, during Peel's administration, and was offered a seat in his cabinet, but declined. On the repeal agitation (1845) of the corn-laws he was made the leader of the protectionists, and suddenly assumed great importance. As a parliamentary leader he struck hard, evinced a mastery of details unexpected in a man of his tastes, kept his party compact, and contributed materially to Peel's overthrow in 1846. In religious politics he advocated the removal of disabilities from Jews, and an endowment of the Irish Catholic Church. D. suddenly near Welbeck Abbey, Nottinghamshire, Sept. 21, 1848. Earl Beaconsfield wrote a life of him (8th ed. 1872).

Bent'ley, RICHARD, D. D.: critic and classical scholar; b. at Oulton, in Yorkshire, England, Jan. 27, 1662. He entered St. John's College, Cambridge, in 1676, and having taken the degree of bachelor became in 1683 tutor to Dr. Stillingfleet's son, with whom he went to Oxford. He was ordained a priest in 1690. In 1692 he was appointed to deliver the Boyle lecture on the evidences of religion, and in 1694 became keeper of the Royal Library. He published in 1699 a celebrated *Dissertation on the Epistles of Phalaris*, which procured for him a European reputation. He maintained that these Epistles were spurious, which involved him in a controversy with Atterbury, Charles Boyle, Pope, and other writers, who resorted to sarcasm and personality. Bentley defended himself in another *Dissertation on the Epistles of Phalaris* (1699) to the confusion of his adversaries, and by it he established his place as the first in time and learning of English historical critics. He was appointed master of Trinity College, Cambridge, in 1700, and married Joanna Bernard in 1701. In 1711 he published a good edition of Horace. His arrogance and their traditionalism provoked a series of quarrels and litigations with the fellows of Trinity College. He was appointed Regius Professor of Divinity in 1717, and was deprived of all his academic degrees and honors by the senate of the university in 1718, but he was reinstated by a mandamus of the court of king's bench in 1724. Among his productions was an edition of Homer, which he left unfinished. He proposed to revise and correct the text of the Greek Testament by comparing it with all the manuscripts. He failed to perform this task, but his principles of criticism have since been adopted, and have triumphed over all opposition. He died in Cambridge, July 14, 1742. His daughter was the mother of Richard Cumberland, the dramatist. See his *Life* by J. H. Monk (London, 1830) and R. C. Jebb (1882).

Bentley, ROBERT, F. L. S.: medical botanist; b. at Hitchin, England, Mar. 25, 1821; member of Royal College of Surgeons 1847; president of the British Pharmaceutical conferences 1866–67; was member of many English and American pharmaceutical and botanical societies. Author of *Manual of Botany*; *Text-book of the Organic Materia Medica*, etc. D. in London, Dec. 28, 1893.

Benton, JAMES GILCHRIST: soldier; b. in Lebanon, N. H., Sept. 15, 1820; graduated at West Point in 1842; major of

ordnance, Sept. 15, 1863. He served at various arsenals and on special duties 1842–57; as member of the ordnance board 1854–56; at Military Academy as instructor of ordnance and gunnery 1857–61. In the civil war he was an assistant in the ordnance bureau at Washington 1861–63; in command of Washington arsenal till June 14, 1864, and since of Springfield armory, Mass. Brevet lieutenant-colonel and colonel Mar. 13, 1865, for faithful and meritorious services in the ordnance department. He made great improvements in the Springfield rifle, seacoast gun-carriages, and the system of loading barbette guns under cover; also invented the Benton electro-ballistic pendulum, a velocimeter, a spring-dynamometer, and minor devices in the use of arms. His reports to the Government on his experiments were valuable in their time. He was author of *A Course of Instruction in Ordnance and Gunnery for the use of the Cadets of the United States Military Academy* (1860). D. in Springfield, Mass., Aug. 23, 1881.

Benton, THOMAS HART: Senator; b. near Hillsborough, N. C., Mar. 14, 1782. He removed to Tennessee, where his father, then dead, had acquired a vast tract of land; studied law, and began to practice at Nashville about 1810. In the war of 1812 he served as colonel under Gen. Jackson. He became a resident of St. Louis, Mo., in 1815, and was elected a Senator of the U. S. for Missouri in 1820. Having been re-elected in 1826, he supported Gen. Jackson, opposed the U. S. bank, and advocated a gold and silver currency, for which reason he was often called "Old Bullion." For many years he was the most prominent public man of Missouri. He was a member of the National Senate for thirty years, and opposed the extreme State Rights policy of Calhoun. In 1852 he was elected to the House of Representatives, in which he opposed the repeal of the Missouri Compromise. He was opposed by a powerful party of State Rights Democrats in Missouri, who defeated him as a candidate for Governor in 1856. His life in Tennessee was turbulent with hot-blood, and involved a bitter quarrel with Gen. Jackson. In the Senate he was a persistent advocate of opening the public lands of the West to actual settlers; promoted surveying and exploring expeditions, foreseeing a great empire to grow up even to the Pacific. He introduced the "expunging resolutions" which removed from the Senate record its censure of President Jackson; opposed Polk's 54° 40' N. boundary line for Oregon, and facilitated the settlement on the existing line; resisted Calhoun's influence, and the two contended bitterly in the forum and in political combination. He was the father-in-law of J. C. Fremont, but opposed his candidacy for the presidency in 1856 as promoting sectional politics. He published a *Thirty Years' View, or a History of the Working of the American Government for Thirty Years, 1820–50* (2 vols., 1854–56). D. in Washington, D. C., Apr. 10, 1858. See his life by Theodore Roosevelt in American Statesman Series, 1887.

Benton Harbor: city and railroad junction; Berrien co., Mich. (for location of county, see map of Michigan, ref. 8–G); on Ch. and W. Mich. and Cl., Cin., Ch. and St. Louis R. Rs., and on the east side of St. Joseph's river, and the Benton Harbor ship-canal; 1½ miles from Lake Michigan, and about 60 miles E. by N. from Chicago. It has a large trade in grain and lumber, and an immense one in fruit, large manufactories of fruit packages, wood and iron machinery, furniture, flour, barrels, vinegar, pickles, cider, vehicles, and canned fruit, and an undeveloped water-power. Regular lines of steamers and sailing vessels connect it with Chicago and Milwaukee. Pop. (1880) 1,230; (1890) 3,692; (1900) 6,562. EDITOR OF "PALLADIUM."

Bentonville: town; connected by a branch road with St. Louis and San Francisco R. R.; capital of Benton co., Ark. (for location of county, see map of Arkansas, ref. 1–A); 170 miles N. W. of Little Rock. It is the center of a fruit-growing country; has an active trade in tobacco, etc., and has a large fruit-evaporating industry. Here are nine churches (two colored) and a public school. Pop. (1880) 696; (1890) 1,677; (1900) with suburbs, 1,843. EDITOR OF "DEMOCRAT."

Bentonsville: a post-village of Johnston co., N. C., in a township of its own name; about 17 miles W. of Goldsboro. After the battle of Averysboro (Mar. 16, 1865) the army of Gen. Sherman advanced toward Goldsboro, but Gen. Johnston, who had been concentrating at Smithfield, N. C., slipped out at night in light marching order, expecting to crush the left wing of Sherman's army, under Gen. Slocum, before support could reach him. Gen. Slocum, marching toward

Goldsboro, struck Johnston at about 6 A. M., Mar. 19, and was at first driven back, but throwing up rifle-pits, assumed the defensive, Kilpatrick with his cavalry supporting his left. Johnston failed to dislodge the veterans of Slocum from their position, while the artillery fire upon the Confederates was very damaging. By morning re-enforcements had arrived to Slocum's aid, and during the day the original line was reoccupied and strengthened. The Confederates spent the day in fortifying their position. On the morning of the 21st the right wing arrived, and the day was spent in placing it in position on three sides of Johnston and pressing the troops close to his works, but Johnston hastily retreated during the night of Mar. 21 on Smithfield and Raleigh. The Federal loss was upward of 1,600, killed and wounded; the Confederate loss is reported as 239 killed, 1,694 wounded, and 673 prisoners; total 2,696. Pop. of township (1880) 1,076; (1890) 1,004; (1900) 1,184. Revised by JAS. MERCUR.

Benue (i. e. the mother of waters): a large river of Central Africa; the principal tributary of the Niger or Quorra. It rises in the mountains of Adamawa and flows nearly westward, making the southern boundary of Sokoto, and enters the Niger at Lokoya, about 300 miles from its mouth. Dr. Barth in 1851 crossed it near lon. 12° 30' E., and found it there about 800 yards wide. Dr. Baikie in 1850 ascended the Benue to Dulti or Dolti, which is about 400 miles from its mouth. A second expedition to explore this river was undertaken by Dr. Baikie in 1861. In 1867 Gerhard Rohlfs traveled up this river from Dagbo to its entrance into the Niger at Lokoya, a distance of about 150 miles.

Benwood: town; Marshall co., W. Va. (for location of county, see map of West Virginia, ref. 4-G); on B. and O. and O. River R. Rs.; 4 miles S. of Wheeling, in the midst of an iron-mining region. Pop. (1890) 2,934; (1900) 4,511.

Benyowsky, baŷ-ně-ōv'skěe, MAURICE AUGUSTUS, Count de: Hungarian adventurer; b. at Werbo, 1741; taken prisoner 1761 while fighting for the Polish confederation; banished to Kamtchatka; tutor in the family of the governor; gained the affections of the governor's daughter, who assisted him to escape after a struggle in which the governor was killed; with ninety-six companions sailed in a ship well armed and provisioned, and reached France in 1772; invited by the French Government, he sailed to Madagascar to found a colony, and was there made king in 1776, adopting the native costume; becoming involved in difficulties with the French, he was killed in battle, May 28, 1786. See *Memoirs and Travels of Benyowsky*, written by himself (1790).

Ben'zene, or **Ben'zol**: C₆H₆; the first member of an important series of compounds containing carbon and hydrogen (hydrocarbons), other members being toluene, C₇H₈, xylene, C₈H₁₀, mesitylene, C₉H₁₂, etc. It was first found in iron vessels in which coal-gas was kept under pressure. It was afterward made by distilling benzoic acid with lime, but is now obtained in enormous quantities from coal-tar, an extremely complex mixture of organic compounds formed in the distillation of coal for the manufacture of gas. When coal-tar is distilled, the oil that first passes over floats on water and is hence called "light oil." It is from this that benzene is obtained.

Benzene is a colorless liquid, of pleasant odor, that boils at 85° C. When cooled down to about the freezing-point of water it solidifies, forming a mass of crystals. It burns easily with a bright flame. It is a good solvent for caoutchouc, gutta-percha, wax, and fatty substances. With nitric acid it forms nitrobenzene, from which in turn aniline is made. All aniline used in the arts is made in this way.

IRA REMSEN.

Benzert: See BIZERTA.

Benzidine: a base made by heating NITROBENZENE (*q. v.*) with caustic soda and zinc-dust. The nitrobenzene is thus converted into hydrazobenzene. When this is treated with strong hydrochloric acid it is transformed into benzidine. There is a close relationship between this compound and ANILINE (*q. v.*). The latter is an amido derivative of BENZENE (*q. v.*), and is represented by the formula C₆H₅.NH₂. Benzidine is an amido derivative of the hydrocarbon diphenyl, C₆H₅, and is represented by the formula $\begin{matrix} C_6H_5 & & C_6H_4.NH_2 \\ | & & | \\ C_6H_5 & & C_6H_4.NH_2 \end{matrix}$. Valuable dyes are obtained by converting it into a diazo compound, and treating this with phenols and amido compounds. See BENZIDINE DYES.

IRA REMSEN.

Benzidine Dyes: products of the action of various PHENOLS (*q. v.*) and amido compounds on the diazo compounds

obtained from BENZIDINE (*q. v.*) and TOLIDINE (*q. v.*). The first important dye of this class known was *Congo-red*, which is prepared by the action of diazotized benzidine on naphthionic acid. (See NAPHTHALENE.) Congo-red and the other benzidine dyes dye cotton without the aid of a mordant, and are known as *substantive dyes*. Other dyes belonging to this class are *chrysamine*, formed from diazotized benzidine and salicylic acid; and *benzopurpurin*, formed from diazotized TOLUIDINE (*q. v.*) and naphthionic acid. (See NAPHTHALENE.) This is one of the most extensively used dyes.

IRA REMSEN.

Benzine: See PETROLEUM.

Benzo'ic Acid: a substance, C₇H₆O₂, first obtained from gum benzoin. It occurs also in a number of natural resins, and in some sweet-smelling flowers. It is now prepared from gum benzoin, from the urine of the cow or horse, and from toluene. In the urine of herbivorous animals there is a compound known as hippuric acid, which breaks down easily by putrefaction or by treatment with hydrochloric acid into benzoic acid and glyecoll or glycine. TOLUENE (*q. v.*) is a hydrocarbon closely allied to benzene, and obtained like it from coal-tar. By oxidation, or, better, by treatment with chlorine and subsequent oxidation, toluene yields benzoic acid, and most of the acid that comes into the market at the present time is obtained from toluene. Benzoic acid crystallizes in lustrous leaflets; it is easily sublimed. It is used in medicine, the natural product from gum benzoin being alone suitable for this purpose. The artificially prepared acid is used in the manufacture of aniline blue.

IRA REMSEN.

Benzo'in, or **Gum Ben'jamin** (Lat. *benzo'inum*): a fragrant resinous substance; is the concrete juice of a tree called *Styrax benzoin*, which is a native of Sumatra, Siam, and Borneo, and belongs to the natural order STYRACACEÆ (*q. v.*). The resin is obtained by making incisions in the bark of trees which are cultivated for that purpose. It is extensively used as incense in Roman Catholic and Greek churches; is also used in perfumery, and in medicine as a stimulant, emetic, and styptic. A tincture of benzoin is sometimes applied to wounds, and is employed in making a cosmetic called virgin's milk.

Benzo'in odoriferum: a shrub more correctly called *Lindera benzoin*, of the family Lauraceæ, a native of the U. S., popularly called benjamin-tree, spice-bush, etc. Its bark is aromatic, stimulant, and tonic, and has been used as a remedy for intermittent fevers.

Benzol: See BENZENE.

Benzopurpurin: See BENZIDINE DYES.

Beothukan Indians: the Beothuks; a linguistic stock or family of North American Indians which, so far as is known, consisted of a single tribe. Their only known habitat was the valley of the Exploits river in Newfoundland. It is, however, probable that the entire area of Newfoundland was in their possession at the time of its discovery by Cabot in 1497. The name Beothuk, or Beothik, is derived from a native word meaning "men," or perhaps "human beings"; but King reported that *Shavatharott* was the name which these Indians claimed for themselves. They were also called by Latham the "Good-night" Indians, from a mistranslated word which resembled the term Beothuk in sound. The term "Red Indians," or, better, "Red-men," is a literal rendering of a Micmac name for them, bestowed from the fact that the Beothuks painted their bodies and their property with red ochre.

Before the examination by Mr. Gatschet, of the U. S. Bureau of Ethnology, of the scanty accessible material of their language established its position as constituting a distinct linguistic stock, it had been considered as distantly related either to the Eskimauan or to the Algonquian family, although the appearance, manners and customs, lodges and canoes of the people as described distinguished them from the tribes of either of the families mentioned.

Owing to wars with the Micmacs, and to famine, the Beothuks became extinct, or were absorbed by other tribes, within the decade ending with 1830. See INDIANS OF NORTH AMERICA.

GARRICK MALLERY.

Berabera: See BARABRA.

Be'owulf: the title of a celebrated Anglo-Saxon poem, written not later than the eighth century, and having for its subject a semi-fabulous hero of Denmark. There is only one MS. of it in existence: this belongs to the tenth century, and is in the British Museum. It was first edited by Thor-

kelin (Copenhagen, 1815); by Harrison and Sharp (Boston, 1883; 3d ed. 1888); Eng. trans. first by Kemble (1833); other trans. by H. W. Lumsden (London, 1881; 2d ed. 1883); J. M. Garnett (Boston, 1882).

Béranger, baÿ'raän'zhay', JEAN PIERRE, de: French lyric poet; b. in Paris, Aug. 19, 1780. He passed about three years as an apprentice to a printer, and never received a very liberal education. He was neglected by his father, and spent many of his early years with an aunt, who imbued his mind with virtuous and republican principles. His first essays in verse, which were written under the pressure of poverty, obtained for him in 1804 the patronage of Lucien Bonaparte. He was employed for nearly twelve years as a clerk or subordinate secretary in the University of Paris. He published in 1815 a volume of songs (*Chansons morales et autres*) which became very popular. Some of his verses were political, and contained satirical passages which were offensive to the royalists, then the party in power. Having produced another volume of poems in 1821, he was prosecuted and sentenced to an imprisonment for three months. This increased the popularity of his songs, but failed to restrain the freedom of his satire or abate the ardor of his republicanism. He published a third volume in 1825, and in 1828 a fourth volume, for which he was sentenced to pay a fine of 10,000 francs and to be imprisoned for nine months. In 1830, however, convinced that the time had not yet come for a republic, he did much by his advice to his friends, the leaders of the revolution of July, toward establishing Louis Philippe on the throne. He refused to accept royal favor as a reward, nevertheless; and, with the exception of the brief episode of his unwilling election to the Assembly in 1848, he spent the rest of his life in retirement, revising his poems, preparing his memoirs, and corresponding with many of the best spirits in France. His songs, which had so remarkable an influence over his countrymen, are wonderful for the clearness and perfection of their style, at the same time that they are beautifully various with gayety and with pathos. D. in Paris, July 16, 1857. See his memoirs, *Ma Biographie* (1858); his *Correspondance* (1860); P. Boiteau, *Vie de Béranger* (1861); A. Arnould, *Béranger, ses amis, ses ennemis, et ses critiques* (1864); J. Janin, *Béranger et son Temps* (1866); Sainte-Beuve, *Portraits Contemporains* (vol. i.).

Revised by A. R. MARSH.

Berar, baÿ'raar', or **The Berars'**: a commissionership of Central India; between lats. 19° 30' N. and 21° 46' N., and longs. 76° and 79° 13' E.; bounded on the N. and E. by the Central Provinces, on the S. by Haiderabad, on the W. by Haiderabad and the Bombay Presidency. Area, 17,714 sq. miles. It falls into two distinct sections—the lowlands of the north and the Balaghat or highlands of the south: the first are fertile, but unattractive and nearly treeless; the second picturesque and with forests, but not so suitable for cultivation. Cotton is the chief crop, and is of fine quality; millet, wheat, rice, linseed, the castor-plant, and the sugar-cane are also cultivated. There is little manufacturing—chiefly cotton-cloth of poor quality, carpets, and saddlery. The Nagpur branch of the Great Indian Peninsular Railway traverses the province from east to west. The Berars were ceded to the British by the Nizam of Haiderabad in 1853 as payment for a debt. Pop. (1901) 2,752,418, of whom about 86 per cent. are Hindus. The principal towns are Elichpur, a former capital, Amraoti, Akat, Akola, and Karinja.

M. W. H.

Berat': a town of European Turkey; in Albania; on the river Ergent, here crossed by a bridge; 30 miles N. E. of Avlona (see map of Turkey, ref. 4-B). It contains a citadel, several Greek churches, and a number of mosques. It is the seat of a Greek archbishop. The population is estimated at 12,000, a majority of whom are Greeks.

Béraud, baÿ'rō'. JEAN: genre-painter of subjects taken almost exclusively from Parisian life, and an artist of much talent, whose work is notable for good drawing and great truth of observation; b. at St. Petersburg of French parents about 1845; pupil of Bonnat; first-class medal, Paris Exposition, 1889; Legion of Honor 1887. His latest works (1890-92) have been modernized conceptions of scenes in the life of Christ. *La Madeleine* represents a woman in the costume of to-day at the feet of Christ, who sits at a table in a supper-room in a Paris restaurant, and the scene of *The Descent from the Cross* is placed on Montmartre overlooking the city of Paris, with a group of people who are working men and women of the vicinity. Studio in Paris.

WILLIAM A. COFFIN.

Ber'ber, or **El Mesherif**: a town of Nubia, on the Nile (see map of Africa, ref. 3-G). Roads lead from here to Egypt and Khartum. It has considerable trade. Pop. 8,000.

Ber'bera: a seaport station of Eastern Africa, in Somali; on the Gulf of Aden, 160 miles E. S. E. of Zeyla (see map of Africa, ref. 4-II). Here is held an annual fair, which is attended by 10,000 to 20,000 persons from various foreign countries. They bring coffee, gold-dust, ivory, slaves, cattle, etc., to exchange for cotton, rice, and Indian piece-goods. The fair begins in November, and continues nearly six months. It has an excellent and capacious harbor.

Berberida'ceæ: See BARBERRY FAMILY.

Ber'bers [from the Arabic name, *barbar*, *berber*]: a name given to the uncivilized, nomadic tribes of aborigines who inhabit the mountainous regions of Barbary and the northern part of the Desert of Sahara. They include the Kabyles, Tuaregs, and other Saharan peoples. They are the descendants of the aboriginal or ancient inhabitants of Northern Africa, who occupied the country before it was conquered by the Arabs, and they are the most numerous part of the present population. The Berbers vary in complexion with situation. Those who inhabit the high valleys of the Atlas have light hair and eyes, while those who occupy the oases of the Sahara are dark, approaching the Negroes in complexion, though their features are entirely unlike theirs. Their language is allied to the Semitic in type, and has received from F. W. Newman the name of sub-Semitic. Language, customs, and physical type seem to indicate affiliation with the Semitic races of Asia and Eastern Africa. They are warlike, cruel, and very tenacious of their independence. In religion they are bigoted Mohammedans. They keep cattle and sheep, cultivate fruit-trees, and practice agriculture in a rude manner. Many of them live in tents or in clay huts.

Berbice, ber-bees': the eastern division of BRITISH GUIANA. See GUIANA.

Berchta, bārch'ta: name given in south of Germany and Switzerland to a spiritual being apparently the same as the Hulda of Northern Germany. This being represented originally one of the kindly aspects of the unseen powers, and Hulda is still so traditionally represented; but Berchta developed rather into an object of terror used frequently to frighten children. She has the oversight of spinners. The last day of the year is sacred to her, and if on that day she finds any flax left on the distaff she spoils it. She is represented as having a long iron nose and an immensely large foot. She is the original of all the myths of the White Lady.

C. II. THURBER.

Berchtesgaden, bārch'tez-gaa'den: county in the Salzburg Alps in the S. E. of Bavaria. Area, 155 sq. miles. The country is mountainous and unproductive, but extremely picturesque. Formerly an ecclesiastical territory, it became in 1803 a principality of the Electorate of Salzburg, and since 1810 has belonged to Bavaria. The capital, of the same name, much visited by travelers, has a royal château, interesting salt mines, and is celebrated for the manufacture of toys and articles of wood, iron, and ivory, and other things famous as *Berchtesgaden* wares. Pop. of town (1890) 2,300.

C. II. THURBER.

Berek'mans, PROSPER JULES ALPHONSE, A. M.: one of the leading horticulturists of the U. S. and president of the American Pomological Society; was born at Aerschot, Belgium, Oct. 13, 1830. His father was author of *Album de Pomologie*, a leading Belgian work. He removed to the U. S. in 1850, and in 1857 moved to Georgia, where he has since resided. He was one of the commissioners of the World's Exposition at New Orleans in 1884.

Berdiansk, bār-dēe-aansk': a seaport-town of Russia; government of Taurida; on the north shore of the Sea of Azof; 184 miles N. E. of Simféropol (see map of Russia, ref. 10-D). It has a good roadstead and an active trade, and has been remarkable for its rapid growth. It was founded in 1827, was recognized as a town in 1835, and became capital of a circle in 1842. Its principal industries are the boiling of tallow and the manufacture of bricks, tiles, and macaroni. It derives its prosperity partly from the coal mines and salt lakes of the vicinity. Pop. (1882) 20,849.

Berditchef': a town of Russia; province of Kiev; 194 miles N. W. of Elisabetgrad (see map of Russia, ref. 9-C). It is meanly built, but is an important commercial town,

having four annual fairs, held between Aug. 15 and Sept. 15. The value of the goods, cattle, corn, wine, etc., sold here annually is estimated at \$3,000,000. Pop. (1882) 52,563; (1897) 53,728.

Bere'a: village (founded in 1829); Cuyahoga co., O. (for location of county, see map of Ohio, ref. 2-II); on Cl., Cin., Chi. and St. Louis and Lake Sh. and Mich. S. R. R.s.; 12 miles S. W. of Cleveland, with which it is connected by an electric railway line. Berea is noted for its extensive quarries of sandstone, 18,000 carloads having been shipped in a year. It is the seat of Baldwin University and German Wallace College, both Methodist Episcopal; has excellent public schools and seven churches; is lighted by natural gas and electricity. Pop. (1880) 1,682; (1890) 2,533; (1900) 2,510.

EDITOR OF "ADVERTISER."

Berea College: in the southern part of Madison co., Ky.; 40 miles S. of Lexington. Its founders and promoters were Rev. John G. Fee and Rev. J. A. R. Rogers, natives, respectively, of Kentucky and Connecticut. It long enjoyed the fostering care of the American Missionary Association. For twenty years from 1869 Rev. E. H. Fairchild was president. Always anti-slavery in character, its leading friends were driven from the State just before the war. At its close some returned. A college charter was obtained, and since 1873 classes have been graduated yearly. There are three courses: classical, philosophical, and scientific (for males and females). White and colored are admitted, the colored slightly predominating. In 1900 about 700 students, chiefly from the mountain districts of Tennessee, Kentucky, Virginia, and North Carolina, were on the roll, with 26 professors and teachers. Endowment, \$500,000: value of buildings about the same. President, Wm. H. Frost, Ph. D., D. D. L. V. DODGE.

Bere'ans: an obscure sect seceding from the Established Church in Scotland; founded by Rev. John Barelay (b. in Muthill, Perthshire, 1734; d. in Edinburgh, July 29, 1798) in 1773. They take their name from Acts xvii. 11; deny natural theology; make all the Psalms Messianic; hold assurance to be of the essence of faith, and unbelief the unpardonable sin. Their numbers are small and diminishing. Barelay's *Works*, with memoir, were published, Glasgow, 1852.

Revised by S. M. JACKSON.

Beregh, báy-reg': a county of Hungary; bounded N. E. by Galicia, E. by the county of Marmaras, S. by the counties of Ugocsa and Szatmar, W. by the county of Szabolcs, and N. W. by the county of Ungvear. Area, 1,440 sq. miles. The country is mostly mountainous, and produces wine. Pop. (1890) 179,208. Chief town, Munkacs.

Berengarius of Tours: a mediæval theologian; b. at Tours about 1000; d. in the neighboring island of St. Cosme, 1088; a pupil of Fulbert of Chartres; became in 1031 the director of the cathedral school in his native place, and in 1040 Archdeacon of Angers. He was a man of both talent and learning, and he soon brought the school into a most flourishing condition. But he was an independent character, of a somewhat rationalistic turn of mind. Concerning the Lord's Supper he held views very different from those which, since the days of Paschasius Radbertus (ninth century), had become generally adopted by the Church, preferring the older view advocated in the same century by Ratramnus. He ascribed to this sacrament only the character of a commemorative act, decidedly rejecting the idea of its being a constantly renewed sacrifice; and the change which the elements were believed to undergo during the celebration he considered to be merely symbolical, declaring the doctrine of transubstantiation an absurdity. People soon became aware that the great teacher of Tours deviated from the commonly accepted course of the Church, and Berengarius himself contributed much to call forth a conflict by his letter to Lanfranc. His view was condemned by the synods of Rome and Vereelli, both in 1050, and he was for a time imprisoned. Hildebrand (later Gregory VII.) came to his aid, and persuaded the Council of Tours (1054) to accept a general statement that the elements after consecration were the Body and Blood of Christ. In 1059 he was forced in a synod in Rome to retract his real views, but on his return to Tours renewed their advocacy. In 1079 he was by another synod in Rome compelled to retract a second time. Again when safe home he repented of his recantation, and recalled it, but, convinced that he could not make headway against the reigning theory, he retired to the island of St. Cosme, and lived in solitude, but he had, nevertheless, many followers. His works are in Migne, *Pat. Lat.*, CLXXVIII,

sep. ed. by A. F. and F. T. Vischer of his chief book *De sacra cœna* (Berlin, 1834). See H. Sundendorf, *Berengarius Turonensis, oder eine Sammlung ihre betreffender Briefe* (Berlin, 1850); cf. Hefele, *Koncilien-geschichte* (vol. 5, 2d ed. 1886).

Revised by S. M. JACKSON.

Bereni'ce: a daughter of Magas, King of Cyrene; married to Ptolemy Euergetes, King of Egypt. During his absence on a military expedition she made a vow to sacrifice her hair to Venus for his safe return, which vow she performed. The hair having disappeared over night, the astronomer Conon reported that Jupiter had transformed it into the constellation now called *Coma Berenices* (Berenice's Hair). She was put to death by her son, Ptolemy Philopator, in 222 B. C. See Ramler's *Ptolemäus und Berenice*.

Berenice (called **Bernice** in the New Testament): a daughter of Agrippa I., King of Judea; b. in 28 A. D. She was married to her uncle, Herod, King of Chalcis, and, after his death, to Polemon, King of Cilicia. During a visit to Rome she captivated Titus, the son of the Emperor Vespasian, as she had done Vespasian himself. She was a sister of King Agrippa, before whom St. Paul spoke in his own defense. See Acts xxv. 13, 23; xxvi. 30.

Berenice: an ancient city of Egypt; on the Red Sea; 20 miles S. W. of Ras Bernass. It was founded by Ptolemy Philadelphus, who named it after his mother, and was a great emporium of the trade with India. The modern name is *Sakayt-el-Kublee*. Here are the ruins of a temple of Serapis and other interesting antiquities.

Beresford, Lord CHARLES: See the Appendix.

Beresford, ber'es-fürd, WILLIAM CARR, Viscount: general; b. in Ireland, Oct. 2, 1768; a natural son of the first Marquis of Waterford. He took command of the Portuguese army in Feb., 1809, and fought against the French in the Peninsula. In May, 1811, he defeated Soult at Albuera. He received the title of Duke of Elvas in Spain; was created a viscount in 1823, and was master-general of the ordnance in 1828-30. D. Jan. 8, 1854.

Berezina, báy-re-zee'náá, or **Beresina**: a river of Russia; rises in the government of Minsk, flows southward, and enters the Dnieper above Rechitza. Its length is about 325 miles. It is navigable, and is connected with the Düna by a canal which opens a communication between the Baltic and Black seas. The French army, retreating from Moscow in Nov., 1812, suffered a great disaster in the passage of this river. The French constructed hastily two bridges over the river, but while they were crossing they were attacked by the Russians, who took about 16,000 prisoners. The French loss, besides the prisoners, amounted to nearly 12,000, many of whom were drowned in the river.

Bergaigne, ABEL: Orientalist; b. at Vimy, Pas-de-Calais, Aug. 31, 1838; became Professor of Sanskrit at the Sorbonne. He devoted himself to the criticism and exegesis of the *Vedas*, and published *La religion védique* (Paris, 1883). D. Aug. 6, 1888.

C. R. LANMAN.

Ber'gama (anc. *Pergamum* or *Pergamus*): a ruined city of Asia Minor; in Anatolia; situated in a beautiful valley, on the river Caicus; 46 miles N. N. W. of Smyrna (see map of Turkey, ref. 5-D). Pop. about 6,000. The ancient city was the capital of the kingdom of Pergamus, and the seat of one of the seven churches of the Apocalypse. Here are extensive ruins of a palace, temple, amphitheater, and other edifices.

Bergamo, bãr'gã-mô: a province of Italy; in Lombardy; bounded N. by Sondrio, E. by Brescia, S. by Cremona, and W. by Como and Milan. Area, 1,088 sq. miles. The northern part is mountainous. The soil of the plains and valleys is fertile. Silk is among the products. Pop. (1890) 412,393. Capital, Bergamo.

Bergamo (anc. *Bergomum*): a city of Italy; capital of province of same name; on several low hills, 39 miles by rail N. E. of Milan (see map of Italy, ref. 2-C). It presents a very picturesque appearance, and is well built. It has a castle, a cathedral, a college, a library, a theater, many convents and churches; also extensive manufactures of silk, cotton, linen, and woolen fabrics. *Bergomum* was destroyed by Attila in 452 A. D., after which it became an important city of the Lombard kings. Pop. 39,000.

Ber'gamot: the fruit of a tree which is a species or variety of the genus *Citrus*; also called **Bergamot Orange**, or **Mellaro'sa**. According to most botanists, it is a variety of the orange (*Citrus aurantium*). It is cultivated in the

south of Europe. The fruit is pear-shaped, of a pale yellow or green color, and has a green, sub-acid, and fragrant pulp. From its rind is obtained by distillation the oil of bergamot, which has a very agreeable odor, is extensively used in perfumery, and is an ingredient in eau-de-cologne and several fragrant essences. *Wild bergamot* is a name applied to the *Monarda fistulosa*, a common wild mint, because of its odor.

Berge, bār'ge, WILLIAM: organist; b. in Witzenhausen, Hesse-Cassel, Germany, in 1824; studied under his father, Spohr, and Volckmar. When seven years old he played the organ in church. Studied first for the ministry in the Reformed Church, but afterward became a Roman Catholic. Moved to New York in 1846, and was appointed organist of several churches, finally becoming organist of St. Francis Xavier church in Sixteenth Street, remaining there till within two years of his death, which occurred on Apr. 6, 1883. In 1847 appointed Professor of Music in the College of the Sacred Heart; founded and conducted the Berge Choral Union, which produced Beethoven's *Ninth Symphony* with Thomas's orchestra in 1866. He composed some organ pieces and several masses. His playing was brilliant, quick, and accurate, and his sight-reading remarkable. D. E. HERVEY.

Bergen, bār'gen: an important city and seaport of Norway; capital of province of Bergen; at the head of a deep bay (fiord) of the Atlantic; 184 miles W. N. W. of Christiania; lat. 60° 24' N., lon. 5° 18' E. (see map of Norway and Sweden, ref. 10-A). It is picturesquely situated at the foot of a mountain, and inclosed on nearly all sides by water. The harbor is deep and safe, and is defended by several forts. Bergen is well built, has a cathedral, several hospitals, a theater, a public library, a national museum, and a college. It is the seat of one of the three public treasuries, and is probably the most commercial town of Norway. A large portion of the population is employed in the fisheries, and fish and cod-liver oil form the chief articles of export. It is stated that in the spring 600 fishing-vessels may be seen at once in the harbor. These vessels bring cargoes of fish, caught in the preceding winter on the northern shores. Bergen was founded in 1070, and was once a Hanse town. Pop. (1891) 53,686.

Bergen-op-Zoom, bār'gen-op-zōm', or **Berg-op-Zoom**: a strongly fortified town of Holland; in North Brabant; on the river Zoom, at its junction with the East Scheldt; 27 miles by rail W. S. W. of Breda (see map of Holland and Belgium, ref. 8-D). It is important as a military position, and has often been besieged. The Spaniards made unsuccessful attempts to take it in 1588, in 1605, and in 1622. In the last-named year General Spinola lost about 10,000 men in the siege. It was taken by the French in 1747, and again in 1794. A British army attacked it without success in Mar., 1814. Pop. (1890) 12,667.

Berger, bār'zhay', GEORGES: French civil engineer and administrator; b. in Paris, 1834; began life as a mining engineer, but soon left that career to devote himself to the fine arts, developing his tastes by many travels in Egypt and the East. His erudition was both varied and profound, and so great that he was selected to organize the foreign section of the Exposition of 1867. In the Exposition of 1878 he was in charge of the same section; and was director-general of the Exposition of 1889. He has also organized other expositions. He was in 1876-77 adjoint professor at the School of Fine Arts. He has published his views on the *Exposition internationale* of 1869; *Projet d'organisation administratif* (1885); and *l'École française de peinture depuis ses origines jusqu'à la fin du règne de Louis XIV.* (1879). W. R. H.

Berger, PHILIPPE: French Semitic scholar; b. in Beaucourt, Sept. 15, 1846; studied theology under the Protestant faculty at Strassburg; became Professor of Hebrew in the Faculty of Protestant Theology at Paris 1877. He has taken part in the editing of the *Corpus Inscriptionum Semiticarum*, and is the author of various articles and books, of which may be mentioned *L'Arabie avant Mahomet d'après les inscriptions* (Paris, 1885). C. H. TOY.

Berger, SAMUEL: brother of the preceding; b. in Beaucourt, May 2, 1843; studied at Strassburg and Tübingen; became assistant preacher in the Lutheran Church in Paris 1867; librarian to the Faculty of Protestant Theology there 1877. Of his works may be mentioned *La Bible au seizième Siècle* (Paris, 1879); *La Bible française au moyen-âge* (1884); *Le palimpseste de Fleury* (1889).

Bergerac, bār'zhāy'raak': a town of France; in Dordogne; situated in a fertile plain on the right bank of the river Dordogne, here crossed by a fine bridge of five arches; 27 miles S. W. of Périgueux, and 51 miles E. of Bordeaux (see map of France, ref. 7-E). It has a college, a public library, and manufactures of paper, hosiery, serges, and copper-ware. The Bergerac wine produced in this vicinity is highly esteemed. Pop. (1896) 15,642.

Bergerac, SAVINIEN CYRANO, de: French dramatist; b. in Périgord about 1620; served in the army; a celebrated duelist; author of *Agrippina*, *Le Pédant joué*. D. in Paris, 1655.

Bergh, HENRY: philanthropist; b. in New York, 1823; educated at Columbia College; author of *Love's Alternative*, a drama; *Married Off*, a poem; *The Portentous Telegram*; *The Ocean Paragon*; *The Streets of New York*, etc. In 1863 Mr. Bergh was made secretary of legation to Russia, and also acted as vice-consul there. He was the founder and first president of the American Society for the Prevention of Cruelty to Animals. The society was incorporated Apr. 10, 1866, and there are in all thirty-eight States and Territories of the U. S. and Canada which have followed the example of New York. The crowning act of Mr. Bergh's life was the establishment of the Society for the Prevention of Cruelty to Children, which has its duplicate in every State and Territory of the U. S. D. in New York city, Mar. 12, 1888.

Berghaus, bārch'hows, HEINRICH: German geographer; b. at Cleves, May 3, 1797; geographical engineer in the War Department at Berlin 1816; Professor of Mathematics, Academy of Architecture, 1824; published *Elements of Geography* (1842); *Ethnography* (1846); *Nations of the Globe* (1845); German edition of Catlin's *Indians of North America*. D. in Stettin, Feb. 17, 1884.

Berghaus, HERMAN: cartographer; nephew of the preceding; b. at Herford, Westphalia, Germany, Nov. 16, 1828; entered the Geographical Institute of Justus Perthes at Gotha in 1850. Among his numerous publications may be mentioned his *Karte des Oetzthales Gletschergebietes* (1861); *Chart of the World* (1863), which has gone through many editions; *Physikalische Wandkarte von Europa* (1875); *Karte der Alpen* (1878); *Physikalische Wandkarte von Afrika* (1881); *Berghaus's Physikalischer Atlas* (still in process of publication 1893). In the last he was aided by all the best scientific men of German speech. D. at Gotha, Dec. 3, 1890.

Berghem, bārch'hēm, NIKOLAAS: Dutch landscape-painter; original name *Van Haertem*; b. in Haarlem, 1625; pupil of Van Goyen, Jan Wils, and Weenix; painted with great facility and on a great variety of subjects. His pictures are noted for graceful touch, harmonious coloring, and natural composition. D. in Haarlem, 1683.

Bergk, bārch, THEODOR: classical scholar and critic; b. in Leipzig, May 22, 1812. He studied in his native city from 1830-35, and took his degree in Rostock in 1836. Called in 1842 as Professor of Classical Literature to Marburg, and in 1857 to Halle. Continued illness compelled him to resign his position in 1867. He died in Ragatz, July 20, 1881. Among his most noteworthy publications are his work on Aristophanes, his edition of the Greek lyric poets, and an unfinished history of Greek literature (4 vols.). See A. Schäfer, *Biogr. Jahrb.*, iv., pp. 105-110 (1881).

Bergmann, bārch'maan, CARL: musician; b. at Ebersbach, Saxony, Apr. 11, 1821, and when six years old was placed under the instruction of Adolf Zimmermann. His parents moved to Hesse, and there he continued his studies, becoming a proficient performer on the violoncello, and afterward a leader of the orchestra. Having taken part in the rebellion of 1848, he was forced to leave Germany, and came to New York in the autumn of 1849. He became leader of the Germania Society, and a few years later was chosen conductor of the Philharmonic Society, which position he retained until his death in Aug., 1876. He was also elected leader of the Arion Society in 1855, and in the season of 1865 he conducted the opera in the Academy of Music. He also conducted several singing festivals. He was one of the earliest advocates of Wagner's music in this country. He composed an opera, a symphony, and some concert pieces before he had attained his twenty-seventh year, but it is as a conductor of eminence that his fame is secure. D. E. HERVEY.

Bergmann, ERNST, von: German surgeon; b. in Riga, Dec. 16, 1836; studied in Dorpat, Vienna, and Berlin; served with the armies of Prussia and Baden in the wars of 1866 and 1870; Professor of Surgery in University of Würzburg 1878-82; appointed Professor of Surgery and director of the surgical clinic, University of Berlin, 1882. Among his more important writings are *Ueber Fettembolie*; *Das putride Gift*; *Das Sepsin*; *Zur Lehre von der putriden Intoxication*, etc.

Bergmann, TORBERN OLOF, Ph. D.: a Swedish chemist; b. at Catherinberg, West Gothland, Mar. 20, 1735. He was educated at the University of Upsal, and devoted himself to natural history, physics, and mathematics. He obtained the chair of Chemistry at Upsal in 1767. He discovered sulphuretted hydrogen, and first obtained important results from the use of the blowpipe. He laid the foundation of the science of crystallography. Among his works are an *Essay on Electric Affinities* (1775) and *Opuscula Physica et Chemica* (6 vols., 1779-90). D. in Medevi, on the Wettersee, July 8, 1784. See P. F. Aurivillius, *Aminnelse-Tal öfver T. O. Bergmann* (1785); Biot, article in the *Biographie Universelle*.

Bergmehl, bārch'māyl [Germ., mountain-meal]: an extremely fine powder found in geological strata of recent (Eocene) formation, and composed of effete and indestructible silicious frustules of *Diatomaceæ*, which are microscopic plants of the class *Algæ*. Vast beds of these fossils occur in Germany, Lapland, Virginia, Maryland, Vermont, New Hampshire, and other regions. This powder is mixed with flour, and used as food by the people of Sweden and Norway in seasons of scarcity. It is used in making water-glass and the floating bricks of Southern Europe, and as polishing powder.

Bergslien, bārg'slēn, BRYNJULF: a Norwegian sculptor; b. in Vors, Norway, Nov. 11, 1830; a pupil of Jerichan and Bissen. His best-known work is his bronze statue of Karl Johan in Christiania. R. B. ANDERSON.

Bergslien, KNUT: a Norwegian painter; brother of the sculptor; b. in Vors, May 15, 1827. His pictures of the early history of Norway have given him a wide reputation. R. B. ANDERSON.

Bergsøe, bārg'sö, JORGEN VILHELM: Danish author; b. in Copenhagen, Feb. 8, 1835; was in youth a zoölogist, and as such attained distinction. But in consequence of the failure of his eyesight, and of a long and severe illness, he was disqualified for his favorite study, and went to Italy for his health. He became a successful writer of romances. His first venture, *Fra Piazza del Popolo* (1866), had great success. He has also published *Fra den gamle Fabrik* (The Old Factory, 1869); *I Sabinerbjergene* (In the Sabine Hills, 1871); *Bruden fra Rørvig* (The Bride of Rørvig, 1872); *Gjengangertællinger* (Ghost Stories, 1872); *Italienske Noveller* (Italian Tales, 1874); *Fra gamle Dage* (From Old Days, 1885); *Fra sollyse Strande* (From Sunny Shores, 1886); and other volumes, including several collections of poems. His most ambitious work is *Rome under Pius IX.* (1874-77). Revised by G. L. KITTEDGE.

Berhampur, ber-ān-poor': a town of British India; in the presidency of Bengal, on the Bhagirathi river; 6 miles S. of Murshidābād, and 118 miles by land N. of Calcutta (see map of N. India, ref. 7-1). It is one of the principal British military stations in India, and has an appearance of grandeur and importance. Sanitary improvements have rendered it one of the most healthy places in Bengal. Pop. 24,000.

Bering, bay'ring (commonly but incorrectly spelled **Behring**), **VITUS:** a Danish navigator; b. in Jutland in 1680. He entered the Russian navy at an early age, and fought with distinction against the Swedes. In 1725 he was appointed the commander of an expedition sent to explore the Sea of Kamtchatka. During this voyage, which occupied several years, he discovered Bering Strait (1728), and ascertained that Asia was not joined to America. In a subsequent voyage he was wrecked on Bering's island, where he died Dec. 8, 1741. See his *Life* by P. Lauridsen (Chicago, 1889).

Bering (or *Behring*), bay'ring, **Sea** (also called *Sea of Kamtchatka*): the most northern part of the Pacific Ocean, extending between the peninsulas of Alaska and Kamtchatka. It is connected by Bering Strait with the Arctic Ocean.

Bering (or *Behring*) **Strait:** connects the Pacific Ocean with the Arctic Ocean, and separates Asia from America.

It was discovered by Vitus Bering in 1728. Its width is about 45 miles at the narrowest part, between East Cape (Asia) and Cape Prince of Wales (America). The depth of this strait near the middle is about 30 fathoms.

Bering Sea Controversy: a question in dispute between the U. S. and Great Britain in regard to certain rights connected with seal-fishing in Bering Sea. An understanding of the controversy requires a brief description of the points at issue. The seal-fisheries of the Alaskan coast form the most important item in the commercial activities of that Territory. It was largely in consideration of this fact that the Government of the U. S. acquired possession of Alaska by purchase from Russia in 1867, and since the acquisition of the Alaskan territory the seal-fisheries have afforded a very considerable revenue to the Government. But in order that this revenue may be continued the fishing industries must be protected; and such protection, owing to the peculiar habits of seals, came to involve the international question at issue. The home of the seals is upon the Alaskan coast, which is unmistakably within the domain of the U. S. At a certain season of the year, however, the seals are in the habit of going in great numbers to the Pribyloff islands for the purpose of breeding. These islands also belong to the U. S., having been ceded as a part of Alaska by Russia. But in crossing from the mainland to the islands the seals are obliged to cross Bering Sea, when they are subject to interception by fishing vessels from Canada and elsewhere. In this way great depredations have been committed. Many of the seals killed at this season of the year sink in the sea and are lost, while many of those recovered are of inferior value. These depredations very greatly reduced the value of the industry to the U. S. The Secretary of State, in a dispatch published in 1890, made the statement: "From 1870 to 1885 the seal-fisheries, carefully guarded and preserved, yielded 100,000 skins a year. The Canadian intrusions began in 1886, and so great has been the damage resulting from the destruction of seal life in the open sea surrounding the Pribyloff islands that in 1890 the U. S. limited the Alaska Company to 60,000 skins, but the company was able to secure only 21,000 skins."

The question presented was whether the U. S. Government had a right to protect its property in waters that would ordinarily be regarded as a part of the open sea, where, according to international usage, every nation and people ordinarily has the right to hunt and fish according to its own free will. The claim of the U. S. to this right was asserted in 1887; but in order to avoid a diplomatic issue a proposal was made to Great Britain that a convention should be entered into between the two nations, in which Russia should be invited to join, limiting the periods in the year in which seals might be taken, and prescribing a time covering the period of breeding during which they should not be molested. The expediency of the convention was at once conceded by Great Britain, and the U. S. was invited to prepare and furnish a draft of such regulations as were deemed necessary to accomplish the object. Such a draft was prepared and transmitted, and no question arose as to details. The Russian Government accepted the invitation to join in the convention, and there was every reason to anticipate that the whole question would be satisfactorily adjusted. But an unexpected obstacle arose. It came to be understood that Canada, whose people were profiting by the depredations, declined to assent to the proposed restrictions. As the objections of Canada could not be overcome, the attempt to secure a convention came to an end. The U. S. Government was thus driven to assert its rights under international law or to abandon its claims.

The claim set forth by the U. S. was that the waters in which the depredations were committed are not a part of the open sea but are within the jurisdiction of the U. S. It was evident, however, that this claim must be established, if at all, on unusual grounds; for Bering Sea is more than half as large as the Mediterranean, and is accessible through Bering Straits by a passage more than 30 miles in width and by still wider passages from the S. By ordinary international usage, therefore, Bering Sea, except within a 3-mile line from the shore, would be open to the fishermen of all nations. But the question was complicated by claims set up by Russia, and to some extent admitted in the early part of this century. By general consent all the rights of Russia passed to the U. S. at the time of the purchase. As early as 1799 the Russian Government issued a ukase which

claimed exclusive jurisdiction over Bering Sea down to the fifty-fifth degree of north latitude, and under the protection of this ukase the Russian American Company was formed. It does not appear that any power entered a protest against this claim. But in 1821 the edict of 1799 was reaffirmed by Russia, and was so far enlarged as to extend the claim down to the fifty-first degree. Against this ukase of 1821 both Great Britain and the U. S. entered formal protest; but whether the protest related to the general claim maintained by Russia, or merely to an extension of the limit from the fifty-fifth to the fifty-first degree, is one of the questions involved in the controversy which can not be determined by documentary evidence. As a consequence of these protests Russia made important concessions in the treaties of Apr. 17, 1824, and Feb. 28, 1825. It was agreed that for ten years the contracting powers should have the right to visit the "interior seas, gulfs, harbors, and creeks for the purpose of fishing and trading." At the end of ten years, however, Russia refused to renew the agreement, and consequently, since 1834, the owners of the region have rested upon the rights maintained prior to the treaties of 1824 and 1825. In the treaties of 1843 and 1859 between Russia and Great Britain the privileges of the Russian American Company were specifically recognized, but nothing in the treaties throws any light on the question as to the geographical limits of Russia's claim. In 1870, three years after the purchase of Alaska by the U. S., the Government gave to the Alaska Commercial Company the privilege of killing annually 100,000 seal on the Pribyloff islands. It was subsequently found, however, that the seal in their passage to and from the islands were interfered with by poachers. Accordingly, Congress, by special enactment, declared that the U. S. had jurisdiction over all the "mainland, islands, and waters" ceded by Russia to the U. S., and that "no person shall kill any otter, mink, marten, or fur seal, or other fur-bearing animal within the limits of Alaskan territory or the waters thereof." In this law there was no statement as to whether the waters referred to included the whole of the region lying between the Pribyloff islands and the mainland. While the U. S. has never formally claimed that the whole of the waters involved are a part of a "closed sea," Great Britain has maintained that the special rights of the U. S. are limited by the 3-mile line prescribed by ordinary international law. If this position is admitted, the claim of the U. S. must rest upon the question whether seal in passing through open waters from one part of U. S. territory to another are entitled to exemption from molestation. The contention of the U. S. might be thus stated. The right to fish in the open sea is not disputed. But the seal is not a fish. On the contrary, it has its abiding-place on the land, to which it regularly resorts and where it may be said to belong. It thus becomes the property of the owner of the land on which it lives, and in passing to the open sea it is entitled to the same protection as any other property. Moreover, even if the seal were to be regarded as a fish, it would be entitled to exemption from pursuit by any method that would result in its extermination. The methods resorted to by the poachers between 1886 and 1890 threaten such extermination. In preventing such a disaster Great Britain is as much interested as the U. S., inasmuch as all sealskins, though belonging to people of the U. S., are taken to London to be dressed and dyed. It was further urged that the sea is not and never has been absolutely free for any purpose whatever that is injurious to the rights, the property, and the honor of a nation that is able to defend itself. It is held that no nation has more frequently or more resolutely asserted this principle than Great Britain, and instances are cited for the purpose of showing that she has never permitted any abstract theory of freedom on the high sea to become a justification for inflicting serious injuries upon her interests or her property for the sake of the profits to be realized by the assailant. In answer to these contentions the Government of Great Britain expressed a willingness in 1891 to submit several of the questions at issue to arbitration by other friendly governments. There was much diplomatic discussion over the questions to be submitted, but the terms of arbitration were finally agreed upon. The Government of Great Britain agreed to a *modus vivendi* for one year to prevent depredations upon the seals. At the end of the year, the matter in arbitration not yet having been settled, she declined to renew the *modus vivendi*. After some correspondence, however, the British Government consented to a renewal in modified form after the U. S. Senate should have ratified the treaty providing

for submitting the questions involved to arbitration. The treaty ratified by the Senate Mar. 29, 1892, provided for submitting the questions in dispute to a commission of seven persons, two appointed by the President of the U. S., two appointed by the Queen of England, one by the King of Sweden, one by the President of the French Republic, and one by the King of Italy. For the outcome of the whole matter, see FISH-ERY RELATIONS OF THE UNITED STATES. The subject is best studied in the diplomatic correspondence; in *Harper's Weekly* for Mar. 7, 1891; in *The Forum* for Nov., 1889; and in *Harper's Monthly Magazine* for Apr., 1891. C. K. ADAMS.

Berja: a town of Spain; province of Almeria; on the south slope of the Sierra de Gador; 22 miles W. S. W. of Almeria (see map of Spain, ref. 20-F). It is in the midst of lead mines, and has manufactures of linen, hats, hardware, etc. Pop. 16,000.

Berke'ley: town; on railroad; Alameda co., Cal. (for location of county, see map of California, ref. 7-C); the seat of the University of California, five preparatory schools, the State Agricultural College, and the California Institution for the Deaf, Dumb, and Blind; is 9 miles E. of San Francisco, across San Francisco Bay, and 5 miles N. of Oakland. Pop. (1880) not given in census; (1890) 5,101; (1900) 13,214 (increase partly due to annexation of territory).

EDITOR OF "ADVOCATE."

Berkeley, baar'kle, GEORGE: philosopher and bishop; b. at Killerin, Ireland, Mar. 12, 1684. He studied at Trinity College, Dublin, where he formed a friendship with Dean Swift, and became a fellow of that college in 1707. He published in 1709 his *Essay towards a New Theory of Vision*, a work of wide reputation. He propounded his celebrated theory of idealism in a *Treatise Concerning the Principles of Human Knowledge* (1710), in which he affirmed that there is no proof of the existence of a material world. The objects of which we are conscious in perception he called "ideas." Their presence he held to be due to the constant agency of the Almighty, who causes them to pass in a real and orderly succession before the mind. His views are the result of the application of rigid logic to the principles which Locke and his school had adopted from Descartes. His method was allied to that of Malebranche, though his conclusions were drawn with a boldness from which the French philosopher recoiled. As distinguished from the egoistic system of Fichte, Berkeley's views have been called theistic idealism. His object was to undermine materialism and counteract skepticism, and he laid the basis of that intuitional philosophy which has ever since been the basis from which Christian metaphysics have opposed the reasoning of inductive skepticism. In 1713 he removed to London, and wrote several essays for the *Guardian*. He accompanied Lord Peterborough as chaplain to Italy, and returned to London in 1720, and to Ireland in the autumn of 1721. In 1724 he became Dean of Derry, worth £1,500 a year. His abundant charity and zeal induced him to engage in an enterprise for the conversion of the American savages, for which purpose he proposed to found a college in America for the education of missionaries. Having received a promise of pecuniary aid from the Government, he married Anna, a daughter of John Forster, Speaker of the Irish House of Commons, in 1728, and sailed to Rhode Island. He purchased a country seat and estate about 3 miles N. E. from the State-house, Newport, within the limits of the present town of Middletown. Naming his place Whitehall, he resided here for two years and a half. About a mile and a half from his house he had his chair and writing apparatus placed in a natural alcove among the hanging rocks on the beach, and in this natural retreat he wrote the greater part of *The Minute Philosopher*. During his residence in Rhode Island he officiated in Trinity church, Newport, and on his return to England in 1733 he sent to the parish an organ, still preserved. His library was distributed among the neighboring clergy. He gave to Yale College a thousand volumes of valuable works and the deed of his farm, the rents of which were to be appropriated to the support of three post-graduate students. He did not succeed in his enterprise because the ministers failed to perform their promise, and he returned to London 1732, and was appointed Bishop of Cloyne in 1734. Among his works are *Aleiphron, or the Minute Philosopher* (1732); *The Analyst* (1734); a *Word to the Wise* (1740); and several books on the virtues of tar water, in whose curative qualities he had great faith. He died at Oxford, Jan. 23, 1753, leaving an excellent reputation as a model of virtue. See Dr. Stock's *Life of Berke-*

ley, prefixed to his works (2 vols. 4to, 1784); G. M. Wright's *Life of George Berkeley* (prefixed to his works, 1843). Berkeley's works have been edited, with a life annexed, by Prof. A. C. Fraser, in 4 vols. (Oxford, 1871).

Revised by WILLIAM STEVENS PERRY.

Berkeley, Rev. MILES JOSEPH, F. L. S.: English botanist; b. in Oundle, Leicestershire, in 1803; educated at Rugby and Christ's College, Cambridge. He obtained several Church preferments, but his chief distinction was won in science. He published *Gleanings of British Algae* (1833); the last volume of the *English Flora* (1836); *Handbook of Cryptogamic Botany* (1857); *British Fungology* (1860); *British Mosses* (1863). He was an authority on fungi, and published many valuable papers on this subject. D. in his rectory, Sibbertoft, July 30, 1889.

Berkeley, Sir WILLIAM: colonial governor and proprietor; b. near London about 1610. He was appointed Governor of Virginia in 1641, and held that office for many years. He was a royalist in the civil war, and was removed from power in 1651 by Cromwell, but became Governor again in 1660. He rendered himself unpopular by his cruelty in putting to death the adherents of Nathaniel Bacon. D. in England, July 13, 1677. See BACON'S REBELLION.

Berkeley, EARLS OF, and Viscounts Dursley (1679): Barons Berkeley (1416, in England); a prominent family of Great Britain.—THOMAS MORETON FITZ-HARDINGE BERKELEY, the sixth earl, b. Oct. 19, 1796; d. Aug. 27, 1822; his father died in 1810, leaving his estates to his oldest son, born before the marriage (1796) of the countess. The title was adjudged to Thomas Moreton, first child born in wedlock; but he did not assume it until 1881. D. in 1882, and was succeeded by RANDAL MOWBRAY THOMAS BERKELEY, b. 1865.

Berkley, Sir GEORGE: civil engineer; b. in London, Apr. 26, 1821; educated in private schools; in 1835 apprenticed to Samuda Brothers, with whom he worked in the shops and on designs of atmospheric railways, steam-engines, etc. From 1841 to 1849 he was assistant to Robert Stephenson, during which time he was engaged on experiments with locomotives, change of gauge, and rolling-stock of the Eastern Counties and Northeastern Railways. From 1849 to 1859 he was engaged on examinations for the water-supply of Liverpool for Robert Stephenson, the engineer to the London and Blackwall, the North and the Southwestern Junction, and other railways. In 1851 he represented Robert Stephenson as engineer of the Great Indian Peninsular Railway, and upon the death of Stephenson in 1859 took his place. In 1874 he was made one of the consulting engineers to the Colonial Office for Railways in Natal, and for viaducts in Cape Colony, in 1885 consulting engineer to the Indian Midland Railway, and in 1887, with his son, became engineer to the Argentine Northeastern Railway. He entered the Institute of Civil Engineers as an associate in 1845, was made full member in 1861, and president in 1892. He was one of the managers of the Royal Institution. He wrote for the institution upon atmospheric railways in 1845, and upon the strength of iron and steel in 1870, bridges founded upon brick walls, communications in Brazil, etc. Knighted in May, 1893; d. Dec. 20 same year. W. R. HUTTON.

Berkley: town; Norfolk co., Va. (for location of county, see map of Virginia, ref. 7-J); on Nor. Southern R. R., and on Elizabeth river; has ship-building, cotton, and lumber industries, and is connected with Norfolk, a mile distant, by ferry. Pop. (1890) 3,899; (1900) 4,988.

Berkley Springs: a village of Morgan co., W. Va.; 2½ miles S. of the Potomac river and the Baltimore and Ohio R. R., at Sir John's Run; 128 miles W. N. W. of Baltimore (for location, see map of West Virginia, ref. 5-M). Here are medicinal springs, which are much frequented, and have a temperature of 74° F. They are useful in rheumatic, calculous, nervous, and catarrhal diseases. It has a large tannery. Pop. (1880) 534; (1890) not separately returned; (1900) 781.

Berkshire: an inland county of England; bounded N. by Oxford and Bucks, E. by Surrey, S. by Hampshire, and W. by Wiltshire; area, 722 sq. miles. The river Thames forms its entire boundary on the N. and N. E. The surface is beautifully diversified by hills and valleys. In the S. E. is Windsor Forest and Park. Wheat, oats, horses, and swine are the staple products. Pop. (1881) 218,363; (1891) 176,119; (1901) 180,366. Capital, Reading.

Berlad, bār'laat': a town in Roumania; on the Berlad; 63 miles S. of Jassy (see map of Austria-Hungary, ref. 7-II). It is an entrepôt for grain. Pop. 26,568.

Berlichingen, bār'lich-ing-en, GÖTZ or GOTTFRIED, von: famous German knight; surnamed OF THE IRON HAND; b. in 1480 at Fasthausen, in Würtemberg. He lost a hand at the siege of Landshut, and supplied its place by an iron hand. He was a daring and turbulent subject, was involved in several feuds with neighboring barons, and fought for the insurgent peasants against the nobles in the Peasants' war, which closed in 1525. For this offense he was placed under the ban of the empire by Maximilian I. He died in 1562, and left an autobiography (1731). His exploits form the subject of Goethe's drama of *Götz von Berlichingen*.

Berlin, bër-lin': the capital of the Prussian monarchy and of the German empire; the third largest city of Europe; on the river Spree, in lat. 52° 30' N., lon. 13° 24' E. (see map of German Empire, ref. 3-G). The city during the Middle Ages was the capital of the Mark of Brandenburg, and became chief city of the consolidated territory of Brandenburg and Prussia when these were united into a kingdom. The city received an important impulse from its connection with the Hanseatic League, and from the remarkable political and military activity of the Great Elector. Under Frederick the Great the population increased, until at his death it numbered about 115,000. In 1817 it had grown to 188,000; in 1844 to 311,000; in 1851 to 436,000; and in 1867 to 702,000. The greatest impulse, however, was given to the city when, in consequence of the Franco-Prussian war of 1870-71, it became the capital of the new German empire. In the next twenty years its growth was so rapid that in 1891 the population was 1,579,244. Of these, about 135,000 were Roman Catholics and 80,000 Jews. The others were Protestants, and, for the most part, members of the United Evangelical State Church. Pop. (1900) 1,843,000. The principal streets are the Unter den Linden, with its four rows of lime-trees and stately Brandenburg gate, the Wilhelmsstrasse, the Königsstrasse, and the Leipzigerstrasse. The city abounds in public places of unusual interest, among which may be mentioned the Opera-house, the Old Palace, known as the Schloss, the Lustgarten, the Gensdarmenplatz, the Wilhelmplatz, the Thiergarten, the Belle Alliance Platz, the Leipziger Platz, the Pariser Platz, and the Charlottenburg Mausoleum. The statue of Frederick the Great, by Rauch, at the head of Unter den Linden, is one of the most imposing ever erected. In other parts of the city are to be seen statues of Schwerin, Winterfeld, Seidlitz, Keith, Zieten, Von Bülow, Leopold of Dessau, and the Great Elector. The Castle Bridge, built in 1824 upon two massive stone arches, is decorated with eight interesting allegorical groups in marble. The Old and the New Museums have many features that are unsurpassed in the world. What is known as the Old Museum was built in 1828 by Schinkel, and contains the celebrated picture gallery, which is rich, not only in early Italian and German masters, but also in collections of ancient sculpture and other antiquities. The New Museum, erected nearly twenty years later, contains a remarkable collection of Egyptian antiquities brought together by Lepsius.

Institutions of Learning.—The most renowned of the institutions of Berlin is the University, which was established in 1810, under the direction of Wilhelm von Humboldt, and an account of which is given below. The Royal Library numbered in 1890 about 900,000 volumes and more than 18,000 manuscripts; and the library of the University has about 300,000 volumes. The Polytechnicum, erected with a part of the indemnity money received from France after the war of 1870, is one of the most elaborate and imposing educational structures in the world. Other important institutions of learning are the Academy of Science, the Building Academy, the Naval Academy, the Mining Academy, the Pharmaceutical School, the Artillery School, the Singing School, and several institutions for the deaf, dumb, and blind. The city contains ten colleges of the rank of gymnasias and Real schools for the preparation of students for the University and Polytechnicum.

Methods of Administration.—The government of Berlin is republican, but with a method of organization which places virtual control of the city in the hands of those who own the property. Every male inhabitant of Berlin who is a Prussian and twenty-four years of age is a voter, provided: (1) he has lived in the city for one year; (2) is not dependent upon a father or guardian, and enjoys control over his



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BERLIN

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own household and property; (3) has for a year received no alms from public funds; (4) has paid all his municipal taxes during the last year; (5) (a) possesses a house, or (b) pursues a trade with two employees, or (c) pays an income tax, or (d) pays a class tax. The proportion of the inhabitants who under these regulations have the right to vote in the city is about one in seven, or 13 per cent. less than those who have the right to vote at the imperial elections. The most noteworthy characteristic of the government of Berlin, however, is the method by which the voters are divided into classes in such a way as to give to the men of wealth a predominant influence in the government. The voters are divided into three groups or classes, according to the amount of their taxes. The highest taxpayers, beginning with the citizen who pays the highest tax, include so many of the richest men as pay a sum total equal to one-third of all the taxes paid by the citizens of the municipality. The second class begins where the first leaves off, and goes far enough down the list to include those who pay the second third of the entire tax. The remaining citizens form the third class. The first class embraces about $2\frac{1}{2}$ per cent. of the voters and the second about $7\frac{1}{2}$ per cent. The remaining 90 per cent. constitute the third class. Each class elects one-third of the city council. In other words, $2\frac{1}{2}$ per cent. of the citizens elect one-third of the city government, the next $7\frac{1}{2}$ per cent. elect one-third, while the 90 per cent. belonging to the third class elect one-third. The city assembly, consisting of 108 members, is elected for six years, the term of one-third expiring every two years. The office of city assemblyman or councilman is considered one of honor, and no salary is received. The assembly meets every Thursday afternoon, and its meetings are public. The executive branch of the government is in the hands of the mayor and a body of thirty-four magistrates. One-half of the magistrates receive salaries, and are expected to give their whole time to the work. The mayor and paid magistrates are elected for twelve years, and have the right to a pension in case they are not re-elected. The other members of the magistracy are elected for six years. The municipal assembly has the ordinary functions of a legislative body. It discusses matters pertaining to administration, but is not allowed to enter upon executive work, this being left exclusively to the mayor and magistrates. The higher city officers are appointed for life, invariably after a long term of service in subordinate positions. The mayor himself must have graduated in law from a German university. The system of civil service in the various bureaus provides for permanence of tenure, and for punishing and even dismissing officers who do not discharge their duty in every respect. Under such a system of civil service, leading as it does to promotion, it is manifestly not for the interest of an officeholder to be dishonest. The salaries paid in the bureaus and the city treasury range from \$1,275 to \$1,500, while several hundred secretaries and assistants receive no more than from \$450 to \$1,000. But the offices are considered desirable on account of their permanency.

Condition of the Streets and Drainage.—The excellence and thoroughness of the government of Berlin is in no way more conspicuously shown than in the habitual cleanliness of the streets, and in the admirable system of drainage. The streets are every day cleaned between midnight and daybreak; and the stranger is everywhere impressed with the thoroughness with which the work is done. Berlin is less advantageously provided with natural drainage than almost any other of the world's great cities. Paris is drained by the Seine; London by the Thames; Vienna by the Danube; and New York is surrounded by deep water. In Chicago alone of the world's large cities is the drainage question so awkward as it is in Berlin. So long as the city was small, the diminutive and sluggish river Spree sufficed fairly well to carry off refuse matter. Underground sewerage was not well developed, and the houses were provided with cess-pools and underground vaults, rather than with modern plumbing and sewer connections. But the recent development of the capital of the new German empire made it imperatively necessary that something should be done that should be adequate to the situation. Obviously the removal of waste water by a large swift-flowing channel to disinfection and disappearance in salt water was quite out of the question. Sewage farms had been tried experimentally and with some success elsewhere, particularly at one or two places in England. The Berlin municipal council gave the matter much scientific consideration, and at length hit upon a general plan embodying the following essential features: The city should be provided with a complete modern system

of underground sewers, with which all the houses should be brought into direct connection. The city should be divided into some twelve drainage districts, regard being had to the minor topography of Berlin. Each of these districts should have a complete sewer system of its own, which should be called Radial System No. 1, No. 2, and so on. The sewers of each radial system or district should be made to converge to the district pumping station, so that each district should be wholly independent of all the rest. At the lowest point in a given drainage district it was decided to locate a large receiving station for the reception and partial filtration of sewage, and at some point to locate powerful pumping machinery. From each one of these pumping stations there should be a large tunnel of sufficient size to carry off the regular sewage of the entire district, and through this tunnel the pumping machinery should force the sewage out of the city into receiving and subsidence tanks located upon tracts of land purchased by the authorities as sewage farms. These farms are considerable areas of what was almost waste and worthless land, lying at different distances but at an average perhaps of from 7 to 10 miles out of Berlin in several different directions. As rapidly as a district of the city was prepared, the system was put into operation for that particular district. It is only since 1890 that the entire system has been in operation, after perhaps ten years spent in making the great transformation. It is now the completest and most satisfactory system for the disposition of liquid waste that any great city possesses. A scientific agriculture is practiced upon the farms, and by a system of irrigation—a description of which would involve merely technical considerations—it is found possible to make the soil swallow up and disinfect without offense to surrounding farms and villages the entire sewage product of the great metropolis. The system is capable of expansion at both ends to meet the enlarged requirements of the future. From an engineering point of view it is highly successful, while from an economic point of view it has carried with it as little cost as any system that could be devised for the accomplishment of this necessary service. From the sanitary point of view it is above all praise. It is administered as a distinct department of the municipal government with great thrift and success. The waste lands have been made highly productive, and the municipality of Berlin puts upon the market a very large quantity of garden products. Even the water of the sewage, after it has been disinfected, is so perfectly pure as to be brought back to the city for ordinary use. The best account, in English, of the government of Berlin will be found in an article in the *Contemporary Review* for 1884, p. 769, by Prof. Rudolph Gneist, who has been a member of the Berlin city government more than forty years. A more elaborate account will be found in the regular reports annually published by the Berlin city magistracy. See also Von Möller's *Preussisches Stadtrecht*.

C. K. ADAMS.

Berlin: the capital of Waterloo co., Ontario, Dominion of Canada; on the Grand Trunk R. R.; 62 miles W. of Toronto, at the junction of the Galt, Waterloo, and Elmira branches (see map of Ontario, ref. 4-C). It has many important manufacturing interests, including 6 furniture and chair factories, 2 immense tanneries, 3 boot and shoe factories, 2 shirt-factories, piano, button, suspender, glue, and box factories, 5 printing establishments, water-works, electric light, street-cars, a Catholic college, 14 churches, elegant business blocks, and splendid hotels. Pop. (1881) 4,056; (1891) 7,425; (1892) about 8,000. EDITOR OF "NEWS."

Berlin: city; on railroad; Green Lake co., Wis. (for location of county, see map of Wisconsin, ref. 6-E); on Fox river; 94 miles N. W. of Milwaukee. Steamboats ply between this point and Green Bay, etc. Berlin has eight churches, and good graded schools. Its industries are diversified, and include flouring-mills, foundry, and manufactures of turbine-wheels, woolen goods, the manufacture of gloves, whips, washboards, brooms, shoes, the quarrying of granite, canning of fruit, marketing of produce, etc.; and it has water-works and electric lights. The vicinity produces largely cranberries and dairy products. Pop. (1880) 3,353; (1890) 4,149; (1900) 4,489. EDITOR OF "EVENING JOURNAL."

Berlin Blue: See PRUSSIAN BLUE.

Berlin Congress: the meeting in Berlin in 1878 of the plenipotentiaries of the great powers of Europe to decide certain important questions growing out of the Russo-Turkish war of the preceding year. The occasion of the congress was what was regarded as the threatening attitude of Russia

in the East, in consequence of her victory and the Treaty of San Stefano. The general fear was that Russia had acquired a preponderance of power over the Northern Turkish provinces, which might ultimately threaten Constantinople and the approaches to the Black Sea. As this fear involved also the question of controlling the mouth of the Danube, the nation most immediately interested was Austria. But the interests of Great Britain, though more indirect, were not less positive and important, inasmuch as, since the treaty of Paris in 1856, Great Britain had maintained such relations with Turkey as enabled the British Government to have very large influence, and in some respects even control, over Turkish affairs. While the preliminary arrangements for the congress were progressing, Lord Carnarvon probably gave expression to British opinion and feeling when he pointed out to the House of Lords "how convenient for a time it had been to have a power commanding the Dardanelles and the Bosphorus which was not strong enough to stand alone, but was strong enough to stand by the aid of Great Britain, and how hopeless it would be to find any exact equivalent for such an arrangement." He further said that the only substitute would grow up gradually in the general improvement and increasing power of the subject races of Turkey, and it was their interest which Great Britain ought to go into the congress to guard. These two sentences well expressed the spirit of Great Britain in going into the congress. The initiative suggestion of the congress was made by Austria. The place indicated was Berlin and the president Prince Bismarck. Those responding to the suggestion generally recognized the fact that the interests of Europe were so involved in the condition of Turkey and the dependent provinces that all the details of the Treaty of San Stefano (Mar. 3, 1878) might properly come before the congress for review. But at first there were difficulties in the way. At length, however, Russia, owing to the urgent representations of Count Schouvaloff, agreed that the whole Treaty of San Stefano might be submitted for consideration. Accordingly, Germany, acting upon Austria's suggestion, invited the European powers to a congress at Berlin for June 13. On the 15th of that month the plenipotentiaries of Germany, Great Britain, Austria, Russia, France, Italy, and Turkey met at the palace of Prince Bismarck, and organized by the appointment of Prince Bismarck as president. The congress was made up of the most distinguished officials of the several governments. Great Britain was represented by Lords Beaconsfield and Salisbury, and Mr. Odo Russell (afterward Baron Amptill); Russia by Prince Gortschakoff, Count Schouvaloff, and Baron d'Onbril; Germany by Prince Bismarck, Prince Hohenlohe, and Gen. Von Bülow; Austria by Count Andrassy, Count Karolyi, and Baron Haymerlin; France by M. Waddington and the Comte de Saint-Vallier; Italy by Counts Corti and Launay; and Turkey by Carathéodori Pasha, Sadoullah Bey, and Mehemet Ali Pasha.

It was evident from the first that the congress would work toward peace. A sensation was produced when it came out that in May a treaty had been signed between Russia and England agreeing to a settlement of one of the most important questions in dispute. By this treaty Bulgaria was to be divided into two provinces, the northern of which should be independent, and the southern should be governed like a British colony, the governor being appointed for five or ten years with the consent of Europe. Southern Bulgaria was not to reach the Ægean, nor were Turkish troops to enter Bulgaria except in case of war or threatened insurrection. In consideration of Russia's assent to these articles, Great Britain agreed "not to dispute the articles of the preliminary Treaty of San Stefano." When the Bulgarian question, which touched so closely the interests of Austria and Turkey, as well as those of Russia, came before the congress, it was finally settled by the formation of an independent Bulgaria extending from the Danube to the Balkans, with an elective prince and an army of its own, and with the control of all the fortifications. Turkey was given the control of the Balkans, with as many fortifications as she desired. In the region south of the Balkans, "Eastern Roumelia" was established, to be governed by a hospodar, to be appointed for five or ten years, and to be nominated by the sultan and the powers. It was decided to intrust Austria with the task of occupying Bosnia and Herzegovina in the interests of European peace; but the duration of Austrian occupation was not determined. This plan for Austrian occupation was reluctantly accepted by Italy and Turkey. Serbia received independence with a territorial extension. The Montenegrin question was settled by giving

to the little state a considerable increase of territory and access to the sea. The Greek question evoked much interest and discussion, but the congress limited itself to passing a resolution recommending an extension of Hellenic territory, inviting the Porte to come to an understanding with the Greek Government in regard to the frontiers, and tendering the good offices of the powers in case of disagreement. In the course of the meetings of the congress a second great sensation was created by the revelation that on June 4 Great Britain had signed a secret treaty with Turkey by which the two contracting powers entered into mutual obligations. Great Britain, on the one hand, agreed for all future time to defend the Asiatic dominions of the Ottoman empire "by force of arms," while Turkey, on the other, promised, first, to introduce all necessary reforms, as agreed upon with its ally, and, secondly, to assign the island of Cyprus to be occupied and administered by Great Britain, so long as Russia should occupy Batum, Ardahan, and Kars.

It was universally conceded that the part of Great Britain in the congress was played with great skill and brilliancy. By the terms finally adopted the Dardanelles were restored to their condition before the recent war; the stability and ultimate independence of the Northern Turkish provinces were secured; Russia was required to destroy her fortifications at Batum; Turkey was required to reform her government; while Great Britain, by establishing herself in Cyprus, assumed virtual control of the eastern part of the Mediterranean Sea. Many of the most influential newspapers of Europe regarded the results of the congress as henceforth securing the preponderance of British influence in Asia. At the final sitting of the congress it was determined, on motion of Prince Bismarck, that each power should watch over the execution of the clauses agreed upon affecting itself, and should be at liberty to address the Porte such personal observations as it might deem advisable. The congress concluded its work on July 13, just one month from the date for which it was called. The treaty, which is said to be the longest ever written, was signed by a larger number of plenipotentiaries than had ever before fixed their names to a treaty.

C. K. ADAMS.

Berlin, Treaty of: See BERLIN CONGRESS.

Berlin, University of: founded soon after the crushing defeat of Prussia by Napoleon at Jena, at a time when it seemed as though the national life and spirit were at their lowest ebb. Under the inspiring leadership of men like Fichte and Humboldt, however, the country set about recovering its lost prestige with a wisdom and determination that has perhaps never been equaled in history. The inauguration of the great Prussian school-system dates from this period, and of this system the University of Berlin may very properly be considered the crown. The university was founded in 1809 and opened in 1810. The faculty was recruited from the most eminent scholars of Germany, and such leaders as Niebuhr, Wilhelm von Humboldt, Ritter, Fichte, Hegel, Neander, and Schleiermacher soon attracted the attention of Europe to the young institution. The reputation thus established has been maintained by men like Ranke, Mommsen, Curtius, DuBois-Raymond, Helmholtz, Virchow, Droysen, Von Sybel, and Koch. The main building of the university is the old palace of Prince Henry, brother of Frederick II., erected in 1754-64, and appropriated to the use of the university in 1809. It stands on Unter den Linden, opposite the Royal Library and the Opera-house. This building contains some of the museums and scientific collections. The garden in front is adorned with statues of Wilhelm and Alexander von Humboldt. The university also occupies some seven or eight other buildings in adjacent parts of the city. The university library, containing 300,000 volumes, is supplemented by the Royal Library of 900,000 volumes, just across the street, to which students have easy access.

Instruction.—Instruction is given mainly by lectures and in the laboratories. There are also several seminaries. There are four faculties: *Theology*, with 17 professors; *Jurisprudence*, with 26 professors; *Medicine*, with 112 professors; and *Philosophy*, which includes all branches of learning pertaining to general culture and not to professional training, with 181 professors. Using the word professor to indicate instructor of whatever order, there are then 336 professors in these four faculties. No fewer than 757 courses of instruction were offered during the year 1890-91. Of these, 30 were in the Oriental languages. The year is divided into two terms or semesters, the winter semester extending from

the middle of October to the middle of March, and the summer semester from the middle of April to the middle of August.

Students.—The number of matriculated students in 1899 was 4,997. Of the total number, some 400 are usually from the U. S. The expenses are not high. Many of the courses are free. For the others, the fees average about five dollars for a course of four hours a week through one term. In medicine and in the laboratories they are somewhat higher. The use of the academic reading-room, with 250 newspapers, 200 magazines, and 3,000 volumes, costs seventy-five cents a semester.

Graduation.—The German term is "promotion" (to the doctorate), not graduation. The degree conferred is that of Doctor of Medicine, Philosophy, etc. The candidate for the degree of Doctor of Philosophy must present a thesis that shows satisfactory original investigation, must undergo an oral examination, and must maintain his thesis in an open disputation. With his application for a degree the candidate must present a petition to the faculty for admission to this honor, and a short history of his life, both in Latin, a certificate of ripeness for admission to the university from a gymnasium, a certificate of honorable dismissal from the university, a certificate of three years' attendance upon a university, and his dissertation, which, in cases where it would be proper, must be in Latin. The oral examination is public. Certain professors are designated by the faculty to conduct it, but any one present may put a question to the candidate. The disputation is also open, and the candidate has to maintain his position against at least three opponents. There are four degrees of success, designated as *summa cum laude*, *magna cum laude*, *cum laude*, and simply *sustinuit*. Two hundred and fifty copies of the thesis or dissertation and 100 copies of the diploma are printed at the expense of the candidate. The total cost of a "promotion" is about ninety dollars. The regulations in regard to the degree of Doctor are more strict at Berlin than anywhere else, and are more rigidly enforced. Consequently, a degree from Berlin is highly esteemed.

C. H. THURBER.

Berlioz, bār'li-ōz', HECTOR LOUIS: French musical composer; b. at Côte-Saint-André, Isère, Dec. 11, 1803; a physician's son; sent to Paris to study medicine; entered the Conservatory, following a passionate bent for music. He composed *Symphonie fantastique*; overtures to *Waverley* and *King Lear*; *Harold* (1833) and *Romeo et Juliette* (1839), symphonies; *Benvenuto Cellini*, an opera in two acts; *Symphonie Funèbre et Triumphale* (1840); *Damnation de Faust* (1846), a symphony; *Enfance de Christ*, a trilogy (1854); and *Les Troyens*, a grand five-act opera, played without success in 1863. His works bespeak an ardent and independent genius, and have elicited diverse criticism. So far as purely musical invention is concerned, Berlioz can scarcely be ranked with the great tone-poets. But in the science of orchestration, more especially in novel combinations and effects, he remains a supreme master and worthy colleague of Wagner in this specific sense. He was also a talented author and critic, and has published *Traité d'instrumentation et d'orchestration moderne* (1844); *Voyage musicale en Allemagne et en Italie*; *Études sur Beethoven, Gluck, et Weber* (1845); *Soirées de l'orchestre* (1853); *Les Grottesques de la musique* (1859); and *Mémoires* (1870). D. in Paris, Mar. 8, 1869.

Revised by DUDLEY BUCK.

Bermu'da Grass (*Cynodon dactylon*): a grass extensively cultivated in India (where it is called *dhak*), and which has been introduced into the West Indies, Europe, the Southern U. S., and the Sandwich islands. It is valuable both for pasture-grass and for hay, and is especially prized in warm climates, where the grass crop is generally poor; but in light soils, especially northward, its perennial roots cause great trouble to the farmer.

Bermuda Hundred: in Chesterfield co., Va.; on the right bank of the James river, just above the mouth of the Appomattox, and 1½ miles above City Point (for location of county, see map of Virginia, ref. 6-II). The tortuous course of the James river here incloses a neck of land which Gen. Butler occupied and fortified in May 6, 1864, and from which he was to co-operate with Gen. Grant by menacing Richmond and Petersburg. On the morning of May 16, 1864, Gen. Butler, who had moved out of his works, was fiercely attacked by the Confederate force under Beauregard, and after a severe struggle, which lasted till noon, driven back into his intrenchments with severe loss. Beauregard erected a line of works across the peninsula in front of Butler's. Subse-

quent expeditions were made from these works, and the line finally formed a part of the investment lines of the combined armies against Petersburg.

Bermuda Islands, or Bermudas; also called **Somers' Islands**: a group of small, low islands in the Atlantic Ocean, belonging to Great Britain (see map of North America, ref. 7-I). They take their name from Juan Bermudez, who discovered them in 1522. They are about 624 miles E. S. E. of Cape Hatteras, which is the nearest land, and are in lat. 32° 20' N., and lon. 64° 50' W. The extent of the group is only 19 miles by 6 miles, although the number of islets is nearly 400. Area, 20 sq. miles. They derive importance from the commanding position which they occupy between the West Indies and the other parts of British America. They are inclosed on several sides by formidable coral-reefs, which are said to be the only coral-reefs occurring in the central expanse of the Atlantic. The climate is so mild and delightful that these islands are covered with perpetual verdure. Between December and March the temperature ranges from 60° to 66° F. The chief articles of export are potatoes, onions, and arrowroot. The largest of these islands are Bermuda, 15 miles long; St. George's, 3½ miles; Somerset, 3 miles; and Ireland, 3 miles. Capital, Hamilton, on the isle of Bermuda. St. George's isle has a good, landlocked harbor, which is defended by strong batteries. These isles are separated by narrow and intricate channels, and have no streams, and but few pools of fresh water. Many of the inhabitants are employed in building cedar vessels, which are durable and swift. Pop. (1891) 15,884.

Bermudez, bār-moo'dāyth: a maritime state of Venezuela; extending from the peninsula of Paria to the Orinoco river; bounded N. by the Caribbean Sea, E. by the Gulf of Paria and the delta of the Orinoco, S. by Bolivar, and W. by the state of Guzman Blanco. It is also called the Estado de Oriente, or Eastern State. Its eastern boundary is the Rio Manamo, the westernmost mouth of the Orinoco, and on the latter river it extends westward to the Rio Suata. It includes the former provinces of Cumana and Barcelona. Chief towns, Cumana and Barcelona (ports), and Maturin. Area, 32,243 sq. miles. Pop. 297,466.

M. W. H.

Bernadotte, Charles XIV., JOHN: King of Sweden; a French marshal; b. at Pan, Jan. 26, 1764. His original name was JEAN BAPTISTE JULES BERNADOTTE. He enlisted as a private in the army in 1780; served as general of division under Kléber and Jourdan in Flanders in 1794, and under Bonaparte in 1797. In 1798 he was French minister at Vienna, and married Mademoiselle Clary, a sister of Joseph Bonaparte's wife. He was Minister of War for a short time in 1799. Napoleon created him a marshal of France in 1804, and in June, 1806, Prince of Pontecorvo. He fought at Austerlitz in 1805, and defeated the Prussians at Halle in Oct., 1806. He quarreled with Napoleon, who censured his conduct at Wagram (1809), and he resigned his command just after that battle. In Aug., 1810, the Swedish Diet elected Bernadotte as heir to the throne of Sweden, then occupied by Charles XIII., who had no son, and he was immediately associated with the old king in the exercise of royal power. Early in 1812 Bernadotte, who took the name of Charles John, negotiated with Russia a secret treaty of alliance against Napoleon. He openly joined the coalition of the allies in the spring of 1813, and led an army of about 28,000 men into Germany. His army defeated Oudinot at Gross-Beeren in Aug., 1813, but his conduct was considered equivocal and lukewarm by the allies. He forced Prince Christian of Denmark, who had proclaimed himself King of Norway, to resign, and on Nov. 4, 1814, Charles XIII. was proclaimed king, and Bernadotte crown prince. When the allies entered France in 1814, he led his army back to Sweden and conquered Norway. He began to reign alone on the death of Charles XIII. in Feb., 1818, after which a long peace ensued. D. in Stockholm, Mar. 8, 1844, and left the throne to his son, Oscar I. See Erik G. Geijer, *Konung Karts XIV. Johan Historia* (1844); W. G. Meredith, *Memorials of Charles (XIV.) John, King of Sweden* (1829).

Bernard, CLAUDE: French physiologist; b. at Saint-Julien, in dept. of Rhône, July 12, 1813. He wrote *Researches on the Uses of the Pancreas*, which gained the grand prize of the Institute in 1849. He was admitted into the Institute in 1854, and became Professor of Physiology in the College of France in 1855. Bernard discovered the glyco-genic function of the liver. He was created grand officer of the Legion of Honor in 1862. Among his works are *Leçons de*

Physiologie (1855) and *Mémoire sur la Chaleur animale* (1856). D. in Paris, Feb. 10, 1878.

Ber'nard, Sir FRANCIS: lawyer; b. in Nettleham, Lincolnshire, England, 1714; became Governor of New Jersey in 1758, and of Massachusetts in 1760. After nine years of successful administration, during which he acquired Mt. Desert island, he became unpopular in Massachusetts because he brought troops into Boston and opposed liberal measures. He was accused of misconduct, recalled, and made a baronet in 1769. D. in Aylesbury, England, June 16, 1779. His *Letter-books* are in Harvard Library.

Bernard, bār'naar', SAINT: Abbot of Clairvaux; mediæval theologian, and a doctor of the Western Church; b. in his father's castle at Fontaines, near Dijon, in 1091. He became an inmate of the monastery of Cîteaux in 1113, and founded in 1115 a community of the Cistercian order at Clairvaux, in Champagne, of which he was the first abbot. His ascetic life and eloquence and combination of piety, mysticism, and sound practical sense rendered him a very influential and powerful person in the Church. He was regarded as an oracle by all Christendom, and was consulted and obeyed in politics as well as in Church affairs. He did much to encourage monasticism, and founded many monasteries. Yet intensity of conviction made him a persecutor; so he appears as an implacable adversary of Abelard, whose condemnation at the Synod of Paris (1140) was effected by his influence; of Arnold of Brescia, a pupil of Abelard, whom he drove out of France and Switzerland; of the Cathari; and of Gilbert of Portiers. In 1128 he drew up the rule for the new order of Knights Templars. The same intensity led him to arouse Europe to the second crusade, that of 1146, which failed disastrously. Bernard in consequence was denounced, and his disappointment and chagrin hastened his death at Clairvaux, Aug. 20, 1153. He was canonized 1173. His works are numerous. He wrote five famous and beautiful Latin hymns, including the *Jesu dulcis memoria* and the *Salve mundi salutare*, portions of which appear in all hymn-books—in English as, *Jesus, the Very Thought of Thee*, and *O Sacred Head! Now Wounded*, respectively. See his complete works (ed. Mabillon, repr. by Migne, *Pat. Lat. CLXXXIII.-CLXXXV.* Eng. trans. by S. J. Eales, London, 1889, seq.). The best modern lives are by A. Neander (Berlin, 1813; 3d ed. 1865; n. e. Gotha, 1889; a classic Eng. trans., London, 1843); J. C. Morison (London, 1863; 3d ed. 1877); M. T. Ratisbonne (Paris, 1841; 9th ed. 1883; Eng. trans., New York, 1878); S. J. Eales (London, 1890); R. S. Storrs (New York, 1892). Revised by S. M. JACKSON.

Bernard, SIMON: French engineer; b. at Dôle, Apr. 28, 1779; aide-de-camp to Napoleon I.; employed by him in important duties incidental to his branch of the service. He was invited to this country by President Madison in 1816 to assist in the organization of a system of seacoast defense by fortification. The chief engineer, Gen. Swift, and another officer, Col. McRee, sent in their resignations, and Col. W. K. Armistead succeeded as chief engineer. As "assistant engineer," Gen. Bernard was associated with Col. (subsequently general and chief engineer) J. G. Totten, constituting a "permanent board," upon which the labor of working out the fundamental principles of the system and of elaborating the projects of defense for the great seaports devolved. Bernard also had part in the inauguration of some of our earlier works of civil engineering, e. g. the Chesapeake and Ohio Canal, the Delaware breakwater, etc. He resigned in 1831, and returned to France; became aide-de-camp to Louis Philippe, and subsequently Minister of War of France. D. in Paris, Nov. 5, 1839.

Bernard, THOMAS DEHANY: clergyman and author; b. in Clifton, Bristol, England, Nov. 11, 1815; was educated at Oxford, and ordained 1840; select preacher at Oxford 1856, 1862, 1882, and Bampton lecturer 1864. Became canon residentiary at Wells Cathedral in 1868, and chancellor in 1880. Author of *The Witness of God*, University sermons (1863); *The Progress of Doctrine in the New Testament*, Bampton lectures (1864; 4th ed. 1878); *Before His Presence with a Song* (1885); *Central Teaching of Jesus Christ* (1892).

Bernard, Great St.: a famous mountain-pass of the Pennine Alps; upward of 8,000 feet in height; between the Swiss canton of Vaud and the valley of Aosta. Near the summit is the celebrated hospice, said to have been founded in 962 by St. Bernard of Menthon in Savoy for the succor of travelers crossing the mountain. In the humane efforts of the monks of this hospice the valuable dogs known as the

St. Bernard breed, and noted for their size and sagacity, were valuable assistants. In 1800 Napoleon crossed the Alps here with an army of 30,000 men, with cavalry and artillery.

Bernard of Cluny: not to be confounded with his more celebrated countrymen and contemporary, Bernard of Clairvaux; b. at Morlaix, in Brittany, of English parents, probably not far from the year 1100. He was a monk at Cluny under Peter the Venerable, who was abbot there from 1122 to 1156. He wrote a poem, *De Contemptu Mundi*, in about 3,000 lines, portions of which were translated by the Rev. John Mason Neale (1818-66) in 1851 and 1862. Dr. Neale pronounces these verses of Bernard "the most lovely, in the same way that the *Dies Iræ* is the most sublime, and the *Stabat Mater* the most pathetic, of mediæval poems." Hymns taken from this poem, such as *The World is Very Evil*, *Brief Life is Here Our Portion*, and *Jerusalem the Golden*, are among the finest gems in recent English and American collections.

Bernardo del Carpio, bār-naar'dō-del-kaar'pě-ō: Spanish hero of the ninth century; nephew of Alfonso the Chaste; displayed brilliant courage in the war against the Moors; according to tradition, defeated Roland at Roncesvalles; and the hero of several dramas by Lope de Vega and of many Spanish ballads.

Bernay, bār'nay': a town of France; department of Eure; on the railway from Paris to Caën; 25 miles W. N. W. of Evreux (see map of France, ref. 3-E). It has a college, and manufactures of woolen cloths, linens, paper, and leather. A horse-fair, the largest in France, is held here annually. Pop. (1891) 8,016.

Bernardin, bār'naar'dān', SAINT, of Siena: b. at Massa, near Siena, Sept. 8, 1380; entered the order of St. Francis in 1402; visited the Holy Land, and became famous throughout Italy as a preacher; was made vicar-general of his order in 1437. D. May 20, 1444, and was canonized in 1450. His works, strongly mystical, appeared last at Venice (1745, 4 vols.); his biography by J. P. Toussaint (Regensburg, 1873) and by L. Bianchi (3 vols., Siena, 1888).

Bernays, ALBERT JAMES, Ph. D.: chemist; b. in London, Nov. 8, 1823; educated at King's College School and University of Giessen; Lecturer on Chemistry at St. Mary's Hospital Medical School 1854-60; since that time at St. Thomas's Hospital; author of *Household Chemistry*; *Science of Home Life* (1862); *Notes on Analytical Chemistry for Students in Medicine* (3d ed. 1889); *Food* (1876).

Bernays, bār'nīs, JACOB: classical philologist and brilliant stylist; b. in Hamburg, Sept. 18, 1824, of Jewish parents. He took his doctor's degree in 1848, and began his academic career as privat-docent in Bonn at the urgent request of his teacher, Fr. Ritschl. In 1854 he was appointed professor extraordinary and librarian, which positions he retained till his death there, May 26, 1881. Bernays's work was chiefly confined to ancient Greek philosophy, and possesses permanent value. His most noted publications are his treatises on Aristotle's theory of the drama, on the Dialogues of Aristotle, on Phocylides, Theophrastus, the apocryphal letters of Heraclitus, and a masterly biography of Scaliger. His opuscula have been collected and edited by Usener (1885). For an account of his life and a full list of his writings, see C. Schaarschmidt, *Biogr. Jahrb. IV.*, p. 65-83 (1881). ALFRED GUDEMAN.

Bernburg, bār'n'boorkh: a town of Germany; formerly capital of the duchy of Anhalt-Bernburg; on the river Saale, here crossed by a bridge; 24 miles S. S. W. of Magdeburg. It is connected by railway with Berlin and Dresden. It has a gymnasium, a Realschule, a valuable library, a ducal castle, and manufactures of porcelain, paper, and starch. Pop. (1880) 18,593; (1885) 21,464; (1890) 28,257.

Berne, bār'n (Fr. *Berne*; Germ. *Bern*; Lat. *Ber'na*): the most populous canton of Switzerland, and the most extensive except the Grisons. It is bounded N. by Alsace, E. by Basel, Soleure, Aargau, Lucerne, Unterwalden, and Uri, S. by Valais, and W. by Vaud, Fribourg, Neuchâtel, and France. Area, 2,657 English sq. miles. It is traversed by the river Aar, and also drained by the Emmen. The Aar expands into two lakes called Brienz and Thun. The surface is mountainous, and the northern part is occupied by the Jura Mountains. Several high peaks of the Alps—namely, the Finsteraarhorn, 14,032 feet, the Jungfrau, 13,514 feet, Schreckhorn, 13,393 feet—are in Berne. The valleys of the Simmenthal, Lauterbrunnen, and Grindelwald in the Bernese Oberland are celebrated for their beauty. The valleys

of the Aar and Emmen are fertile and adapted to pasturage. Among the mineral resources of the canton are copper, lead, iron, marble, and granite. It has important manufactures of watches, paper, woolen goods, linens, etc. It is intersected by several railroads. Capital, Berne. Pop. (1880) 530,411, of whom 66,015 were Roman Catholics; (1894) 541,051.

Berne, or **Bern** [said to be derived from the Germ. *Bären*, "bears," figures of which are on the armorial bearings of the city]: a city of Switzerland; capital of the canton of Berne; situated on the river Aar, which incloses it on three sides; 65 miles by rail S. of Basel and 92 miles by rail N. E. of Geneva (see map of Switzerland, ref. 4-D). Berne is the seat of the federal government of the republic, and is considered to be the finest city in Switzerland. It is built of freestone, and the houses are massive structures, resting on arcades which form covered promenades on both sides of the streets. Magnificent Alpine scenery is visible from this point. Berne has a Gothic cathedral, a public library, a university, a museum of natural history, a mint, and an arsenal. One of the finest buildings is the new federal palace. The river is here crossed by four large bridges. Several railroads connect it with Geneva, Basel, and other towns. Berne was founded in 1191, and became a free town of the empire in 1218. It joined the Swiss Confederation in 1352. In 1849 it became the permanent capital of the whole republic. Pop. (1880) 44,087; (1885) 47,793; (1897) 49,030, communal.

Berne-Bellecour, bār'n'bel'kooor', ÉTIENNE PROSPER: genre and military painter; b. at Boulogne, June 29, 1838. Pupil of Picot and Barrias; first-class medal, Paris Salon, 1872; Legion of Honor 1878; second-class medal, Paris Exposition, 1889. His pictures of episodes in the Franco-Prussian war have gained him an excellent reputation, second only to such masters as De Neuville and Detaille, and a considerable number of his works are in American collections. Studio in Paris.

WILLIAM A. COFFIN.

Berners, JULIANA: reputed author of the *Boke of St. Albans* (1486); a collection of treatises on hawking, hunting, and heraldry. To the edition of 1496, printed by Wynkyn de Worde, was added a *Treatyse on Fysshynge with an Angle*. During the sixteenth century the *Boke* was very popular, and was often reprinted. The authorship of it is uncertain, and the traditionary life of Dame Juliana is probably mythical.

HENRY A. BEERS.

Bernhard, bār'n'haärt, Duke of Saxe-Weimar: German general; b. in Weimar, Aug. 6, 1604; was a younger son of John III. of Saxe-Weimar. He fought for the Protestant cause in the Thirty Years' war; distinguished himself at Wimpfen in 1622; became a colonel in the army of Denmark, which he quitted in 1628. In 1631 he joined the standard of Gustavus Adolphus. The victory which the Swedes gained at Lützen in 1632 is attributed to the skill and energy of Bernhard, who in 1633 was appointed to the command of the Swedish army. Having made a personal treaty of alliance with France in 1635, he afterward commanded a French army and defeated the imperialists. D. in Neuburg-on-the-Rhine, July 8, 1639. See Schiller, *History of the Thirty Years' War*; J. A. C. von Hellfeld, *Geschichte des Bernhard des Grossen*, etc. (1797); Bernhard Roese, *Herzog Bernhard der Grosse von Sachsen-Weimar* (2 vols., 1828-29).

Bernhardt, bār'n'haärt, ROSINE, better known as SARAH: French actress; b. in Paris, Oct. 22, 1844. Her Jewish parents, after she had passed some years with her grandfather, an Amsterdam optician, placed her in a convent at Versailles, where her ambitions fluctuated from theatrical prominence to the nun's veil. At fourteen, however, she entered the Paris Conservatoire, took prizes in tragedy and comedy, made her *début* in 1862 as Iphigénie in Racine's tragedy at the Théâtre Français, and acted the leading rôle in Scribe's *Valérie*. Received without interest, she withdrew for study, but acted in burlesque in the comic theaters. In Jan., 1867, she took up legitimate comedy, and by the impersonation of the Queen in *Ruy Blas* at the Odéon gained such renown that she was recalled to the Français, and began a career recognized as foremost in French tragedy. In 1879 a company from the Français, of which she was a member, played with brilliant results in London. Bernhardt soon after withdrew from the Théâtre Français, for which breach of contract she was mulcted in the courts in \$20,000; but her tours in Italy, Russia, and the Americas replenished her purse. She played in New York in 1880,

1887, 1891, and 1900, and in 1891 went to Australia. In 1882 she married in London M. Damala, a Greek stock-actor, from whom she was soon divorced. She has exhibited pictures and statues by her own hand in the Paris Salon, and written a play, *L'Aveu* (produced in 1888). She has impersonated the title rôles of Racine's great plays, acted Shakspearean characters, and plays have been written to elicit her highest powers.

Bernhardy, bār'n-haar'dē, GOTTFRIED: German classical scholar of encyclopædic erudition; b. Mar. 20, 1800; privat-docent and professor extraordinary at Berlin 1823-25. In 1829 he was called to Halle as the successor of Reisig, where he remained till his death, May 14, 1875. Author of a *History of Greek Literature*; of *Roman Literature*; *Eratothénica*; *Wissenschaftliche Syntax der griech. Sprache*; and of a monumental edition of *Suidas*. Cf. R. Volkmann, *G. B.* (Halle, 1887).

Berni, bār'nēē, FRANCESCO: Italian satiric poet; b. about 1496; known chiefly by his satiric *rifacimento* of Boiardo's *Orlando Innamorato*. (See BOIARDO.) This was first published in 1541, and soon quite eclipsed the fame of the original. His *Rime Burlesche* (Venice, 1538) were very famous in their time. From him a burlesque style is called by the Italians "Bernesque." See Antonio Virgili, *Francesco Berni, con documenti inediti*, Florence, 1881; *Opere di F. Berni*, 5 vols., Milan, 1806. D. May 26, 1535. A. R. MARSH.

Bernice: See BERENICE.

Bernier, bār'ni-ay', CAMILLE: landscape-painter; b. at Colmar, France, 1823; pupil of Léon Fleury; Legion of Honor 1872; medal of honor, Paris Exposition, 1889. An artist of real merit, who has painted numerous excellent pictures. One of the best of his works is *The Abandoned Lane* (1879), in the museum at La Rochelle. Studio in Paris. W. A. C.

Bernina, bār-nēē'nā: an imposing mountain-group in the Swiss canton of Grisons; rises 13,407 feet above the level of the sea, and has a remarkable glacier. The Pass of Bernina, the altitude of which is 6,671 feet, affords a communication between the Upper Engadine and the Valtelline.

Bernini, bār-nēē'nēē, GIOVANNI LORENZO: an Italian architect and sculptor; b. in Naples, Dec. 7, 1598; lived at Rome. His works, the best among which are the colonnade to St. Peter's church, the Scala Regia of the Vatican, and the Barberini Palace at Venice, possess some excellences, but show the beginning of the decline of art into the *baroque* or Jesuit style, to which his influence greatly contributed. D. in Rome, Nov. 28, 1680.

Bernoulli, bār'noo'lee, or **Bernouilli**, DANIEL, F. R. S.: mathematician and philosopher; b. in Groningen, Feb. 9, 1700; son of Jean (1667-1748). He became in 1733 Professor of Anatomy and Botany at Basel, where he afterward obtained the chair of Physics and Speculative Philosophy. He gained many prizes of the French Academy of Sciences, and wrote in Latin and French many scientific works. He was one of the three greatest members of this famous family. D. in Basel, Mar. 17, 1782. See Condorcet, *Éloge de Daniel Bernoulli* (1782).

Bernoulli, JACQUES: a mathematician; uncle of the preceding; b. in Basel, Dec. 27, 1654. He became Professor of Mathematics in that city in 1687. He solved Leibnitz's problem of the isochronous curve, discovered the properties of the logarithmic spiral, and wrote several treatises on mathematics, etc. D. in Basel, Aug. 16, 1705. See Battier, *Vita Jacobi Bernoulli* (1705).

Bernoulli, JEAN or JOHN: one of the mathematicians of the Bernoulli family; b. in Basel, July 27, 1667. He was the father of Daniel and brother of Jacques (1654-1705). He discovered the exponential calculus, and ascertained the curve of swiftest descent. In 1705 he succeeded his brother Jacques as Professor of Mathematics at Basel. His works were published in 4 vols., 1742. D. in Basel, Jan. 1, 1748.

Bernoulli, JEAN: son of the preceding; b. in Basel, May 18, 1710. He became Professor of Mathematics at Basel in 1748, and wrote several treatises. D. July 11, 1790.—BERNOULLI, JEAN: b. in Basel, Nov. 4, 1744; son of the preceding. He became astronomer royal at Berlin in 1764, and wrote various works. D. July 13, 1807.—BERNOULLI, JÉROME: naturalist; b. in Basel, 1745; d. in 1829.—BERNOULLI, NICOLAS: son of Jean and a brother of Daniel, noticed above; b. in Basel, Jan. 29, 1695. He was Professor of Mathematics at St. Petersburg, where he died, July 26,

1726.—BERNOULLI, NICOLAS, LL. D., F. R. S.: cousin of the preceding; b. in Basel, Oct. 10, 1687. He made several discoveries in mathematics. D. in Basel, Nov. 29, 1759.

Bernstorff, bār'nstōrf, ALBRECHT, Count: a Prussian diplomatist and statesman; b. Mar. 22, 1809; became in 1857 Prussian ambassador in London; Minister of Foreign Affairs from 1861 to 1862; returned to London in 1862, and represented the German empire in the London Conference of 1871. D. in London, Mar. 26, 1873.

Bernstorff, JOHANN HARTWIG ERNST, Count von: statesman; b. in Hanover, May 13, 1712. Having entered the civil service of Denmark, he was appointed Minister of Foreign Affairs (prime minister) in 1761. He was a liberal patron of learning and the arts, and he promoted the commerce and manufactures of Denmark. He retained power till 1770. D. in Hamburg, Feb. 19, 1772. See G. H. Ahle-mann, *Ueber das Leben und den Charakter des Grafen von Bernstorff* (1777); G. Navarro, *Vie du Comte J. H. E. Bernstorff* (1822).

Beroaldo, bāy-rō-aal'dō, FILIPPO (1453-1516): professor at Bologna, his native city. Editor and commentator of Plautus, Cicero, and of numerous post-classical Latin writers. See Roscoe's *Life of Leo X.*; Burekhardt's *Die Cultur der Renaissance*.

Ber'oe: a genus of jellyfishes belonging to the class *Ctenophora*, and notable for the absence of tentacles. They are phosphorescent marine animals, with an oval or nearly globular body of a delicate jelly-like substance, the whole body cavity serving as a stomach. As in all the other members of the class, the sides of the body are provided with eight rows of vibratile plates, by which the animal is propelled through the water.
DAVID S. JORDAN.

Berē'a, or **Berea**: a large and ancient city of Macedonia; situated at the foot of Mt. Bermius; about 30 miles from Pella. It was attacked by the Athenians in the war which began about 430 B. C. St. Paul visited Berea, and preached there. (See Acts xvii. 10.) Its site is occupied by the modern town of Veria, 35 miles W. of Salonica. See VERIA.

Bero'sus (in Gr. Βηρωσός): historian; priest of Bel in Babylon; b. under Alexander the Great; dedicated his history of Chaldaea (Χαλδαϊκά) in three books to Antiochus Soter, who reigned 280-261 B. C. His accounts have been largely confirmed by the cuneiform inscriptions. Fragments in Müller's *Fragmenta Historicorum Græcorum*, ii. 495-510.

Berquin, bār'kăn', LOUIS, de: b. at Passy, France, about 1490; studied law and became a counselor of Francis I.; was a friend of Erasmus and active in circulating his works; accused of Lutheranism and imprisoned in 1523, 1526, and 1529; condemned first to imprisonment for life, then to be burned alive; the last sentence was executed in Paris, Apr. 17, 1529, and he became the first Protestant martyr in France.

Berri: See BERRY.

Berrien, ber'ri-en, JOHN MCPHERSON, LL. D.: lawyer and politician; b. in New Jersey, Aug. 23, 1781. He removed to Georgia, and was elected a Senator of the U. S. in 1824. He was Attorney-General under President Jackson in 1829-31, and was again chosen Senator in 1840 and 1846. D. in Savannah, Jan. 1, 1856.

Berry: a fruit which consists of a pulpy pericarp without valves, containing seeds, which have no covering except the pulp or rind; as the grape, gooseberry, currant, barberry, service-berry, and cranberry. Some of them have the calyx adherent to the ovary and the placenta parietal, as the gooseberry. Others have the ovary free and the placenta in the center, as the grape. The term berry is popularly applied to several small fruits which are not berries in the scientific sense, as the strawberry, which bears seeds (*achenia*) on the external surface of an enlarged and pulpy receptacle. The orange is a berry with a leathery rind, and is also called a *hesperidium*.

Berry, or **Berri**: a former province of France, near its center; now forms the departments of Cher and Indre. Capital, Bourges. Berry was erected into a duchy about 1360, after which it was held by many princes of the royal family of France. The last Duke of Berry was the younger son of Charles X.

Berry, or **Berri**, CHARLES FERDINAND, Duc de: b. at Versailles, Jan. 24, 1778; the second son of Charles X. He emigrated with his father in 1793; returned to France in

1814, and married in 1816 Caroline Ferdinande Louise, a daughter of the King of Naples. He was assassinated by Louvel, in Paris, Feb. 14, 1820. He was the father of the Count de Chambord (Henry V.), who was recognized by the Legitimist party as the heir to the French throne. See Chateaubriand, *Mémoires touchant la Vie et la Mort du Duc de Berry* (1820).

Berry, IRAM G.: major-general of U. S. volunteers; b. at Rockland, Me., Aug. 27, 1824; killed at the battle of Chancellorsville, Va., May 2, 1863. He was a member of the Maine Legislature several times, mayor of his native city, and president of Lime Rock bank. At the first call for troops to suppress the Confederate movement he raised three full companies, and himself entered the service as colonel of the Fourth Maine volunteers. He was made a brigadier-general Mar. 17, 1862, and major-general Nov. 29, 1862. Killed at the head of his division by a shot while leading a bayonet charge on the morning of May 2, 1863.

Berryer, bār'i-ay', ANTOINE PIERRE: French orator and lawyer; b. in Paris, Jan. 4, 1790. He defended Gen. Cambronne about 1815, gained distinction as an advocate of defendants in political trials, and was elected to the Chamber of Deputies in 1830. After Charles X. had been dethroned (July, 1830), he remained in the Chamber as the orator of the Legitimist party, although the other members of that party all retired. He made an eloquent speech against the abolition of hereditary nobility in 1831. During the first years of the reign of Louis Philippe he was regarded as the foremost orator in the Chamber. In 1840 he defended Louis Napoleon, who was tried for his attempt to excite a revolution at Boulogne. He was elected to the Constituent Assembly in 1848, and the Legislative Assembly in 1849. In 1850 he went to Wiesbaden to offer homage to the Count de Chambord. He opposed the republic, and protested against the *coup d'état* of Dec., 1851, after which he retired from political life. In 1852 he was elected a member of the French Academy. D. in Paris, Nov. 29, 1868. See Louis Marie de la Haye de Cormenin, *Biographie parlementaire de M. Berryer* (1837).

Ber'yville: on railroad; capital of Clarke co., Va. (for location of county, see map of Virginia, ref. 3-G); is situated 5 miles W. of the Shenandoah river and 10½ E. of Winchester. It contains an academy, and is often called "Battle-town," owing to the many contests there of Gen. Morgan of Revolutionary fame. Washington, in surveying the lands of this county when it was a part of Frederick, had his headquarters at a beautiful spring just beyond the town. Pop. (1870) 580; (1900) 938.

Bersaglieri, bār-sāal-yā'rēē: the Italian name of the riflemen or sharpshooters who served in the army of Victor Emmanuel when he was King of Sardinia. They took part in the Crimean war, 1854-55, and fought against Austria in 1859. They wear a dark-green uniform.

Ber'serker [Icel. *berserkr*, probably meaning bear-coat]: a hero of Scandinavian mythology, who fought without coat of mail. He was the grandson of Starkader, and overcame all opponents by his irresistible valor. The name has also been given to a class of warriors who fought naked and performed extraordinary feats under the influence of a kind of demoniac possession.

Bert, bār, PAUL: b. at Auxerre, in the department of Yonne, France, Oct. 17, 1833; studied medicine in Paris; was appointed professor in the faculty of sciences at Bordeaux 1866, and Professor of Physiology in Collège de France 1869; achieved a great reputation by his interesting physiological researches, and more especially by his bold experiments for ascertaining the conditions of human existence at different altitudes, for which he received in 1875 the grand biennial prize of the Académie des Sciences (20,000 francs). See his *Notes d'Anatomie et de Physiologie comparées* (1867-70); *Recherches sur le Mouvement de la Sensitive* (1867-70); *Recherches expérimentales sur l'influence que les modifications barométriques exercent sur les phénomènes de la vie* (1874); *La Pression barométrique* (1874). He also took a part in politics; was prefect of the department of Le Nord in 1871; elected a member of the Chamber of Deputies in 1872; joined the *Union républicaine*; spoke with great ardor in favor of making elementary instruction compulsory and secular; was Minister of Public Instruction in Gambetta's cabinet. See his *La Morale des Jésuites* (6th ed. 1880); *La première année d'enseignement scientifique et instruction civique à l'École* (1882). D. in Hanoi, Nov. 11, 1886.

Berthelot, bār'te-lō', MARCELLIN PIERRE: chemist; b. in Paris, Oct. 25, 1827; Professor of Chemistry in the Collège de France in his native city. He has contributed largely to our knowledge of synthetical processes, and especially of the relations between the phenomena of heat and of chemistry. His principal larger works are: *Chimie organique fondée sur la synthèse* (1860); *Mécanique chimique fondée sur la thermo-chimie* (1879); *Les origines de l'alchimie* (1885); *Chimie des anciens* (1889).

Berthier, bār'ti-ay, LOUIS ALEXANDRE: Prince of Wagram; general; b. at Versailles, Nov. 20, 1753. He served as captain under La Fayette in the U. S. 1778-82. In 1796 he became general of division, and chief of the staff of Bonaparte's army of Italy. He gained the confidence of the general-in-chief, retained for many years the position of chief of the staff, and accompanied Bonaparte to Egypt in 1798. About the end of 1799 he was appointed Minister of War. He became a marshal of France in 1804, and rendered important services in the campaign against Austria, 1805. He usually rode in the carriage of Napoleon, whose plans he digested, and whose orders he dispatched with remarkable rapidity and precision. For his conduct at the battle of Wagram (1809) he received the title of Prince of Wagram. He entered the service of Louis XVIII. in 1814, but when Napoleon returned from Elba Berthier retired to Bamberg, where he was killed by a fall from a window, Jan. 1, 1815.

Berthierite, or **Hardingerite**: a steel-gray, bronzy mineral containing FeS + Sb₂S₃.

Berthold, bār'tōlt, von **Regensburg**: the greatest German preacher of the Middle Ages; b. probably in Regensburg about 1220; d. there Dec. 13, 1272. His sermons are valuable not only as specimens of early German pulpit oratory which he created, but also as documents of early German prose. See Franz Pfeiffer, *Berthold von Regensburg Predigten* (Vienna, 1862); Franz Göbel, *B. v. R. Missionspredigten* (1873); Unkel, *B. v. R.* (Cologne, 1882). J. G.

Berthollet, bār'to-lay', CLAUDE LOUIS, M. D., Count: chemist; b. in Talloire, Savoy, Nov. 9, 1748. He discovered the composition of ammonia, and invented the process of bleaching by chlorine, that of filtration through charcoal, and several fulminating powders. Author of *The Elements of the Art of Dyeing* (1799), and *Essai de statique chimique* (1803). He was associated with Lavoisier in forming a new chemical nomenclature, and was one of the chief originators of modern chemistry. D. near Paris, Nov. 6, 1822.

Bertholle'tia: a genus of trees of the family *Myrtaceæ*. It contains *B. excelsa*, which produces BRAZIL-NUTS (*q. v.*).

Berti, DOMENICO: See the Appendix.

Bertillon, ALPHONSE: anthropologist; b. in Paris, 1853. In 1880, as chief of the identification bureau of the police service of Paris, he established a system of measurements that made the recognition of recidivists or lapsed criminals practically a certainty. In the 700 identifications, which had been transmitted by him to the examining magistrate during the preceding six years, not a single error had been found. His method was adopted throughout France, with a central bureau in Paris, where there occurred a speedy and most marked decrease in the number of professional criminals, who by various disguises had hitherto been able to elude identification by photograph. Belgium and adjacent countries soon adopted the method in self-defense, and it is now general in Europe. It was adopted in Chicago during the World's Fair in 1893 with good results. The principles upon which in practice the system rests take a threefold form: (1) *Anthropometric* (see ANTHROPOMETRY), consisting of measurements of the bony and least changing parts of the adult—e. g. the length and breadth of the head, length of the spine, forearm, finger, nose, ear, etc.; (2) *descriptive*, giving color and other characteristics of the eye, color and quality of the hair, etc.; and (3) *pathological*, giving marks resulting from disease, wounds, or tattooing, warts, moles, etc. These are recorded in a regular order, and by clever abbreviations written on cards and filed away in groups according to some prominent measurements. The chances of error in identification are one in 13,000,000. The system has been used to some extent in the U. S., but a central bureau is needed where duplicates of every case may be kept. The advantages are self-evident; photographs are uncertain, as all men are subject to change in face and appearance whereas the bony parts and iris of the adult never change; photographs can not be sent by telegraph, while these measurements can be sent cheaply and

correctly, the order of facts being the same everywhere. Bertillon has written several works on the subject of criminal anthropology. See his *Identification Anthropométrique* (1893); and *The Theory and Practice of Anthropometric Identification*, by R. W. McClaughy (Chicago and New York, 1896). W. M. F. ROUND.

Bertin, bār'tān', LOUIS FRANÇOIS; called **Bertin l'Ainé**, laÿ'nay': journalist; b. in Paris, Dec. 14, 1766. He founded in 1800, together with his brother (LOUIS FRANÇOIS, surnamed DE VEAUX), the daily *Journal des Débats*, a literary and political journal, which obtained great influence and success. He was hostile to Napoleon, who banished him. On Napoleon's fall he returned and revived his journal in 1814, and continued to edit it until his death, Sept. 13, 1841.—His son LOUIS MARIE ARMAND, b. Aug. 22, 1801, succeeded him as editor. D. in Paris, Jan. 12, 1854.

Bertramus: See RATRAMNUS.

Bertrand, bār'traān', HENRI GRATIEN, Count de: a French general; b. at Châteauroux, Mar. 18, 1773. He followed Napoleon to St. Helena in 1815. D. in Châteauroux, Jan. 31, 1844, leaving *Memoirs of the Campaigns of Egypt and Syria, Dictated by Napoleon at St. Helena* (2 vols., 1847).

Berwick-on-Tweed (often called simply **Berwick**): a fortified seaport-town of England; in Northumberland; on the left (north) bank of the Tweed, at its entrance into the North Sea; 58 miles by rail E. S. E. of Edinburgh; lat. 55° 46' N., lon. 1° 59' W. (see map of England, ref. 2-G). The river is here crossed by an old stone bridge of fifteen arches, 924 feet long, and by a magnificent viaduct, over which the trains of the North British Railway pass. It is crossed by the Northeastern, the Midland, and the Great Northern Railways. It has a Gothic church, a theater, a public library, a town-hall, also large manufactures of steam-engines, mill-machinery, etc. Coal mines are worked in the vicinity. Pop. (1891) 13,378. The history of Berwick is full of interest. It was one of the chief seaports of Scotland in the Middle Ages, and in the border wars was often taken and retaken by the English and Scotch, who regarded it as an important military position. It was finally ceded to England in 1502, and became by treaty a free town, independent of both states. These privileges were confirmed on the accession of James I. to the English throne. Down to the time of George II. it was customary in parliamentary statutes to mention specifically their application to "Berwick-on-the-Tweed."

Berwickshire: a county of Scotland; forming its south-east extremity; bounded N. by Haddington, N. E. by the German Ocean, and S. E. by the river Tweed, which separates it from England, S. by Roxburgh, and W. by Edinburgh. Area, 463 sq. miles. It is drained by the Blackadder, the Whiteadder, and the Eye. The surface is partly hilly in the northern part, occupied by the Lammermuir Hills. The Merse district in the south part, and near the Tweed, is nearly level, and is one of the most fertile and well-cultivated tracts in Great Britain. Carboniferous limestone, porphyry, and old red sandstone occur here. Pop. (1901) 30,785. Capital, Greenlaw.

Ber'yl (Gr. *βήρυλλος*): a mineral (silicate of beryllia) which crystallizes in six-sided prisms, generally green, varying to blue, yellow, or even colorless. The sides of the prisms are often striated longitudinally, but the terminating or truncating planes are generally smooth. The hardness is 7.5 to 8. Those that have clear tints of sky-blue or sea-green form, when transparent, beautiful gems, called by jewelers aqua marine. The clear yellow ones are also used as gems, under the name of golden beryl. The deep rich green variety is the EMERALD (*q. v.*). Beryls are not uncommon in regions of metamorphic rock (gneiss, mica-slate, etc.), such as New England. Gigantic crystals occur at Acworth and Grafton, N. H.—in one case 4 feet long and weighing over a ton, but rough and opaque. Beryls of fine quality occur in Brazil, the Urals, North Carolina, Maine, Colorado, and at other localities. See EMERALD. GEORGE F. KUNZ.

Ber'yx: name of a genus of fishes of the family *Beryce-dæ*, of which few species are living in the present seas, while a large number are found fossil. It begins with the first of the teleosts in the chalk. Three species are found in the chalk of England, and several in the tertiary, especially in the fish-beds of Monte Bolea, near Verona in Italy. This is therefore one of the oldest genera of living fishes.

Berze'lius, JOHAN JACOB, M. D., F. R. S., Baron: Swedish chemist; b. in East Gothland, Aug. 20, 1779. He stud-

ied medicine and chemistry at the University of Upsal, and published in 1606 a *Treatise on Animal Chemistry* (2 vols.). He acquired great excellence as an analyst, and made important discoveries in chemistry. He was the author of the system of chemical symbols, and he discovered the elements selenium and thorium. His most important work is a *System of Chemistry* (Lärebok i Kemien, 3 vols., 1808-18), which was translated into every European language. He was Professor of Medicine and Pharmacy at Stockholm 1807-32. He contributed largely to *Memoirs of Physics, Chemistry, and Mineralogy* (6 vols., 1806-18), a work founded by Berzelius and Hisinger. D. Aug. 7, 1848. See G. Forehammer, *J. J. Berzelius* (1849).

Besa: an ancient city of Egypt, on the site of which the city of Antinoöpolis was built by the Emperor Hadrian in honor of Antinous. It was situated on the east bank of the Nile, near the modern village of Ababde.

Besançon, baŷ'zaän-sön' (anc. *Vesontio*): a city of France; capital of the department of Doubs; on the river Doubs; 58 miles by rail E. of Dijon (see map of France, ref. 5-H). It is connected with Paris and Lyons by several railways, is well built and strongly fortified, having a citadel which is considered impregnable. It was formerly the capital of Franche-Comté. The most remarkable edifices are a Gothic cathedral, a town-hall, a theater, the palace of Cardinal Granvelle, and the prefecture. It has also a college, a public library, a museum, an academy of sciences and arts, and extensive manufactures of watches, jewelry, porcelain, carpets, etc. *Vesontio* was an important town in the time of Cæsar, who in 58 B. C. expelled the Sequani from it. It has Roman antiquities and the remains of an amphitheater and aqueduct. Pop. (1891) 56,065; (1896) 57,556.

Besant, the coin: See **BEZANT**.

Besant, WALTER: novelist; b. at Portsmouth, England, in 1838; graduated at Christ's College, Cambridge; was chosen to a professorship in the Royal College of Mauritius, and afterward served as secretary to the Palestine Exploration Fund. In conjunction with James Rice he published between 1871 and 1882 some dozen novels, including *Ready Money Mortiboy* (1871); *The Monks of Thelema* (1878); *By Celia's Arbour* (1878); and *The Seamy Side* (1880). After the death of his collaborator in 1882 he published a number of books. Among the most popular of these are *All Sorts and Conditions of Men* (1882), which dealt with the social problems of cities and led to the establishment of a public hall in the East End of London; *Dorothy Foster* (1884); *Children of Gibeon* (1886); *The World Went Very Well Then* (1887); *Herr Paulus* (1888); *For Faith and Freedom* (1889); *Armored of Lyonesse* (1890); *A History of London* (1893); *Beyond the Dreams of Avarice* (1894); *The City of Refuge* (1896). He was founder and first president of the Society of Authors. He was knighted May 24, 1895. D. June 9, 1901.

Besnard, bes'naar', PAUL ALBERT: contemporary figure-painter of the French school; pupil of Cabanel, and winner of the Grand Prix de Rome in 1874. He is identified with the most advanced "impressionists" in his methods, and is an artist of great individuality and surpassing technical skill. His portraits are remarkable for beauty and harmony of color, and he has done notable work in decoration. He is one of the most original figures in modern art, and is considered a master by those most in sympathy with his artistic purposes. Second-class medal, Salon, 1880; Legion of Honor 1888. Studio in Paris. W. A. C.

Bessara'bia (after Prince Bessaraba): a province in the southwest part of Russia; bounded N. by Podolia, E. by Podolia, Cherson, and the Black Sea, S. W. and W. by Roumania and Galicia. Area, 17,619 sq. miles. By the treaty of Paris (1856) part of Bessarabia adjacent to the Black Sea was ceded to Turkey, but by the treaty of Berlin in 1878 it was ceded to Russia again. The surface is mostly low and flat; the soil is fertile, producing wheat, barley, maize, tobacco, etc. The chief articles of export are cattle, wool, tallow, and salt. The most of the land is in pasturage. The population is composed of Russians, Germans, Bulgarians, Moldavians, Greeks, Jews, Poles, etc. Pop. (1897) 1,936,403. Capital, Kishinef.

Bessa'rion, JOHN: Greek cardinal; b. in Trebizond in 1403; was a disciple of Gemistus Piethon in philosophy. He favored the union of the Latin and Greek Churches; accompanied the Greek Emperor John II. to the Council of Ferrara (1438-39); was appointed a cardinal in 1439 by Pope

Eugenius IV., and Bishop of Frascati by Nicholas V.; received in 1463 the title of patriarch of Constantinople *in parlibus*. He wrote several works in defense of the philosophy of Plato, translated the *Metaphysics of Aristotle* into Latin, and was an efficient promoter of Greek learning in Italy. At his death he left his library to Venice, and it became the basis of the Library of St. Mark. D. in Ravenna, Nov. 19, 1472. See A. Bandini, *De Vita et Rebus gestis Bessarionis Cardinalis* (1777); also G. Voigt, *Die Wiederbelebung des classischen Alterthums* (2d ed. 1880); Vast, *Le Cardinal Bessarion* (1878); E. Legrand, *Bibliographie hellénique* (2 t., 1885).

Bess'borough, EARLS OF (1739): Viscounts Duncannon (1723), Barons of Bessborough (1723, in Ireland), Barons Ponsonby (1749, in Great Britain), Barons Duncannon (1834, in the United Kingdom), a prominent family of Great Britain.—JOHN GEORGE BRABAZON PONSONBY, the fifth earl; b. Oct. 14, 1809; succeeded his father in 1847. He was member of Parliament for Bletchingley in 1831, for Higham Ferrers in 1831, and for Derby 1834-37. D. Jan. 28, 1880.

Bes'semer: town; Jefferson co., Ala. (for location of county, see map of Alabama, ref. 3-C); on Queen and Crescent Route, and Louis. and Nash. R. Rs.; 11 miles from Birmingham. Bessemer is in an iron and coal mining district, and its principal industry is iron-working; it has also brick-making and wood-working industries. Pop. (1890) 4,544; (1900) 6,358.

Bessemer: city (founded in 1880); Pueblo co., Col. (for location of county, see map of Colorado, ref. 5-E); on Rio Grande R. R. and on Arkansas river, joining Pueblo on the south. The city has 4 public schools and 5 churches; its principal industry is furnished by a great steel-works, employing 1,200 men, with a monthly pay-roll of \$100,000. Pop. (1890) 3,317; annexed to Pueblo since 1890.

EDITOR OF "INDICATOR."

Bessemer: city (founded in 1884); capital of Gogebic co., Mich. (for location of county, see map of Michigan, ref. 2-D); on Du., So. Sh. and At., Mil., L. S. and W., and Wis. Central R. Rs.; 47 miles from Ashland, Wis., in a district noted for its beautiful scenery. Bessemer has a fine high school, six churches, and a stone court-house costing \$50,000. Its industries are chiefly manufacturing and iron-mining. Pop. (1890) 2,566; (1900) 3,911.

EDITOR OF "PICK AND AXE."

Bessemer, Sir HENRY: an English inventor, whose name is coupled with a revolution in the manufacture of steel. He was born at Charlton, in Hertfordshire, Jan. 13, 1813; the youngest son of Anthony Bessemer, a French refugee. Beginning life in London at the age of eighteen as a modeler and designer, he turned his attention first to improving the method of stamping deeds, which was adopted without compensation to Bessemer by the English Stamp Office. He successively turned his inventive skill to devising machinery for making figured Utrecht velvet, to working out a type-casting machine, and to the manufacture of bronze powder. The latter proved a conspicuous commercial success, and is still produced by his successors. Between 1844 and 1853 a series of other inventions occupied his attention. In 1854 he brought before Emperor Napoleon an invention relating to projectiles. This brought him into contact with the manufacture of steel, and led him to make a series of experiments at an old factory at St. Pancras, which led to the invention of the pneumatic process bearing his name. The first public announcement of it was made on Aug. 11, 1856, at the Cheltenham meeting of the British Association. It was received with skepticism and ridicule by the majority of iron-makers. Experiments which proved successful in some localities were discredited by disastrous failures in others. A series of laborious and costly investigations followed, which proved that the pig iron to be used must be low in phosphorus, and that a manganese carbon alloy must be added at the end of the operation, the latter discovery having been made by Robert Mushet. Again Bessemer came before the public, reading a paper on May 24, 1859, before the Institution of Civil Engineers. It was not until he had established works at Sheffield, and had become an active and dangerous competitor, that other makers availed themselves of the process. It made such rapid progress that ten years after the first announcement Bessemer was deriving from it an income of £100,000 per year, his total revenue from the patents having been £1,057,748. The Sheffield works yielded in fourteen years eighty-one times the origi-

nal investment. In 1869 he entered a new field of invention, aiming to check the rolling motion of vessels and prevent seasickness. A vessel with a swinging saloon was launched in 1874, but after a few voyages she was abandoned. Later he devoted himself to the improvement of telescopes. D. in London, Mar. 15, 1898. C. KIRCHHOFF.

Bessemer's Process for Refining Iron: See BESSEMER, HENRY, and STEEL.

Bes'ser, WILLIAM FREDERICK, D. D.: Lutheran preacher and commentator; b. at Warnstedt, in the Harz, Sept. 27, 1816. He was a pupil of Tholuck, Hengstenberg, and von Gerlach. The most of his life was spent in the pastorate in Pomerania and Silesia. From 1853-57 he was associate director of the Leipzig Society for Foreign Missions. He was a preacher of great power who sought to faithfully expound the meaning of the text of the Bible, and whose expository lectures (*Bibelstunden*) cover nearly all the books of the New Testament. They are extensively read in devotional meetings in Germany. Several volumes have been translated into English: *Christ the Light of the World*; *Christ the Life of the World*, an exposition of the Gospel of John (Edinburgh, 1861); an admirable translation by Mrs. Huxtable. D. in Niederlössnitz, near Dresden, Sept. 26, 1884.

HENRY E. JACOBS.

Bes'sey, CHARLES EDWIN, Ph. D.: botanist; b. in Milton, Wayne co., O., May 21, 1845; educated in the common schools and academies of Ohio, in Michigan Agricultural College, and in Harvard University; Professor of Botany in Iowa Agricultural College 1870-84; Professor of Botany in University of Nebraska 1884; associate editor (botany) of *American Naturalist* 1880; president of Iowa Academy of Sciences 1875-84; president of Society for the Promotion of Agricultural Science 1883-85; president of Nebraska Academy of Sciences 1891; acting chancellor of University of Nebraska 1888-91; fellow of American Association for the Advancement of Science; principal publications are *Reports on Insects* (1873-74); *Geography of Iowa* (1876); *The Erysiphei of North America* (1877); *Botany for High Schools and Colleges* (1880); *Essentials of Botany* (1884); *Reports of the State Botanist of Nebraska* (1887 to 1892); *Preliminary Report on the Native Trees and Shrubs of Nebraska* (1891); associate editor of *Johnson's Universal Cyclopaedia*, in charge of the department of Botany, 1893.

Bessières, bes'si-âr', JEAN BAPTISTE: Duke of Istria; French marshal; b. near Cahors, Lot, Aug. 5, 1768. He entered the army as a private in 1792, served with distinction in Italy and Egypt, became a general of division in 1802, and marshal of France in 1804. He rendered important services at Austerlitz, Jena, Friedland, and Eylau. Having obtained in 1808 command of an army in Spain, he gained a victory at Medina del Rio Seco. He had the chief command of the cavalry of the grand army in 1813, and was killed on the day before the battle of Lützen, May 1, 1813. See Miramont, *Vie de J. B. Bessières*; *Victoires et Conquêtes des Français*.

Best, WILLIAM THOMAS: organist; b. in Carlisle, England, Aug. 13, 1826; devoted himself to the study of the organ, and received his first appointment in 1840 in Liverpool, where with few intervals he had since remained. Since 1855 he had been organist of St. George's Hall there. He was one of the most remarkable organists of the century. His compositions include a few church services and anthems, and an immense number of organ pieces, original and arranged, a few pieces for pianoforte, and two or three orchestral pieces. D. May 10, 1897. D. E. HERVEY.

Bestia'ris: books treating of beasts. See PHYSIOLOGUS.

Betanzos, baÿ-taan'thōs (anc. *Fla'vium Brigantium*): a town of Spain; province of Corunna; 12 miles S. E. of Corunna (see map of Spain, ref. 12-B). It is said to be the oldest town in Galicia, and has remains of ancient fortifications. Here are manufactures of linen, leather, and pottery. Pop. (1887) 8,122.

Be'tel, or Pawn: a narcotic stimulant extensively used as a masticatory by Oriental peoples, especially by tribes of the Malay race. It consists of a portion of the nut of the *Areca catechu* (called the betel-nut or *pinang*), rolled up with lime in the leaf of the *Piper betel* or other species of pepper. The leaf is plucked green, and is smeared with moistened quicklime before the slice of areca nut is wrapped in it. This mixture is chewed continually by men, women, and children, and the use of it is so general that a Malay presents his betel-box as a European offers his snuff-box.

This practice appears to be very ancient, having prevailed before the Christian era. The betel causes giddiness in those who are not accustomed to chewing it. The habitual use of it blackens the teeth, and perhaps destroys them. According to Sir James E. Tennent, the betel is beneficial, acting as a tonic, antacid, and carminative.

Beth: a Hebrew noun, meaning "house" or "habitation"; employed some fifty times in the Scriptures as a prefix in naming places, such as Bethel, Bethlehem, and Bethany.

Betham-Edwards, Miss MATILDA BARBARA: author; b. at Westerfield, England, 1836; has contributed to *Punch*, *Graphic*, *Macmillan's Magazine*, and other periodicals, and published numerous novels which have been reprinted in other languages, *The White House by the Sea* appearing in 1855. In 1885 she published a volume of poems, and in 1889 edited Arthur Young's *Travels in France*.

Beth'any [Heb., house of dates]: a village of Palestine; on the east slope of the Mount of Olives, nearly 2 miles (15 stadia) E. of Jerusalem. As the home of Mary, Martha, and Lazarus, it was the scene of interesting events in sacred history. (See Matthew xxi. 17; xxvi. 6; John xi. and xii.; Luke xix. 29.) From some point near the village Christ ascended into heaven. (Luke xxiv. 50.) Here is a cave or excavation in a rock, which, according to a worthless tradition, is the grave of Lazarus. The descent into it is effected by twenty-six steps cut into the solid rock. The modern village contains about forty families of Moslems.

Bethany: town; capital of Harrison co., Mo. (for location of county, see map of Missouri, ref. 1-E); on Chicago, Burlington and Quincy R. R.; 62 miles N. E. of St. Joseph; is in an agricultural and stock-raising district, and has wagon, broom, and canning factories. Pop. (1880) 994; (1890) 1,105; (1900) 2,093.

Bethany: a village of Brooke co., West Va. (for location of county, see map of West Virginia, ref. 3-II); on Buffalo Creek; 7 miles from the Ohio river, and 16 miles N. E. of Wheeling. It is situated in a beautiful and fertile region, and is the seat of Bethany College, established in 1841 by Alexander Campbell. (See DISCIPLES OF CHRIST.) Pop. (1880) 335; (1890) about 400; (1900) 245.

Beth'el (Arab. *Beitin* or *Beiteen*): an ancient town of Palestine; noted as the scene of the dream of the patriarch Jacob; was 10 or 12 miles N. of Jerusalem. It was near the boundary between Judea and Samaria. Here are ruins of ancient churches and other buildings.

Bethel: borough; Fairfield co., Conn. (for location of county, see map of Connecticut, ref. 11-D); on branch of Housatonic R. R.; 62 miles from New York city; has large hat-shops, farming industries, and street railroad to Danbury, 3 miles distant. Pop. (1880) 1,767; (1890) 2,335; (1900) 2,561.

Bethel: on railroad; Windsor co., Vt. (for location of county, see map of Vermont, ref. 7-C); 25 miles N. W. of White River junction; has manufactures of lumber, leather, flour, shoes, meal, etc. Pop. of township (1880) 1,693; (1890) 1,448; (1900) 1,611. EDITOR OF "COURIER."

Bethel College: in McKenzie, Tenn.; an institution of learning founded, with a liberal charter, in 1850. Obligated to close its doors during the civil war, it was successfully reorganized at its close, and has since had a successful career. The college is under the control of the Synod of West Tennessee of the Cumberland Presbyterian Church. A liberal Christianity and a high standard of moral character are inculcated, yet no peculiar sectarian or political principles are allowed in the literary department. Candidates for the ministry of all denominations receive tuition free of charge. Both sexes are admitted. The course of study is thorough and of an eminently practical character. Charles E. Starke, A. M., is president. At present (1900) there are 6 teachers in all departments, 3 permanent lecturers, and 87 students.

Bethes'da [Heb., house of mercy]: a pool or tank at Jerusalem where the lame man was miraculously healed (John v. 1-9). Some identify it with Birket Israil, a large reservoir inside the city walls, near St. Stephen's Gate; others with the Fountain of the Virgin (intermittent), about 300 yards S. of the Temple area; and others with the pool of Siloam, about 300 yards farther S.

Beth'lehem [Heb., house of bread; so called from its fertile soil]: a town frequently mentioned in both the Old and New Testaments, and especially distinguished as the

birthplace of our Saviour, as well as of his ancestor, King David (see map of Palestine, ref. 10-D). Anciently it was called "Bethlehem Judah," to distinguish it from another Bethlehem in the northern part of Palestine (Josh. xix. 15). It is mentioned as existing in the time of Jacob, but was probably never very large or commercially important. It has at present about 5,000 inhabitants, all Christians. The principal trade of the place is in crosses, beads, and relics. Here are Greek, Latin, and Armenian convents; and the monks show a cave which they claim to have been the stable where our Lord was born. See Robinson's *Biblical Researches*; Hackett's *Illustrations of Scripture*; Ritter's *Geography of Palestine*.

Bethlehem: borough and railroad junction; Northampton co., Pa. (for location of county, see map of Pennsylvania, ref. 4-J); on the left bank of the Lehigh river, 57 miles N. of Philadelphia and 5 miles E. of Allentown. It is pleasantly situated on the slopes of several hills. Two bridges across the river connect it with South Bethlehem, the seat of Lehigh University, founded by Asa Packer in 1866, and richly endowed, having fine stone edifices on a high and commanding position. Bethlehem was founded in 1741 by the Moravians, who have here a large stone church 142 feet long, a theological seminary, an ancient chapel, a young ladies' seminary, and an extensive parochial school. There are a large number of manufactories, chiefly in South Bethlehem, including three silk-mills, several foundries, the Bethlehem Iron Company's rolling-mills, machine-shops, etc.—one of the largest establishments of the kind in the U. S.; Lehigh Zinc Company's rolling-mill, zinc oxide and spelter works; Lehigh Brass-works, gas-works in both boroughs, etc. South Bethlehem also contains the main offices of the Lehigh Valley Railroad Company. Pop. (1880) 5,193; (1890) 6,762; (1900) 7,293; of South Bethlehem borough (1880) 4,925; (1890) 10,302; (1900) 13,241. EDITOR OF "TIMES."

Bethlemites: an order of monks established at Cambridge, England, in 1257; also, an order of monks and nuns instituted at Guatemala about 1665. They are found in Central and South America and the Canary islands.

Bethlen-Gabor, bet'len-gaa'bōr: Magyar general and ruler; b. 1580; through aid of the Turks was chosen Prince of Transylvania 1613; aided the Bohemians in defense of their religious and political rights against Austria 1619; King of Hungary 1620, but soon abdicated, receiving important concessions from Ferdinand II. of Austria; took part in the Thirty Years war. He did much to advance the cause of learning. D. 1629.

Bethmann-Hollweg, bāt'maan-hōl'vāch, MORITZ AUGUST: jurist and statesman; b. at Frankfort-on-the-Main, Apr. 8, 1795. He was Professor of Civil Law at Berlin, and subsequently at Bonn, and was Prussian Minister of Public Instruction from 1858 to 1862. He published several valuable legal works. D. in his castle, Rheineck, on the Rhine, near Andernach, July 14, 1877.

Beth'phage [Heb., house of figs]: a locality in Palestine, near Jerusalem; appears to have been on or near the Mount of Olives. The name occurs in Luke xix. 29 and Matthew xxi. 1. Its site has not been exactly ascertained.

Bethsa'ida [Heb., fish-houses]: an ancient town in Palestine; on the west shore of the Lake of Galilee, the home of Andrew, Peter, and Philip (John i. 44). Dr. Robinson identifies it with Ain-et-Tabigbah, in a little bay or cove between Khan Minyeh (Capernaum?) and Tell Hum (Chorazin?). Another Bethsaida, afterward called *Julias*, was situated near the head of the lake, on the east side of the Jordan, about 2 miles from its mouth. It was near this Bethsaida that Christ fed the 5,000. (Luke ix. 10-17.)

Beth'shemesh [Heb., house of the sun]: the name of four places mentioned in the Scriptures, the most important of which was a sacerdotal city of Judah, about 15 miles W. S. W. of Jerusalem, and about 2 miles from the great Philistine plain. It was here the ark rested on its way home from Ekron (7 miles). It was here that Amaziah, King of Judah, was worsted and taken prisoner by Jehoash, King of Israel (2 Kings xiv. 11-13). In the reign of Ahaz it was captured by the Philistines (2 Chron. xxviii. 18), and is not again mentioned in sacred history. It stood on a low ridge. Only ruins now mark the spot, which bears the name of *Ain-Shems* (fountain of the sun). The greater part of Samson's exploits were in its immediate neighborhood.

Béthune, bay'tün': a fortified town of France; department of Pas-de-Calais; 23 miles by rail N. N. W. of Arras (see map of France, ref. 2-F). It has a fine castle, a college, and a Gothic church; also manufactures of oil, soap, and woolen goods. It was taken from the Spaniards in 1645, retaken by Prince Eugène in 1710, and restored to France in 1713. Pop. (1896) 11,627.

Bethune, CHARLES J. S.: See the Appendix.

Bethune, GEORGE WASHINGTON, D. D.: divine and poet; b. in the city of New York, Mar. 18, 1805; graduated at Dickinson College 1823, and studied at the Princeton Theological Seminary in 1823-25. In 1827 he became pastor of a Dutch Reformed church in Rhinebeck, N. Y. He was afterward settled in Utica, and still later in Philadelphia. In 1851 he removed to Brooklyn, N. Y., and 1859 to New York as associate pastor of the Twenty-first Street church. He was a distinguished orator and most lovable man, a poet and a wit. In 1861 he went to Europe for the benefit of his health, but died at Florence, Apr. 27, 1862. He published an edition of *Walton's Complete Angler* (N. Y., 1846); *A Commentary on the 130th Psalm* (1847); and *Lays of Love and Faith* (1847). Several of his hymns are widely used. See his life by A. R. Van Nest (New York, 1867).

S. M. JACKSON.

Betlis: See BITLIS.

Béton, bay'tōi': an artificial stone made by the thorough mixing of sand and hydraulic cement. It was invented by François Coignet, and is hence often called *Béton-Coignet*. The word has been sometimes used as synonymous with concrete, but this designation is now mostly abandoned. See CEMENT, CONCRETE, and STONE.

Betterments: improvements put on real estate which enhance its value more than mere repairs. According to the common law, if a *bona fide* holder of real estate under a defeasible title made improvements while in possession of the land, they became a part of the realty, and could not be removed therefrom without the consent of the lawful owner, neither could any compensation be had therefor. Where the true owner, in an ejectment suit, asked judgment for mesne profits, the *bona-fide* disseisor was allowed to offset the same by a claim for his improvements. In some States statutes have been passed under which the disseisor is now allowed to bring an original action to recover the value of his improvements. Statutes will be found in the several States which provide that after recovery in ejectment, if the improvements were made in good faith, the defendant shall be entitled to recover of the plaintiff the value of the same; but the plaintiff is given the right to elect to have the value of the land without the improvements assessed, and the defendant must then purchase the same at the price assessed within a given time or lose the benefit of his claim for improvements. HENRY WADE ROGERS.

Bet'terton, THOMAS: English actor; b. in London in Aug., 1635. He performed with great success the parts of Hamlet, Macbeth, and Othello. He was the chief ornament of the English stage for nearly fifty years. His wife was a popular actress. D. in London, Apr. 28, 1710. See Charles Gildon, *Life of T. Betterton* (1710).

Betting, or **Wagering**: the laying or making of a bet or wager. (See WAGER.) This is a vicious practice which prevails more or less in all countries. The English are addicted to betting on horse-races to a ruinous extent. The British Parliament passed an act, 16 and 17 Vict. c. 119, to suppress the haunts of betters, called betting-houses, which it declares to be a common nuisance and contrary to law. But it provides that its enactments shall not extend to stakes or deposits due to the winner of any race or lawful sport. The U. S. laws prohibit betting on elections.

Betts, BEVERLEY ROBINSON, A. M.: b. in the city of New York, Aug. 3, 1827; graduated at Columbia College in 1846, and at the General Theological Seminary of the Protestant Episcopal Church in that city in 1850; ordained in 1850. After a short charge of Trinity church, Rockaway, he was in 1855 made rector of St. Saviour's church, Maspeth, Long Island, which position he held for nearly fourteen years; in 1865 he was appointed librarian of Columbia College; prepared for the press a full catalogue of the library of the college (1874); was a frequent contributor to Church reviews and journals. He retired from the librarianship in 1883. D. May 21, 1899.

Betts, SAMUEL ROSSITER, LL. D.: jurist; b. in Richmond, Mass., June 8, 1787; graduated at Williams College in 1806;

practiced law in Sullivan co., N. Y.; served in the war of 1812; became judge advocate; was a member of Congress (1815-17). He was a judge of the circuit court of the State (1823-26), and U. S. district judge (1826-67). D. in New Haven, Conn., Nov. 2, 1868. He published a treatise on *Admiralty Practice* (1838).

Betul, bāy-tool': a district of Nerbudda, Central Provinces, British India; the westernmost part of the great Satpura plateau; between the parallels 21° 20' N. and 22° 35' N., and meridians 77° 20' E. and 78° 35' E. It is a hilly highland tract, averaging 2,000 feet above the sea. The northern and southern parts are sparsely settled and comparatively sterile, while the central portion has a very rich soil, is well watered, and densely populated. Wheat and pulses form the principal crops, while cotton, rice, sugarcane, and opium are raised to some extent. Coal occurs in many parts, but is not worked. Extensive forests occupy about one-fifth of the area, and yield much good timber. Area, 3,905 sq. miles. The climate is comparatively salubrious, but fevers of a severe type prevail in the jungles. The rainfall is about 40 inches per year. Pop. 300,000. The aboriginal Gonds can still be found in the jungle towns.
M. W. H.

Beugnot, bōn'yō', ARTHUR AUGUSTE, Comte de: writer and liberal statesman; b. at Bar-sur-Anbe, Mar. 25, 1797. He wrote an *Essay on the Institutions of Saint Louis* (Paris, 8vo, 1821); *The Jews of the West* (Paris, 8vo, 1824); and a *History of the Destruction of Paganism in the West* (2 vols., 1835). He became a peer of France in 1841. As a member of the Legislative Assembly of 1849 he promoted freedom in public instruction. D. in Paris, Mar. 15, 1865.

Beulé, bō'lay', CHARLES ERNEST: a French archæologist; b. in Saumur, June 29, 1826; took part in 1849-53 in the excavations of the Acropolis in Athens, and became in 1854 Professor of Archæology in the Imperial Library in Paris. He wrote, among other works, *L'Acropole d'Athènes* (2 vols., 1854); *Études sur le Péloponnèse* (1855); *Fouilles de Carthage* (the results of his excavations in Carthage in 1858); and *Auguste, sa Famille*, etc. (1867). D. in Paris, Apr. 4, 1874.

Beurmann, boir'mään, KARL MORITZ, von: explorer; b. in Potsdam, July 28, 1835. In 1860 he attempted to explore the country of the Bogos, but did not succeed in reaching it until Mar., 1861. In Dec., 1861, he was engaged to look for Vogel, who, it was supposed, had been murdered in Wadai. Beurmann was to start from Tripoli, while at the same time Heuglin should attempt to reach Wadai from Abyssinia. He reached Kuka in Bornu in Aug., 1862. As it was impossible to reach Wadai at that time, he made a trip to Jacoba in Bantchi, from which he returned to Kuka Dec. 13. Soon after he attempted the voyage to Wadai, and, having succeeded after several futile attempts, he was murdered in Feb., 1863, in Moa, in the most western province of Wadai, by the command of the governor.

Beust, boist, FRIEDRICH FERDINAND, Count von: b. in Dresden, June 13, 1809. He studied law and political economy at Leipzig and Göttingen; entered the diplomatic service of Saxony in 1831; was made minister of foreign affairs in 1849. In this position he made himself noticed by his opposition to Prussia, which often assumed the aspect of mere rivalry with Bismarck. After the battle of Sadowa he resigned his position, and removed to Vienna; in 1867 he was made chancellor of the Austrian empire, notwithstanding his Protestant faith. The complete reorganization of the empire—political, financial, military, etc.—was the problem placed before him, and the present constitution, which made great concessions to the Magyars, placing them on an equal footing with the Germans, but paying little regard to the Slavs, was his work. Following his advice, Austria simply canceled the concordat with the Pope in spite of the protest of the Cnria, removed Jewish disabilities, and authorized civil marriages. In 1871 he went to London as Austrian ambassador; he remained till 1876, when he was appointed Austrian ambassador at Paris; held the office till 1882. D. in Vienna, Oct. 24, 1886. See his *Memoirs* (Eng. trans. by H. de Worms, London, 2 vols., 1887).

Beuthen, boi'ten: a town of Prussia; in Silesia; 50 miles E. S. E. of Oppeln (see map of German Empire, ref. 5-J); has manufactures of woolen cloth, zinc-ware, and pottery. Pop. (1880) 22,823; (1890) 30,823.

Beveridge, WILLIAM: Orientalist and bishop; b. at Barrow, Leicestershire, England, early in 1636-37 (baptized

Feb. 21), and was educated at Cambridge. He was a man of great learning, and of profoundly religious character. He published a *Treatise on Chronology* (1669); a work *On the Canons of the Greek Church* (1672); and several devotional treatises. In 1704 he was appointed Bishop of St. Asaph. D. in London, Mar. 5, 1707-08. See Thomas H. Horne's *Memoir of Bishop Beveridge*, prefixed to an edition of his works (9 vols., London, 1824); another edition was published in twelve volumes of the Anglo-Catholic Library at Oxford (1842-48). His favorite production, *Private Thoughts upon Religion*, appeared posthumously (1709); often reprinted (e. g. 1871).

Beverland, bev'er-laänt, ADRIAAN: a Dutch classical scholar and heterodox writer; b. at Middelburg about 1654; was a friend of Isaac Vossius. He wrote *Peccatum Originale* (place of publication called "Elentheropolis in Porto Hesperidum," 1678; 2d ed. Leyden, 1679; French translation in Paris, 1714; 6th ed. 1774); *De fornicatione cavenda* (Augsburg, 1697; 2d ed. Amsterdam, 1698); and other works which were censured for impiety. He wrote also *De stolata virginitatis jure* (Leyden, 1680). He was banished from Utrecht, and removed to England, where he died insane in 1712.
S. M. JACKSON.

Bev'erley: a market-town of Yorkshire, England; 1 mile W. of the river Hull, and 10 miles N. N. W. of the city of Hull (see map of England, ref. 6-J). It is the chief town of the East Riding of Yorkshire, and is handsomely built. The origin of the name is said to be *Beverlac*, a "lake or dam of beavers." It has an ancient and beautiful Gothic minster, called the Church of St. John, which exhibits several styles of Gothic architecture, and ranks next to York Minster among the ecclesiastical structures of England. The oldest part of this was erected in the thirteenth century. A priory was founded here about 700 A. D. Beverley has an active trade in corn, coals, and leather, and is on the railway from Hull to York. It was made a suffragan episcopal see in 1889. Pop. (1891) 12,539.

Beverly: city; on main line of B. and M. R. R., Essex co., Mass. (for location, see map of Massachusetts, ref. 1-1); is on a small inlet of the ocean, 2 miles N. N. E. of Salem and 18 miles N. N. E. of Boston. A bridge across the inlet connects it with Salem. It derives its prosperity chiefly from manufactures of shoes, oiled clothing, leather belting, earriages, and other staple merchandise. Has a high school, fine system of water-works, a well-equipped fire department, and two street-railway systems. Its tax valuation in 1891 was \$13,168,155. Pop. of township (1880) 8,456; (1890) 10,821; (1900) 13,884.
EDITOR OF "CITIZEN."

Beverly: a city of Burlington co., N. J. (for location of county, see map of New Jersey, ref. 5-D); on railroad and the Delaware river; 15 miles above Philadelphia. It has a woolen mill, an oil-cloth factory, a very extensive rope-walk, and is a place of summer resort. Pop. (1880) 1,759; (1890) 1,957; (1900) 1,950.

Bewick, byu'ik, THOMAS: English engraver; b. near Newcastle-on-Tyne, Aug. 12, 1753; a pupil of Beilby. He was the founder of the modern English school of wood-engraving, and none of his numerous pupils has excelled him. He illustrated Gay's *Fables* (1779). Beilby and Bewick published in 1790 a *History of British Quadrupeds*, with engravings, which procured for Bewick a high reputation. He was assisted by his brother John in the designs of Goldsmith's *Traveller* and *Deserted Village*. Among his best works are *Æsop's Fables* and a *History of British Birds* (2 vols., 1804). D. at Gateshead, Nov. 8, 1828. See Dobson, *Bewick and his Pupils* (1884).

Bey, or **Beg** [Turk., prince, governor]: a title of the Turkish empire. The ruling officers of Tripoli and Tunis are beys, and the same title is given to some local magistrates, to colonels and generals of the army, and to the sons of pashas. In other cases it is a merely honorary title.

Beyle, bayl, MARIE HENRI: French *littérateur*, who wrote under the assumed name of *Stendhal*; b. at Grenoble, Jan. 23, 1783. He held several high civil offices under Napoleon. Among his chief works are a *History of Painting in Italy* (2 vols., 1817); *Le Rouge et le Noir*, a novel; a *Life of Rossini* (1824); *Memoirs of a Tourist* (1838); *Rome, Naples, and Florence*; and a novel called *The Carthusian Nun of Parma* (1839). He passed many years in Italy. D. in Paris Mar. 23, 1842. See Honoré de Balzac, *Études sur M. Beyle*.

Beyrout, or **Beyrut**, **Beirut**, or **Bairut**, pronounced in Arabic bay'root', but in Turkish bī'root' [supposed by some

to be identical with the *Berothai* of 2 Sam. viii. 8, and the *Berothah* of Ezek. xlvii. 16; Gr. Βηρυτός; Lat. *Berytus*]: a flourishing commercial town and seaport of Syria; finely situated on the Mediterranean, at the foot of Mt. Lebanon, 58 miles W. N. W. of Damascus (see map of Palestine, ref. 2-E). The harbor admits only small vessels, but in the bay about 3 miles from the city there is good anchorage for large ships. This is the chief seaport of Damascus and Syria, and has an extensive commerce, which is increasing. French steamers ply weekly between Beyrout and Marseilles, and British steamers ply regularly between this city and Liverpool. The chief articles of export are madder, silk, wool, olive oil, and gums. Here are important manufactures of silk stuffs. Pop. about 85,000. *Berytus* was besieged and taken by Baldwin, King of Jerusalem, about 1110, and retaken by the Saracens in 1187. American missionaries have been there since 1823. The Protestant Syrian College was opened in 1866.

Be'za (Fr. *De Bèze*), THEODORE: Calvinistic theologian; b. in his father's castle in Vezelay, Burgundy, June 24, 1519. In his youth he enjoyed two benefices in the Catholic Church, and lived in Paris the careless life of a Humanist and poet; but he was converted in 1548 and went to Geneva, where he avowed himself a Protestant. He became Professor of Greek at Lausanne 1549, and an intimate friend of Calvin. In 1554 he published a treatise, *De Hæreticis a Civili Magistratu Puniendis*, in which he defended the burning of Servetus. He removed to Geneva in 1558, and became Calvin's ablest coadjutor, and his successor as Professor of Theology in 1564. He afterward ruled the Genevan Church with energy for forty years. At the same time he played a very prominent part in French religious history, for which his aristocratic birth, courtly bearing, and rare learning fitted him. He was the chosen spokesman of the Huguenot party, and frequently appeared in their behalf before kings and other potentates. After Calvin's death he was recognized more than ever as the great Reformed theologian. But he lacked Calvin's genius, and made his system too inflexible. Thus he prepared the way for the reaction which Arminius, one of his pupils, brought about. The Calvinistic party in the Church of England revered Beza and sat at his feet. One of his great services was the completion of Clement Marot's French translation of the Psalms (1560), which furnished the Huguenots with their song-book; another was his editions of Stephen's Greek Testament (Geneva, 1565, *sqq.*), with a superior Latin translation, first issued separately 1557, and notes; all of which were popular and affected King James's revisers. He also presented to the University of Cambridge the uncial codex D (1581). Among his other works are a *Life of Calvin*, the best of the contemporary biographies of the Reformers (Eng. trans. Edin. 1844). The *History of the Reformed Churches in France from 1521 to 1563* (3 vols., 1580), attributed to Beza, is his only in the sense that he suggested it, edited and supplied matter for it anonymously; but he was not the writer of the greater part of it (best ed. by Baum, Cunitz, and R. Reuss, Paris, 1883-89, 3 vols.; there is no Eng. trans.). D. in Geneva, Oct. 13, 1605. See Baum, *Th. Beza* (2 vols., 1843-51); Heppe, *Th. Beza* (1861).

SAMUEL MACAULEY JACKSON.

Bezant', or **Besant** [O. Fr. *besan*, plur. *besanz*, from Lat. *byzantius*, sc. *nummus*, coin, Byzantine]: a gold coin struck at Byzantium, or a circular piece of gold or silver without any impression; supposed to be a part of the old coinage of Byzantium. Some of these were brought home by the crusaders, and were current in England. Their value was 10s. sterling, but some gold bezants were worth £15 sterling. They occur in heraldic charges, especially Cornish coat-armor, and in the arms of banks or bankers (hence the "three balls" of the pawnbroker's shop). *Bezant* in heraldry is a globe *or*, or a circle *argent*.

Béziers, bay'zhay' (anc. *Bæterræ*): a city of France; in the department of Hérault; on the river Orb and the Canal du Midi; 27 miles by rail E. S. E. of Cète (see map of France, ref. 9-F). It is on the railway which connects Montpellier with Toulouse, and has a delightful situation, with a mild climate. It has a college, a public library, a theater; also manufactures of silk, hosiery, gloves, etc. Béziers was the scene of a massacre of the Albigenes in 1209. Pop. (1896) 48,012.

Bezique, be-zeek' [from Fr. *bésigue*; etymol. unknown]: game at cards; played by two persons with a double pack,

containing only the aces, tens, kings, queens, knaves, nines, eights, and sevens, which rank in the order named. Eight cards are dealt each player, and after each trick each player draws one from the top of the stock, the winner of the trick drawing first. Trump is determined either by the suit of the first marriage or sequence scored, or by turning the top card of the stock, which is then placed right side up beside the stock and constitutes its bottom card. The lead belongs to the non-dealer for the first trick; thereafter to the winner of the previous trick. The leader wins the trick unless his opponent plays a higher card of the same suit or (when trump is not led) a trump. After the stock is exhausted, the second player must follow suit if possible and take the trick if possible; before this he is under no restriction whatever as to what card to play.

He who first scores 1,000 points wins the game; if his opponent has scored less than 500 the game counts double; a *partie* is the best three games of five. The winner of the last trick of each hand scores 10; each brisque (ace or ten) taken in a trick counts 10; and if trump is turned, 10 each is scored for turning the seven, for exchanging from one's hand a seven of trumps for a turned trump not a seven, and for declaring the second seven of trumps. Besides this, certain combinations of cards when declared count as follows: Class I.—Marriage (king and queen of the same suit), 20; royal marriage (same for trump suit), 40; sequence of five highest trumps (i. e. ace, ten, king, queen, and knave), 250. Class II.—Bezique (queen of spades and knave of diamonds), 40; double bezique (both queens of spades and knaves of diamonds), 500. Class III.—Any four aces, 100; any four kings, 80; any four queens, 60; any four knaves, 40. Except for the seven of trumps, a declaration is made by placing the declared cards (which still form part of the player's hand) face up on the table, where they remain until played, or until the stock is exhausted. A declaration (or exchange of the seven of trumps) can be scored only after winning a trick and before drawing, and only one can be scored at a time. It can not be scored after the stock is exhausted. After a card has scored in one combination, it may form a part of other combinations, with the restriction that it can not be used in an *equal* or *inferior* one of the same class. A player is not obliged to declare or score any combination he may hold, but after each trick he should repeat what he has to score for new combinations of declared cards.

RUBICON BEZIQUE is a modification of the above game played with four packs instead of two, and differing somewhat in its method of counting.

Be'zoar [viâ Span. and Arab. from Pers. *pâdzahr*, antidote]: a calculous concretion found in the stomachs or intestines of goats, deer, and other ruminant animals; formerly prized for its supposed medicinal virtues and as an antidote to poisons. That of the antelope was especially prized. The bezoar is usually composed of phosphates of lime. It is quite worthless as a medicine.

Bezold, bay'tsolt, JOHANN FRIEDERICH WILHELM, von, Ph. D.: meteorologist; director of the German Meteorological Institute and professor in the University of Berlin; b. at Munich, Bavaria, June 21, 1837; educated at the Gymnasium in Munich and at the universities of Munich and Göttingen; became privat-docent, then professor at the former university, from which station he was called to Berlin as professor in the university there and director of the official meteorological institute. Dr. von Bezold is a physicist as well as a meteorologist, and he holds an eminent position as a student of the more abstruse problems of meteorology. His publications have been very numerous; among them may be mentioned *Die Farbenlehre im Hinblick auf Kunst und Kunstgewerbe* (Brunswick, 1874; Boston, 1876); *Beobgn. der met. Stationen im Königr. Bayern* (6 vols., 1879-84; with Dr. Lang); *Ergebnisse der met. Beobgn. in Prussia* (1885-91); many publications in Poggendorff's and Wiedemann's *Annalen*, more especially on electricity and physiological optics; *Beobachtungen über die Dämmerung* (*Pogg. Annalen*, 1864); *Ein Beitrag zur Gewitterkunde* (*ib.*, 1869); *Die Kältenrückfälle im Mai*, *Abhandlungen d. bayer. Akad.* (1883); four papers *Zur Thermodynamik der Atmosphäre*, in the *Sitzungsberichte der Berliner Akad.* (1888-92); *Zur Theorie der Cyklonen* (*ib.*, 1890).

MARK W. HARRINGTON.

Bezenberger, ADALBERT: See the Appendix.

Bhagalpur: See the Appendix.

APPENDIX.

Abstract of Title: in conveyancing, a brief statement or summary of the instruments and facts composing the evidence necessary to prove a title to real estate, and the evidence of the charges and liens upon the property. The abstract is intended to enable a purchaser or mortgagee, or their counsel, to judge exactly the state of the title to the property, and to this end should set forth briefly, in chronological order, the facts affecting the title. The abstract usually contains a caption showing the contents and method of arrangement, and drawings and an index if needed, and sets forth the particulars of all patents, deeds, powers, wills, judicial sales, execution sales, tax sales, dedications to public use, titles by descent, and liens and incumbrances. The last mentioned usually include, in the U. S., liens to State and Federal Government, official bonds, taxes, special assessments, judgments and executions, recognizances, attachments, *lis pendens*, mechanics' liens, vendors' liens, decedents' debts, legacies and annuities, mortgages and deeds of trust, dower and curtesy, easements, and miscellaneous liens.

In the U. S. the universal practice and necessity of recording instruments affecting real estate, in order to make them effectual as notice to innocent third parties and the title secure, makes it possible for any one to make an abstract of title of any particular piece of real estate, and abstracts are usually prepared at the expense of the purchaser, the vendor being required only to be able to deliver a marketable title, and not to furnish an abstract in the absence of an express agreement to that effect.

In England, where mortgages by custom were created by delivery of the title-deeds, this abstract is usually prepared at the expense of the owner, and his failure to deliver an abstract of title relieves the purchaser from his contract in law. In the U. S. the abstract is carried back a varying number of years; in England, by virtue of the act of 38 and 39 Vict., c. 78, it is sufficient if it be carried back forty years prior to the date of the intended sale.

See Comyns on *Abstracts of Title* (5th ed. London, 1895); Gover's *Hints as to Advising on Titles* (3d ed. London, 1896); and Warvelle's *Treatise on Abstracts and Examinations of Title to Real Property* (2d ed. Chicago, 1892).

F. STURGES ALLEN.

Accommodation and Adaptation: terms common to psychology and biology, and both denoting the process by which the mind or the organism is brought into living adjustment with its environment or surrounding conditions. Accommodation is the more recent term and has certain special applications: (1) Accommodation of the eye is the process of adjustment to the varying distances at which the object seen presents itself. It is accomplished by a very exact reflex muscular adjustment, by which the convex surface of the crystalline lens is made more or less convex for the focusing of the rays upon the retina. (See VISION.) (2) Accommodation considered as a principle of mental action is the general process of taking in new facts, sensations, and experiences generally, and learning them so that they can be treated suitably in the future. It is opposed to "habit," which covers the mind's treatment of its knowledge under certain regular rules of action. Accommodation usually involves the violation or modification of one or more habits of action. Mental growth is by a continuous series of new accommodations to the social, scientific, artistic, and literary environments. There are two great questions to be answered in any theory of mental accommodation: First, how the muscular system becomes adapted to secure suitable action upon the objects of the external world. This is necessary in order that we may anticipate by our action the recurrence of this or that sensational experience. According to a school of thinkers who follow J. S. Mill, the essence of our belief in the external world is just our sense that by suitable (i. e. properly ac-

commodated) action we can reinstate the objects of the external world in our experience at any time. (See BELIEF.) And, second, the accommodation of the attention whereby we are able to bring the attention into focus with the proper concentration directly upon this or that object of thought. (See ATTENTION.) In both of these cases many psychologists believe that accommodation is secured by the production of "overproduced or excessive movements" made in the line as near as possible to that which seems suitable to acquire the new adjustment. From these excessive movements those elements are repeated and refined which succeed in some measure, and by going through the process again and again the activity aimed at is secured; thus accommodation becomes perfect. A common illustration of this is the child's learning to control his hands for writing or any delicate piece of manipulation. He throws his whole body into excessive and convulsive efforts, centering about his hand, and thus increases the chance of producing the right combinations. As he succeeds, the unnecessary and uncouth movements are allowed to die away.

In biology accommodation is used for the process whereby the organism becomes adjusted to the conditions of its environment. All the adjustments which the animals learn in their individual lifetime, by functional activity, are accommodations, such as changes of color with change of temperature, or other forces in the surroundings, etc.

Adaptation is used in biology for adjustments which are anatomical and due to constitutional differences (see VARIATION) rather than to functional processes. Yet adaptation is often used in a loose sense to denote simply the fact that there is an adjustment without asking how it came about. In this usage accommodations become cases of adaptation which involve functional adjustment. For literature, see the works given under EVOLUTION and GENETIC PSYCHOLOGY, and the titles cited under *Accommodation and Adaptation* in *Baldwin's Dictionary of Philosophy and Psychology* (Macmillans, 1899-1900).
J. MARK BALDWIN.

Acetylene: a compound of hydrogen and carbon having the composition represented by the formula C_2H_2 . It was discovered in England in 1836 by Edmund Davy, a relative of the great chemist Sir Humphry Davy. In 1807 the latter discovered potassium by electrolysis of fused potassium hydroxide; later Curaudau calcined potassium tartrate, thus obtaining a mixture of potassium carbonate and carbon, which on distillation yielded potassium. Edmund Davy, experimenting with this method, obtained a black substance which decomposed water, yielding a combustible gaseous compound of carbon and hydrogen; the black substance was impure potassium carbide, C_2K_2 , the gas acetylene, C_2H_2 . In 1862 Berthelot in Paris prepared acetylene by different methods, two of which deserve mention: First, by heating ethylene gas, which at red heat breaks down into acetylene and hydrogen, $C_2H_4 = C_2H_2 + 2H$; secondly, by direct synthesis from the elements; in a glass vessel filled with hydrogen he caused an electric arc to play between two carbon points, thus vaporizing carbon, which at the heated points combined with hydrogen, forming acetylene, $2C + 2H = C_2H_2$. Berthelot studied the properties of acetylene and gave it its name. He also discovered a method of making acetylene by the incomplete combustion of coal-gas, which is still the usual laboratory method of preparation. In the same year, 1862, Wöhler in Göttingen heated an alloy of calcium and zinc together with carbon to a very high temperature and obtained calcium carbide, C_2Ca . He noted particularly its remarkable property of decomposing water, forming acetylene and slaked lime. Thus both acetylene and calcium carbide have been known for many years, and various other methods of preparation have been devised. But all these methods are so costly that both substances had only a scientific interest until the period 1892-95, when

Thomas L. Willson, of Canada, in his works at Spray, N. C., and Prof. Henri Moissan, of Paris, discovered, each without knowledge of the other's work, practically the same method of making calcium carbide cheaply, a method applicable on the large scale, by the action of very high heat, generated by a powerful electric arc, on a mixture of lime and carbon, the products being calcium carbide and carbon monoxide, $3C + CaO = C_2Ca + CO$. The calcium carbide decomposes water, yielding calcium hydroxide (slaked lime) and acetylene, $C_2Ca + 2H_2O = C_2H_2 + CaO_2H_2$. Curiously enough, the discovery of Willson and that of Moissan were both accidental. With these discoveries the industrial value of carbide and of acetylene was established.

Physical Properties and Chemistry of Calcium Carbide.—Calcium carbide is a hard, brittle, reddish-brown, crystalline substance of brilliant metallic luster; its specific gravity is 2.2. One cubic foot of carbide weighs $137\frac{1}{2}$ lb. No known reagent dissolves it without complete decomposition; hydrogen does not act on it, nor do most metals. Water changes it quantitatively into slaked lime and acetylene, 1 kilogramme of carbide yielding 349 liters, or 1 lb., 5.62 cubic feet of acetylene.

Calcium carbide is formed by bringing together metallic calcium or any of its compounds with carbon at sufficiently high temperature. This fact is of great importance with relation to the present condition of the sun and stars, to the condition of the surface rocks of the earth in earlier periods of its geological history, and to the condition of the heated interior of the earth at the present time. Upon the facts that other common metals resemble calcium in this power of forming carbides at high temperatures, and that most metallic carbides are decomposed by water or dilute acids yielding inflammable gaseous or liquid hydrocarbons, Moissan bases his theory of the formation of natural gas and of petroleum. For full information on carbides the reader is referred to Moissan's book (see *Bibliography*). Among the known carbides those of sodium, potassium, lithium, barium, strontium, and calcium decompose water, yielding acetylene. Owing to the cheapness of the raw material, calcium carbide is the only one which has or will have industrial value as a source of acetylene. Other uses of carbide are for carbonizing steel (experiments in Germany having led to its introduction in some steel-works for this purpose) and as a germicide. It is claimed that it is the most effectual remedy against black rot, and especially against phylloxera. It is probable that much of the enormous output of carbide for 1899 will be used in French, Spanish, and Italian vineyards for the latter purpose. The action of the carbide as a germicide seems to be due to the slow generation of acetylene, which is deadly to the phylloxera.

Physical Properties and Chemistry of Acetylene.—Pure acetylene is a colorless gas of pleasant ethereal odor. The unpleasant garlic odor of commercial acetylene is due to impurities, which can be removed by passing the impure gas through solutions of chloride of lime, metallic salts, and water successively. Acetylene is lighter than air; its density is 0.92. It contains 92.3 per cent. of carbon and 7.7 per cent. of hydrogen by weight. Heated to above 600° , it polymerizes, forming other hydrocarbons. At 760° it is decomposed into carbon and hydrogen. The weight of a cubic meter is 1.12 kilogrammes. At 20° C. 10 volumes of water absorb 11 volumes of acetylene; 100 volumes of a saturated aqueous solution of salt absorb 5 volumes; 1 volume of alcohol dissolves 6 volumes; 1 volume of acetone dissolves 15 volumes; at 12 atmospheres pressure 1 liter of acetone dissolves 300 liters of acetylene. These solubilities are of practical importance in generating and storing acetylene. Acetylene is very slowly decomposed by direct sunlight, yielding a mixture of dense, gaseous, liquid, and solid hydrocarbons. Acetylene heated to a red heat yields benzene, $3(C_2H_2) = C_6H_6$. This is not an industrial method of making benzene, but the fact is of great importance in its bearing on acetylene generators and burners. With very cheap carbide acetylene would prove useful in many ways in chemical industry, and its use would have the most widespread effect on industry and agriculture. For example, alcohol can be made from it, and a method for making sugar from acetylene has been patented in Germany. These processes are of no practical interest with the present prices of alcohol, of sugar, and of carbide.

The work of Moissan, of Gerdes, and of others has proved conclusively that neither pure acetylene nor commercial acetylene attacks copper, lead, tin, zinc, iron, brass, or any other common metal or alloy. A. Gerdes, working with

Julius Pintsch in Berlin, hung plates of various metals in cylinders filled (a) with acetylene, (b) with a mixture of 80 per cent. acetylene and 20 per cent. oil-gas, and (c) with a mixture of 20 per cent. acetylene and 80 per cent. oil-gas. The acetylene cylinders were at atmospheric pressure, the mixture at a pressure of 10 atmospheres. The cylinders were placed on a roof and exposed for nine months through the hot and cold seasons, but the metal plates were not attacked. Acetylene is decomposed, however, at ordinary temperatures with incandescence by platinum sponge, and by finely divided and freshly reduced iron, cobalt, and nickel, because metals in this condition are very porous and absorb the gas so energetically that enough heat is generated to raise the temperature to the decomposing-point of acetylene, 760° C.

Acetylene is absorbed by ammoniacal solutions of cuprous salts, and of silver salts, forming cuprous acetylide, C_2Cu_2 , and silver acetylide, C_2Ag_2 . These acetylides, if dry, are very explosive. Acetylene also attacks commercial solutions of cupric salts, such as copper sulphate, precipitating slowly, but quantitatively, all copper, as black cupric acetylide, C_2Cu . This also is very dangerous when dry, friction or heating to only 50° C. causing explosion. Repeated statements have been published in the daily press and in technical and scientific journals to the effect that it is dangerous to use copper or brass in apparatus for generating or storing acetylene, because the explosive cuprous acetylide could be formed. (The equally explosive cupric salt is a recent and not generally known discovery.) These statements lack foundation, as acetylene does not act on metallic copper or brass, and the conditions necessary to change the metal into an ammoniacal cupric or cuprous salt could hardly be realized in generators, gas-holders, or storage-cylinders. Still, as acetylene from impure carbide is always more or less contaminated by ammonia, such conditions are not impossible, and it is well to exclude the use of copper or brass from generators. The use of these metals in small lamps such as bicycle-lamps, which are made of brass, is entirely safe.

Combustion of Acetylene.—Acetylene ignited in an open vessel burns with a luminous and very smoky flame, giving off clouds of fine soot, owing to imperfect combustion. If mixed with enough air to render the combustion complete, the flame is white and clear. Two volumes of acetylene burn with 5 volumes of oxygen, forming 2 volumes of water-vapor and 4 of carbon dioxide, $2(C_2H_2) + 5O_2 = 2H_2O + 4CO_2$. The same products with addition of nitrogen are formed when 2 volumes of acetylene burn with 25 volumes of air. The actinic power of the clear acetylene light is high; light colors appear lighter and dark colors darker than in sunlight. The light is white and has none of the bluish tint of the electric arc light, or the greenish tint of the gas-flame of the Welsbach burner. When acetylene is formed from carbon and hydrogen heat is absorbed—i. e. the reaction is endothermic. The molecular weight of acetylene (C_2H_2) is 26—i. e. 26 grammes of acetylene are made up of 24 grammes of carbon and 2 grammes of hydrogen; 24 grammes of carbon burned to carbon dioxide give $24 \times 8.08 = 193.9$ calories; 2 grammes of hydrogen burned to water-vapor give $2 \times 34.5 = 69$ calories. In making 26 grammes of acetylene 55 calories are absorbed, which are given up on burning, $193.9 + 69 + 55 = 317.9$ calories; 1,000 grammes (= 1 kilogramme) generate 12,230 calories, or 1 cubic meter of acetylene generates 13,697 calories; 1 cubic foot generates 407 calories. Actual tests confirm these figures. As a cubic meter of illuminating-gas has an average heat of combustion of 5,500 calories, that of acetylene has over two and a half times as much—i. e. 4 cubic feet of acetylene burned in a gas-stove would do the same work as about 9 cubic feet of illuminating-gas; yet, for illuminating purposes, with an equal light, acetylene gives off much less heat than illuminating-gas, because one light-unit is produced by the combustion of 7 liters of acetylene per hour, generating 98 calories, while to obtain the same light from illuminating-gas, using the most improved Welsbach burner, 25 liters must be burned, generating 125 calories. The only inflammable mixtures of acetylene with air, i. e. those in which combustion can spread through the mass, lie for unconfined volumes between 2.8 per cent. of acetylene as the lowest and 65 per cent. as the highest limit; in tubes the limits approach each other gradually as the diameter decreases, till in tubes of 0.5 mm. diameter no combustible mixture of air and acetylene can strike back. These facts are important as applied to the construction of

acetylene burners with the Welsbach mantle. Acetylene has a kindling temperature of 480°C .; that of average illuminating-gas is 600°C .

Temperatures of Combustion.—A mixture of air and acetylene containing 7.74 per cent. acetylene burns with a temperature of $2,420^{\circ}\text{C}$. The Walther process for making carbide depends upon this fact. Burned with an equal volume of pure oxygen it gives a temperature of $4,000^{\circ}$ —i. e. $1,000^{\circ}$ higher than the oxyhydrogen flame—and the products of combustion are pure carbon monoxide and hydrogen, two combustible gases, and both of them reducing agents, a double property which will render acetylene very valuable for many laboratory uses and metallurgical reactions. When used as an illuminant, however, it has been experimentally proved by Grehant that with a proper burner the combustion of acetylene to carbon dioxide and water is complete; not a trace of carbon monoxide or other combustible gas containing carbon is formed; but with an inefficient burner the poisonous carbon monoxide is formed to some extent.

Toxic Properties of Acetylene.—The experiments of Breiner, of Malooz and Crismer, of Frank, and especially of Grehant, show that, while acetylene is poisonous in large doses, it is much less poisonous than coal-gas or water-gas, as these contain carbon monoxide. Acetylene simply dissolves in the blood-plasma, while carbon monoxide forms a compound with the hæmoglobin of the blood. Acetylene made in poor generators from commercial carbide contains impurities, which, when the gas is burned, yield combustion products not toxic, but injurious to persons with weak lungs. With good generators, however, only harmless traces of these impurities remain in the acetylene.

Liquefaction of Acetylene.—Acetylene liquefies when it is subjected to a pressure of 39.76 atmospheres at 20°C . (68°F .), at which temperature it has a density of 0.33 as compared with water; i. e. 1 liter of liquid acetylene at 40 atmospheres pressure weighs 330 grammes. A cubic meter of gaseous acetylene is compressed to 2 liters when liquefied, or 500 cubic feet of gas give 1 cubic foot of liquid. If liquid acetylene is allowed to escape in a jet from a cylinder of the liquid into the air, it becomes gaseous, and in so doing absorbs so much heat that the temperature is reduced to -90°C ., freezing a part of the liquid acetylene to a white solid like snow. These properties of liquid acetylene suggested its use for storage for house illumination, and methods were devised for liquefying the gas. Those of Dickerson and Suckert, Bullier, and Pictet may be mentioned. Dickerson and Suckert in New York were the first to liquefy acetylene commercially. By their method the gas is developed by dripping water on carbide in a closed generator, passes mixed with water-vapor through a cool condenser which condenses the water-vapor, the gas passing into a drying-chamber containing trays of calcium carbide, which absorbs the last traces of moisture. From the drying-chamber the gas passes into a cooled condenser, where it is liquefied by the pressure of the gas in the closed generator, and runs into a receiver from which a pipe leads to the shipping-cylinders. The strong steel shipping-cylinders contain about half a cubic foot or 9 lb. of liquid acetylene, which gives 250 cubic feet of gaseous acetylene, or they are of double that capacity. Bullier's method of liquefaction is in the main similar to Suckert's, as, indeed, is Pictet's. As a cylinder containing half a cubic foot of liquid acetylene would furnish 250 cubic feet of gas, equivalent in illuminating power to 2,500 cubic feet of illuminating-gas, and without the inconvenience of laying gas-mains in the streets, the attention of inventors was at first chiefly turned to this method of supply. It may in the future come again into prominence despite the present strong feeling against it, its use in some cities and some countries being prohibited. This feeling was caused by a number of explosions of liquid acetylene, accompanied by loss of life, and destruction of buildings by explosions and subsequent fire. Several of these explosions occurred in buildings where the acetylene was liquefied, some in the houses of consumers. In every case the evidence showed that the explosions were caused by gross carelessness.

Liquid Acetylene Compared with Calcium Carbide and with Acetone Solutions of Acetylene as a Means of Storing or Transportation.—One cubic meter of acetylene is compressed to 2 liters in liquid form. Two liters of carbide weigh 4.44 kilogrammes, which will produce $1\frac{1}{2}$ cubic meters of acetylene, reckoning 300 liters to the kilogramme, which is the average guaranteed yield of French commercial carbide.

Then the light carbide drums occupy less space and weigh much less than the heavy steel cylinders, while the generation of the gas is simple and with proper generators perfectly safe. These facts must be granted, and, with the existing feelings and laws regarding acetylene, the only practical method of illumination by acetylene at the present time consists in transporting the carbide and generating the gas at the place of consumption. Still, as will be seen, this method involves the use of generators which have to be refilled and cleaned from time to time, and the waste products removed. For consumers who object to this care, the solubility of acetylene in acetone suggests a convenient method.

Solutions of Acetylene in Acetone under Pressure.—Claude and Hess in France have recently suggested the use of such solutions under moderate pressure. One liter of acetone dissolves 15 liters of acetylene at 15°C . under the atmospheric pressure, and 300 liters under a pressure of 12 atmospheres. A rise of temperature of 35° only doubles the pressure within the vessel, whereas with liquid acetylene a rise of but 18° increases the pressure from 40 atmospheres initial pressure at 19° to 68 atmospheres at 39° . Hence solution in acetone greatly diminishes the danger of storage and transportation as compared with liquid acetylene.

Explosiveness of Acetylene.—Berthelot and Violle have published in the *Comptes Rendus* of the French Academy of Sciences the results of a series of elaborate experiments on the explosiveness of gaseous and of liquid acetylene, and of solutions of acetylene in acetone. The general method of experiment was to fill a steel bomb with the acetylene, or with the solution, and start the decomposition of the acetylene by exploding a cap of fulminating mercury inside the bomb and connected by a wire with a battery, so that a spark could ignite it. With gaseous acetylene the decomposition does not spread beyond the point of contact with the cap, unless the acetylene is under more than two atmospheres pressure; if the pressure is greater the decomposition spreads instantaneously, causing a violent explosion. The decomposition represented by the equation $\text{C}_2\text{H}_2 = 2\text{C} + 2\text{H}$ causes the temperature to rise to $2,750^{\circ}\text{C}$. The pressure produced is eleven times the initial pressure. Liquid acetylene (liquefied under a pressure of 40 atmospheres) is instantly decomposed by the spark, exerting a pressure of 79,138 lb. per square inch, liquid acetylene thus having about the same explosive force as gun-cotton. Bombs filled with gaseous or liquid acetylene and crushed by the fall of a heavy ram do not explode, unless friction of the fragments of the iron bomb cause a spark. Solutions of acetylene in acetone are absolutely safe and can not be exploded by a shock or spark within the bomb at pressures not exceeding 10 atmospheres: if, however, the pressure approaches 20 atmospheres, the explosion is even more violent than that of liquid acetylene, as both the acetylene and the acetone are decomposed into their elements; the liability to explosion is equal to that of liquid acetylene, but the danger from accidental rise of temperature is much less. Berthelot concludes that acetylene explosions can be prevented (1) by using gaseous acetylene under low pressure; (2) by using solutions of acetylene in acetone under such conditions that the pressure can not exceed 10 atmospheres; (3) by not using liquid acetylene; (4) by not allowing water to drip on an excess of carbide in the generator, which causes over-heating. See *Generators*.

Acetylene as an Enricher of Water-gas and of Coal-gas.—It was hoped that acetylene would be found valuable for these purposes, but experiments by Lewes and others proved that it was not a good enricher of water-gas. It is an excellent enricher of coal-gas, but elaborate experiments by Vautier show that at the present prices of carbide acetylene can not be profitably used abroad. The experiments of American observers show that, if carbide could be bought at \$50 a ton, acetylene could compete with other enrichers.

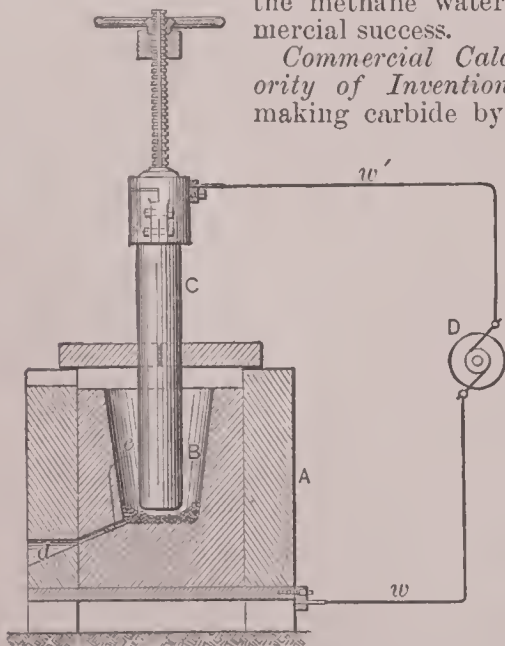
Diluents of Acetylene.—A common objection to the acetylene light is that the very high illumination coming from a small source is a strain to the eye, unless the source of light is shielded, while at the same time it causes dark shadows, so that the actual illuminating effect to the user is not as great as the value shown by the photometer would indicate. This trouble, as well as that of smoky burners, disappears when the acetylene is diluted. Air, water-gas, hydrogen, carbon dioxide, carbon monoxide, and nitrogen have been suggested and experimented with. Suffice it to say that none of these has a practical value.

Pintsch Oil-gas and Acetylene Light.—The only diluent in actual use is the Pintsch oil-gas. A. Gerdes, working

with Julius Pintsch, the inventor of the oil-gas lighting method now in common use in Europe and in this country, has made excellent experiments on mixtures of oil-gas and acetylene. He has proved that a mixture of oil-gas with 20 per cent. of acetylene, used at 10 atmospheres pressure, is perfectly safe, and gives double the light given by oil-gas alone, raising the candle-power from 19 to 38. The best proof of the safety and value of this light, which is primarily intended for railroad use, is that it has been adopted by the Prussian state roads after thorough tests by Government experts, and is now in use for lighting cars on all of the Prussian state lines.

Marsh-gas as a Diluent.—Prof. Vivian B. Lewes, perhaps the foremost English expert on gas-lighting and on acetylene, while engaged in studying the relative illuminating values of the different constituents of coal-gas, was struck by the value of methane (marsh-gas) in increasing the size of the flame and keeping up its illuminating power. He has recently tried the effect of methane as a diluent for acetylene, and finds (a) that mixtures of methane and acetylene give a higher value than $2\frac{1}{2}$ candles for each per cent. of acetylene added; (b) that with a mixture of methane and 10 per cent. of acetylene the enrichment value is over 3 candles for each per cent. of acetylene added; (c) that the addition of methane to a mixture of carbon monoxide and acetylene, or to one of hydrogen and acetylene, or to one of water-gas and acetylene, at once raises the enrichment value of the acetylene. Pure methane would be too expensive a diluent, but Lewes has devised a new form of water-gas generator which makes a water-gas containing 45 per cent. of hydrogen, 15 per cent. of carbon monoxide, and 30 per cent. of methane, at a cost of from 15 to 20 cents per 1,000 cubic feet (in London), and which has an initial illuminating value of 10 to 12 candles. This mixed with 5 per cent. of acetylene has 18 to 20 candle-power, and it is proposed that it should be distributed and burned in exactly the same way, and with the same burners, as coal-gas, having the same specific gravity and illuminating value. Mixtures of this methane water-gas with 50 per cent. of acetylene compressed in cylinders for railroad lighting was proved to be absolutely safe like the Pintsch gas-mixture. Lewes thinks that this method of utilizing acetylene is pre-eminently the one which promises for it the largest and most remunerative future. It will be noted that this result of Lewes is really simply solving the problem by using acetylene to enrich water-gas. Lewes himself was the first to point out that a small percentage of acetylene simply vanishes in water-gas without enriching it appreciably. This curious fact was noted by all other observers. Now Lewes shows that he can enrich water-gas with acetylene by adding enough methane. There is no doubt of the great practical value of these studies if a working generator for the methane water-gas proves a commercial success.

Commercial Calcium Carbide—Priority of Invention.—The priority of making carbide by an electric furnace is claimed by Willson in America, for Moissan in France by his friends, and by Borchers in Germany. Space can not be given to details of the dispute. Willson's priority is established. The German Government, recognizing it, has annulled the patent it had granted to Bullier, who had patented Moissan's process. Borchers's claims are too vague to mention. It is an American invention. Willson's co-workers, Dr. G. de Chalmot, chemist, and J. M. Morehead,



Section of Willson's first furnace.

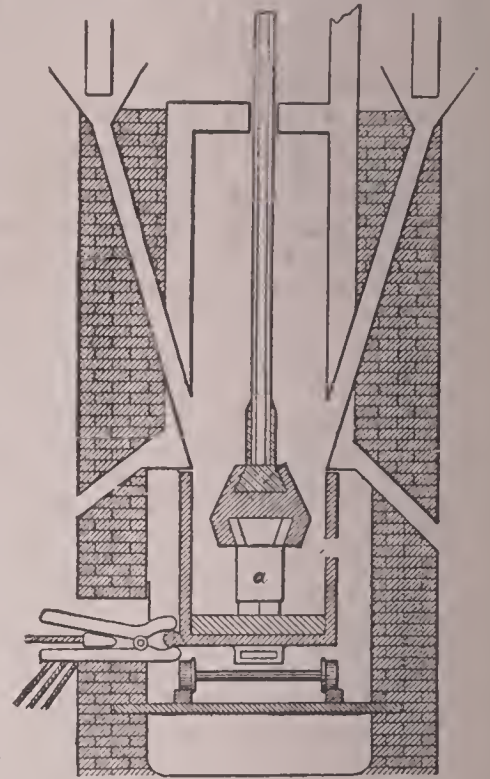
A, masonry; B, carbon crucible or hearth; C, movable carbon electrode; D, dynamo; w w', wires carrying current; d, tap-hole. Bullier's furnace is similar, differing only in detail.

electrician, worked up the details of the furnace process in the early days at Spray, N. C., and the purity and yield of

the carbide per horse-power as well as the yield from weight of material obtained by De Chalmot and Morehead have never been excelled.

Carbide Furnaces.—Electric furnaces are of two classes, *electrolytic*, in which electrical energy is transformed into chemical energy to bring about chemical decomposition by electrolysis, and *electrothermic*, in which electrical energy is transformed into thermal energy to produce high temperature. Carbide furnaces are all of the latter type; the heat in the arc of the carbide furnace ranges from 2,000° C., the minimum, to 3,800°, the maximum. Of the many electric furnaces patented or used for making carbide, drawings of a few of the most important are given. They all have this essential principle in common, that the heat is generated by an arc current between two carbon electrodes, in most furnaces one electrode being the crucible itself or its carbon bottom, the other electrode having a vertical carbon rod dipping into the melted carbide. The drawing of Willson's first furnace at Spray, N. C., shows these features.

In the first Niagara Falls furnace built under Willson's patents by Messrs. de Chalmot, Morehead & King, the bottom of the furnace is an iron car running on rails. In this car the carbide is formed; the bottom is covered with 4 to 8 inches of carbon; the movable carbon electrode (a) is raised as the carbide is formed. When the car is full the current is cut off for a moment, and the full car is replaced by an empty one. This furnace is now replaced by the Horry furnace.



Section of old Niagara Falls furnace.

The furnaces in actual use in Europe are of the Willson or Bullier type, or modifications of these types. The Heroult furnace, thirty-two of which are in use at Notre Dame de Briançon, on the Isere in Savoy, at Froges, near Grenoble, and at the Neuhausen works at the falls of the Rhine, resembles the old Niagara Falls furnace. The furnaces of the British Acetylene Illuminating Company at Foyers, Scotland, are a modification of the Willson type. At St. Catharines, Canada, Willson is running his own furnaces. The Horry furnace is now in use at Niagara Falls and at Sault Ste. Marie. This furnace is the invention of W. S. Horry.

The furnaces at Niagara are 9 feet in diameter, with a capacity of 20 tons daily; larger furnaces are building to increase the output to 50 tons daily. The following description of the new Horry plant at Sault Ste. Marie is a brief abstract from an article in the *Electric World*, Aug. 6, 1898: The plant is on the shore of the St. Mary's river, through which Lake Superior empties into Lake Huron. The power canal is designed for an ultimate development of 40,000 horse-power. The portion of the power-house now in construction will be capable of containing 40 generators, 60 carbide furnaces, 80 turbine wheels, and supplementary machinery. The generators consist of a battery of Walker alternating current dynamos, of 500 horse-power or 375 kilowatts each. Each machine will deliver about 2,000 amperes at 200 volts pressure. The capacity of each generator expressed in yield of carbide will be 3 to 4 tons each twenty-four hours. For each four generators there are six furnaces, but four being in operation at one time. The Horry furnaces are of the continuous type. Each consists of a huge short cylinder or hollow wheel, mounted to revolve slowly on a horizontal shaft. The periphery of the cylinder is closed by a number of cast-iron slats which are readily removable. As the cylinder is revolved on its axis from time to time by a worm and hand-wheel, the slats are taken off from one side and replaced on the other, thus leaving the top always open. The cylinder is filled on one side with the mixture of finely

powdered coke-dust and lime, and into the mixture two carbon electrodes project downward. As the carbide is formed the cylinder is revolved, lowering the mass from the electrodes. The fused carbide cools, hardens, and is broken off and removed as it rises on the other side of the cylinder. New material is constantly fed in to maintain the level around the electrodes.



Front of Horry furnace.

This new plant shows the latest improvement in carbide manufacture, unless certain features in the Nicolai smelter constitute a further advance. This smelter is in the main a Horry furnace turned on its side, with the axis vertical instead of horizontal, and with the necessary changes of detail incident to this change of position. It has just been introduced by Nicolai, director of the German Electric Company, in Berlin.

The *Walther process*, introduced at Leipzig, does not use electric power, but burns acetylene at considerable pressure as the source of heat, to form carbide from coke and lime.

Percentage of Pure Carbide in Commercial Carbide.—The actual ingot of good commercial carbide is nearly pure—96 to 99 per cent. In making carbide, however, the ingot is surrounded by a crust of carbide mixed with unchanged material. The crust contains from 40 to 70 per cent. of carbide. As there is no demand for the crust abroad, foreign manufacturers break and blend ingot and crust to standard size. The best foreign manufacturers guarantee 90 per cent. pure or 5 cubic feet of acetylene per pound (pure carbide gives 5.89 cubic feet); 8 to 9 lb. per horsepower in twenty-four hours of carbide averaging 5 cubic feet is considered very satisfactory. The Union Carbide Company, which controls the sale of carbide in the U. S., is selling graded carbides under guarantee. The first grade is nearly pure. The lower grade is the crust.

Packing Carbide.—As the moisture of the air decomposes carbide, it is broken up as soon as made and packed in air-tight tin cans, varying in size from 1 to 400 lb.

Price of Carbide.—The present price of carbide in all foreign countries averages \$96.80 per ton in large lots packed, and \$7.26 per hundredweight (112 lb.), or \$145.20 per ton, in small lots. The prices at Niagara Falls are, for car-load lots of 12 tons, \$70 per ton; for lots of 1 ton, \$75 per ton; for lots of 1,000 to 2,000 lb., per pound, 4 cents; for lots of 100 to 1,000 lb., per pound, 4½ cents—the demand exceeding the supply. The table at the end of this article shows an enormous output of carbide for 1899. Probably much of this will be in demand as a germicide and for metallurgical purposes, but the increased production will certainly lower the price.

Impurities of Commercial Carbide.—These consist of magnesium nitride, calcium phosphide, aluminium sulphide, and iron silicide. In good carbide the total amount is small, and the admirable experiments of Lewes have shown that with a good generator there is no danger possible from the impurities, and that the acetylene generated is practically freed from the impurities of the carbide, these impurities or

their decomposition products remaining in the generator sludge.

Acetylene Generators.—The perplexing and the most important question to the consumer of acetylene at the present time is what generator to buy. The carbide manufacture is so organized that it is everywhere under the control of powerful responsible companies, which sell a guaranteed product at a definite price. With generators it is different. The market is flooded with them at all prices, ranging in value from worse than useless to very good, as regards safety, economy, and quality of light. No individual generators will be mentioned here, for obvious reasons. The generator question has been carefully studied of late, the most exhaustive experiments being those of Lewes. His results agree with those reached by other observers. Lewes classes generators as follows: (1) Those in which water drips or flows slowly on a mass of carbide; (2) those in which water rises, coming in contact with a mass of carbide suspended in a basket within a bell; (3) those in which water rises, coming in contact with layers of carbide suspended on trays, one tray above the other, and without a bell; (4) those in which the carbide is dropped or plunged into an excess of water. He proves that the first two classes are dangerous on account of overheating, the heat generated in experiments with generators of class (2) being in some cases so great that the temperature may rise to over 800° C., at which temperature all acetylene in contact with the glowing mass is decomposed into carbon and hydrogen, while at temperatures above 650° C. acetylene is polymerized, forming benzene and tar. He shows, further, that the heat decomposes the acetylene in part, lessening the yield of gas and greatly impairing its illuminating power; and that the decomposition products (tar and benzene) ruin the burners. Many generators of the third class are good; those of the fourth are the best.

Acetylene Burners.—The best burners are those of the type of the Napheys burner invented by E. J. Dolan, of Philadelphia. It may suffice to say that the general principle is that of the Bunsen burner, causing a thorough mixture of the acetylene with enough air to insure the best illumination. While acetylene thus far is burned with a flat luminous flame, inventors in Germany are now utilizing its great heat of combustion by burning in burners of the Welsbach type using modified Welsbach mantles, with very promising results.

Acetylene Lamps.—Lamps with a generator in the base for domestic use have been put on the market, but have not proved a success. The bicycle-lamps in which, generally, water drips through a needle valve on a cartridge of carbide, or on loose lumps, are successful; there is no gas-holder, the gas being burned as fast as made.

Size of Burners and Cost of Illumination.—The acetylene burners are for ¼, ½, or 1 cubic foot per hour. A ½-foot burner gives a flame of 17 candles. A pound of carbide of 5-cubic-foot quality will give (allowing for loss in the domestic generator) 4½ cubic feet of acetylene per hour. With carbide at \$75 per ton, the acetylene costs (reckoning nothing for the generator, care, or cost of outfit) \$7.44 per 1,000 cubic feet, ⅔ of a cent per half-foot, giving 17 candle-power light for one hour. It is useless to print comparisons of the price of acetylene with that of gas or electricity, as conditions vary for every locality. The chief use of acetylene hitherto has been for lighting country houses where a good light was sought without question as to the cost. While carbide doubtless will be much cheaper in the future, it must be remembered that the continued improvements in incandescent gas-burners, and the introduction at the present moment of greatly improved processes for making and cheapening water-gas, like the Delwyk process, will give a better and cheaper gaslight.

Patents.—The Willson patents cover, in the U. S., Canada, and the South American states, the manufacture of crystalline carbide, and, as all carbide made by electric furnaces is crystalline, no carbide can be made independently of these patents in these countries. The Willson patents in the U. S. are controlled by the Electro Gas Company, the Union Carbide Company acting as distributors of carbide. Willson patents have been applied for, but are contested, in France, Germany, and some of the Australian colonies. In England patents have been granted to both Willson and Bullier. Bullier holds patents in France, and did in Germany, but the German patents were annulled on the ground that Willson's carbide antedated Moissan's. The Horry furnace is controlled by the Electro Gas Company.

Carbide Plants.—From notes in current journals and consular reports, the following imperfect data up to January, 1899, are taken; as manufacturers often withhold information, it is impossible to get full statistics:

COUNTRY.	Town and province.	Present yearly output.	Proposed yearly output in works to be finished, 1899.	Total capacity of new work.	Horse-power of new works.
		Long tons.	Long tons.	Long tons.	
United States..	Niagara Falls.	3,000	6,000	15,000	17,500
	Sault Ste.-Marie.	900	6,000	36,000	40,000
Canada	St. Catharines.	750	....	....	....
Great Britain..	Foyers, Scotland.	387	....	....	....
	Birmingham, Ingleton.	....	....	....	....
Germany	Rheinfelden (and three others).	....	....	....	5,000
	Meran.	....	....	....	1,500
Austria	Lend-Gastein, Tyrol.	....	8,000	75	7,500
	Tajce, Bosnia.....	....	9,000	....	8,000
Switzerland....	Four factories, of which Soc. Genevoise is enlarged.	....	....	....	....
	Gampel, Wallis. Neuhausen is a very large factory.	....	2,790	....	2,500
Sweden	One factory.	....	....	....	....
Belgium	One factory.	....	....	....	....
Italy	Three factories, of which S. Martini.	....	....	....	1,000
	La Prag.	....	....	....	3,000
Spain	Brega, Catalonia.	....	2,790	....	2,500
	A new factory on the Ebro.	....	....	30,000	....
Norway.....	Sarpborg.	....	5,580	....	....
France	Ten factories running, four factories building.	1,000 to 5,000 each.	2,500 to 3,000 each.	....	....

Insurance Regulations.—The New York Board of Fire Underwriters has prohibited the use of liquid acetylene, and allows generators only in well-ventilated, fire-proof, separate buildings. There are special clauses as to lighting and heating the generator buildings, charging generators with carbide, etc. The storage of a limited amount of carbide in the generator buildings is allowed. The gas-pressure must not exceed 4 inches of water in the pipes of the building lighted. London, Paris, Berlin, and indeed most cities have stringent police regulations governing the use of liquid acetylene, and the use of generators is everywhere controlled by regulations similar to those above.

BIBLIOGRAPHY.—The best book on electric furnaces and the work done in them is Moissan's *Le Four électrique*; it is difficult to say enough in praise of this fascinating book, which, while scientific, can be read with pleasure by the general reader. A German book by Borchers is of little merit. Books on calcium carbide and acetylene have been published in French by Pellissier, Pietet, Claude and Hess, Lafevre, and De Perrodil. The last work is now appearing in translation in the *Progressive Age*. German books are those by Dommer, Liebetanz, and Panatovic. There is one in English by W. E. Gibbs, of New York. The best are those of Dommer, Pellissier, and De Perrodil. Journals specially devoted to the subject are published, one in France, two in Germany, and one in Italy, while articles appear from time to time in the various trade journals devoted to illumination. The *Progressive Age*, published in New York, has from the start been very reliable and full, and in March, 1896, sent a commission of three scientific men (two electrical experts and a chemist) to Spray, N. C., where the Willson works were put at their disposal to make actual tests of power, yield, cost, etc., with the view of getting reliable data (which the journal published) and putting an end to contradictory reports.

In conclusion, the writer acknowledges obligation to several of the works mentioned, to the scientific journals, *Comptes Rendus*, *Berichte der deutschen chemischen Gesellschaft*, *Journal of the London Chemical Society*, and *Journal of the Society for Chemical Industry*; to the editor of the *Progressive Age* for the use of engravings, and for personal information; and to *The Engineering Journal* for the engraving of the Horry furnace.

EDWARD RENOUF.

Acland. Rt. Hon. ARTHUR HERBERT DYKE: English public man and educator; b. in 1847; educated at Rugby and

Christ Church, Oxford; B. A. 1870, M. A. 1873; honorary fellow and senior bursar Baliol College and steward of Christ Church; principal of the Oxford Military School, Cowley, 1875-77; in Parliament since 1885. Both in and out of Parliament he has been very active in promoting the cause of intermediate and technical education. He was vice-president of the Council of Education 1892-95, a position that placed him at the head of the educational system of Great Britain. He is the author of a *Handbook of Political History of England*, *Workingmen Co-operators*, and editor of *Studies in Secondary Education*.

C. H. THURBER.

Activity: Any series of changes of a sufficiently regular and continuous character we call activity. The cases may be looked at as of two general sorts: "transient" activity, on the one hand, in which one object is acted upon by another; and "immanent" or "self"-activity, in which the series of changes observed take place within the active object with little or no influence from other things. The activities of physical science are almost entirely of the transient sort: one body, molecule, atom, or system acts upon some other so that the results of the changes in the other are taken as a measure of the activity of the first. In the biological and mental sciences we have activity of the "immanent" type: the series of changes seems to evolve within the organism or the mind, from a kind of determination called self-determination or immanence. They can not be entirely or even largely construed as having been produced by the influence of things outside the organism or the mind. Theories of life and mind, however, turn just upon this question, as to whether both life and mind can be reduced ultimately to changes illustrating activity of the transient type. The controversy between freedom and determinism turns upon the interpretation of mental activity in answer to this question.

LITERATURE.—Stout, *Analytic Psychology* (vol. i., bk. ii., chap. i.); Bradley, *Appearance and Reality* (pp. 95 ff.); Baldwin's *Dictionary of Philosophy and Psychology* (Macmillans, 1899-1900), art. *Activity* (with references).

J. MARK BALDWIN.

Adami, JOHN GEORGE, M. A., M. D.: educator; b. in Manchester, England, Jan. 12, 1862; educated at Owens College, Manchester, and at Cambridge, subsequently studying physiological science at Breslau, Germany, and completing his course of medical study at the Royal School of Medicine, Manchester, in 1887. He was elected fellow and director of natural science studies at Jesus College, Cambridge, in 1891, and held the position until Oct., 1892, when he became Professor of Pathology at McGill University, Montreal, Canada. He was pathologist of the Montreal General Hospital 1892-95, and has been pathologist of the Royal Victoria Hospital since 1894; became Middleton Goldsmith lecturer of the New York Pathological Society in 1896. He has written for various scientific journals on *The Nature of the Glomerular Activity of the Kidneys*, *Overstrain of the Heart*, *Observations upon the Physiology and Pathology of the Mammalian Heart*, *Heart-beat and Pulse-wave*, etc.

Adler, CYRUS: librarian; b. in Van Buren, Ark., Sept. 13, 1863; graduated at the University of Pennsylvania in 1883, and then entered the Johns Hopkins University, where he became a fellow, instructor, and then an associate in Semitic languages. In 1888 he was made honorary assistant curator of historic archaeology in the U. S. National Museum and arranged the collections there. Since 1895 he has been custodian of the collection of historic religious ceremonies in the National Museum, which division was developed by him, and in 1892 he was made librarian of the Smithsonian Institution. In 1890-91 he visited Egypt, Turkey, Serbia, and Persia as an agent for the authorities of the World's Columbian Exposition for the purpose of placing the exposition in its true light before these Governments, and to secure exhibits. He represented the U. S. at the conference held in London in 1898 for the purpose of deciding upon a complete catalogue of scientific literature which is to be begun in 1900 under the auspices of the Royal Society. He is a member of various scientific societies, and is secretary of the Jewish Historical Society, also an editor of its publications. Besides his regular reports as curator and librarian, Dr. Adler has contributed *Progress of Oriental Science in America during 1888* (Washington, 1888), *The Shofar, its Use and Origin* (1893), and, with I. M. Casanowicz, *Biblical Antiquities at the Cotton States Exposition, Atlanta, 1895* (1897), to the Smithsonian publi-

ations. He has also contributed papers to the proceedings of the American Oriental Society, the American Philological Society, the Jewish Historical Society, and to various magazines, as well as editing *Told in the Coffee-house*, a collection of Turkish tales (New York, 1898). M. B.

Æpyornis: the generic and popular name for the members of a group of gigantic and recently extinct birds whose remains are found in the sands and swamps of Southern Madagascar. They constitute the order *Æpyornithes*, and are most nearly related to the cassowaries among living birds. In bulk the type species, *Æpyornis maximus*, exceeded an ostrich, although it stood much lower on its legs; *Æ. titan* and *Æ. ingens* were still larger, the thigh-bone of the largest species exceeding in size that of an ox. The egg of *Æpyornis maximus* is larger than that of any other bird, measuring 13 × 9 inches, and having a capacity equal to 148 eggs of the hen. It has been suggested that reports of these great birds, or of their eggs, may have given rise to the fable of the roc. F. A. LUCAS.

Agrarianism: the Agrarian political movement in Germany. The multiplication of political movements in Germany has been a feature of recent European history. In the case of the particular impulse which has resulted in the issue known as Agrarianism, the genesis of the matter is to be sought in the physical nature of the country. Germany, while favored in some respects, does not rank high among the lands blessed by Nature in soil, climate, or variety of resources. It can not compare with the U. S., and is inferior to France or Russia. A large part of the old Brandenburg, of the provinces of East and West Prussia, of Pomerania, and of other portions of Northern Germany, is naturally infertile; it is productive and lucrative by hard labor, science, and Government encouragement.

The beginnings of the Agrarian movement are to be found in a conference held at Breslau in 1869, under the lead of Ziendorf and Elsner von Gronow. From time to time congresses of German agriculturists met, and the *Deutsche Landeszeitung* became their recognized organ. The Franco-German war, so decisive in a military and political sense, was not followed by unmixed economic gains. By 1876 there was formed in Berlin an association of reformers bent on effecting material changes in taxation and desirous of aiding industry. Freer trade and tax reforms indicate the scope of these earlier agitations, but the tendency of the movement became in time strongly protectionist. In fact, it was about this period (1879) that Bismarck, then omnipotent, developed into an avowed protectionist, and a wave of protectionism was noticeable in many quarters.

The Agrarian feeling grew in strength without taking political shape. After Bismarck's retirement in 1890, several modifications occurred in the commercial relations of the German Empire. In particular the treaties with Austria-Hungary and Italy were renewed, to the supposed detriment of German agricultural interests, and strong opposition was aroused. The "hard times" of the period accentuated the opposition, and out of the sentiment arose the Agrarian League, formed in February, 1893, by delegates at Berlin. The league was not a party, but it had adherents from several of the heterogeneous groups into which the members of the Reichstag and Prussian Landtag are gathered. It welcomed support, in fact, from all the political groups, except the Radicals and Social Democrats. In the election of 1893 for the Prussian Landtag the influence of the league was thrown for the Conservative party, which showed gains. The same year the elections for the Reichstag took place. Out of 397 members the Agrarian League had 130, whose party affinities were with the Conservative, Free Conservative, National Liberal, Anti-Semitic, and Independent factions. The Conservatives, indeed, adopted Agrarianism in their platform. The Agrarian demands were by this time formulated, and included high duties on cereals, tax privileges favoring the agricultural interests, the exclusion from Germany of food products suspected of taint, bimetallicism (as a desirable adjunct in the checking of low prices), and various administrative reforms.

The attempt to negotiate a commercial treaty with Russia led to bitter strife, and a tariff war ensued between the two countries in 1893-94. The Government, however, effected treaties with Roumania, Servia, and Spain, in the face of Agrarian opposition. The league argued against reduction of duties on cereals, and in the objections to the treaty with Russia Bavarian farmers joined forces with

the Prussian Junkers, and the reactionary Conservatives and Imperialists were joined by many National Liberals and Ultramontanes. Great excitement attended the attempt of the imperial Government to push this treaty in 1894. The emperor and his ministers entered the lists in its behalf. Threats were made to dissolve the Reichstag, and the measure passed, to remain in force until 1903. This Russian treaty contained numerous clauses, but the most noted feature was a mutual reduction of rates on cereals from the other country; the German duty on Russian grain was lowered from 7½ to 3½ marks. Many members of the Prussian nobility belong to the Agrarian League, and in this campaign numerous nobles found themselves in opposition to the emperor. It was in this year that William II. made his "right divine" speech at Königsberg, in the very heart of the landed aristocracy. In this address he severely denounced the factious opposition of a nobility to its hereditary chief. Indirectly the party strife led to Caprivi's resignation; the formulation of repressive Anti-Socialist laws followed the Agrarian agitation; the emperor and his chancellor were not in harmony on this subject, and the count resigned his office.

The Social Democrats had considered Agrarianism, but the party trended away from the policy, and in 1895 it formally decided not to support the league. Already in 1894 the league's chief spokesman, Von Kanitz, a Conservative, had proposed a drastic measure in the Prussian Landtag; this was that the Government should have a monopoly of trade in foreign cereals, and should fix the price of domestic cereals. This proposition passed the Herrenhaus. In 1895 it came before the State Council, and was rejected on the following grounds: That trade would be injured thereby; that the work proposed did not fall within the proper functions of government; and that the measures proposed were not consistent with existing treaties. Nothing daunted, the Agrarians introduced the Kanitz bill into the Reichstag. They were recruited from the Conservative, Imperialist, and Anti-Semitic groups, and were in this year (1896) increasingly aggressive. Still they were defeated, two to one, in their bill for state monopoly of imported cereals. They brought in another measure calling for increased taxation of sugar and for bounties on exports of sugar. This bill engendered sectional opposition, on the plea that it would especially benefit the central group of states and provinces; the sugar bounty had been reduced; it was now doubled. And so strong was the league that it carried a margarine bill, placing difficulties in the way of the manufacture and sale of margarine. Yet another act was the one to build grain warehouses and to facilitate the transportation of grain.

Perhaps the law which awakened the most interest outside of Germany was the Stock Exchange Bill. Here the Agrarian League was re-enforced by a contingent of National Liberals and Ultramontanes, and a drastic enactment was carried. It prohibited time contracts for the purchase or sale of grain, placed the bourses under Government control, put a strong agricultural representation on the controlling boards, affixed penalties for undue promoting and speculating, and imposed stringent regulations on the listing of securities. This law went into operation in the beginning of 1897. It elicited great opposition among commercial circles, and the grain-dealers "struck" and boycotted the exchanges. The other principal question associated with the Agrarian League in 1897 was the passage of an emigration bill designed to encourage purely German colonies (in Brazil, etc.) and so to help the congested home population.

Henceforth the league lost ground, while the Radicals and Social Democrats gained. In 1898 the organization, with a membership of perhaps 200,000, elected only 4 avowed Agrarians to the Reichstag. It commands, nevertheless, about 90 votes in that body, drawn from the same conservative, or, as the French would say, *Rightist* groups. The Agrarians continue to demand high duties on the chief agricultural imports, bounties on various exports, more country banks, and reduced railway rates. The Conservative and Agrarian organ has been latterly the *Kreuz-Zeitung*.

The movement finds some parallels in American political history. The demands remind one at times of the platforms of farmers' alliances and of Populists, at times of Republican policies. A conservative landed interest desiring exclusive class privileges is not an anomaly in political history. It remains to be seen whether the league will become identical with a political party, whether it will broaden its field,

whether it will antagonize its apparently natural ally the crown, or whether it will disintegrate.

EDMUND K. ALDEN.

Agricultural Law: See FARM LAW.

Albacore: *Orcynus germa*, a large fish of the mackerel family, closely related to the tunny, or horse-mackerel, but with longer pectoral fins. It reaches a length of 6 feet. It is found in tropical waters around the globe, preying on small fishes and pursuing and capturing the flying-fish.

F. A. LUCAS.

Albert, EUGENE d': See D'ALBERT.

Alcorn, JAMES LUSK: politician; b. near Golconda, Ill., Nov. 4, 1816; educated at Cumberland College. His first office was that of deputy sheriff of Livingston co., Ky., which position he held for five years. In 1843 he was elected to the Kentucky Legislature. In 1844 he went to Mississippi and began to practice law, became a member of the Legislature of that State in 1846, and served, sometimes in one branch and sometimes in the other, until 1865. In 1852 he was chosen elector at large on the Scott ticket, and in 1857 was nominated by the Whigs for Governor, but declined, became a candidate for Congress, and was defeated by J. Q. A. Lamar. He founded the Mississippi levee system, and in 1858 was made president of the levee board of the Mississippi-Yazoo delta. In 1861 the State convention elected him brigadier-general, but Jefferson Davis refused to give him a commission. He was elected to the U. S. Senate in 1865, but not allowed to take his seat. In 1869 he was elected Governor as a Republican, and in 1870 he resigned, and was U. S. Senator 1871-77. In 1873 he was an independent candidate for Governor, but was defeated. D. in Coahoma co., Miss., Dec. 20, 1894.

Allen, GRANT (full name CHARLES GRANT BLAIRFINDIE): author; b. in Kingston, Ontario, Feb. 24, 1848; educated privately and at Oxford, and became a teacher in Spanish Town, Jamaica, and studied the tropical vegetation and the peculiarities of West Indian life. He wrote many novels and scientific works, among which are *Physiological Aesthetics* (1877); *The Color Sense* (1879); *The Evolutionist at Large* (1881); *Anglo-Saxon Britain* (1881); *Vignettes from Nature* (1881); *Colors of Flowers* (1882); *Colin Clout's Calendar* (1883); *Flowers and their Pedigrees* (1884); *Life of Charles Darwin* (1885); *Postprandial Philosophy* (1894); *The Woman Who Did* (1895). D. in London, Oct. 25, 1899.

Almy, JOHN JAY: naval officer; b. in Newport, R. I., April 25, 1814; entered the navy as a midshipman in 1829, became a lieutenant in 1841, served in the Mexican war and in the Nicaragua and Paraguay expeditions, became a commander in 1861, a captain in 1865, a commodore in 1869, and rear-admiral in 1873. During the civil war he captured four blockade-runners with valuable cargoes, and ran ashore and destroyed four others. In 1867 he was assigned to the command of the Brooklyn navy-yard, and subsequently served as chief signal officer, and retired April 24, 1877, after a cruise in the Pacific. D. in Washington, D. C., May 16, 1895.

Alvary, MAX: singer; b. in Düsseldorf, on the Rhine, in 1856, the son of Andreas Achenbach, a well-known painter of that city. As a young man he sang tenor in the local singing societies and choirs. Then he studied, first with Lamperti in Milan, and next with Stockhausen in Frankfort-on-the-Main. He made his first appearance in opera in Weimar, and then adopted his mother's family name, Alvary, as his stage name. His first visit to New York was in the season of 1885-86, as a member of the German company singing in the Metropolitan Opera-house. His first part was Don José in *Carmen*. The next season he sang Walther in *Tannhäuser*, Merlin in Goldmark's opera of that name, and other parts. On Nov. 9, 1886, Wagner's *Siegfried* was produced for the first time in this country with Alvary in the title part. He made a great success. He left New York in 1889, but returned in 1895, adding Tristan to his repertory. On his return again to Europe he met with an accident on the stage at Mannheim from which cancer of the stomach developed. D. at Tabarz, Thuringia, Nov. 8, 1898.

D. E. HERVEY.

Alvord, HENRY ELIJAH, B. S., C. E.: soldier and educator; b. in Greenfield, Mass., Mar. 11, 1844; educated in Massachusetts public schools and in Norwich University, Vermont. He enlisted as a private in 1862, and passed through every grade until he became major in the Second Massachusetts Volunteer Cavalry in 1865; was captain of cavalry in the

regular army 1866-72; chief engineer on the staff of Gen. Sheridan 1868-69. He was a teacher in Williston Seminary, Easthampton, Mass., 1872-81; general manager of the Houghton farm, Orange co., N. Y., 1881-86; Professor of Agriculture in the Massachusetts Agricultural College, Amherst, 1886-88; president of the Maryland Agricultural College 1888-92. He was an officer of numerous agricultural organizations 1872-93; chairman of the executive committee of the Association of American Agricultural Colleges and Experiment Stations 1887-93; vice-president of the American Association for the Advancement of Science, section of Economics, 1887. He has been a frequent contributor to various agricultural journals in America and Europe, and is author of the American section of *Dairy Farming* (London and New York, 1881).

Andrée, S. A.: scientific man, mechanical engineer, and aeronaut; b. in Sweden, Oct. 18, 1854; directed experiments and observations in atmospheric electricity (1882-83) in Spitzbergen; occupied a chair (1886-89) in the leading Swedish school of technology; and had charge of engineering works for some years in the Swedish Government service. He had long been interested in ballooning, and made some notable ascents, one of which was across the Baltic Sea. In 1895 he communicated his plans for a balloon journey into the unknown Arctic area to the Swedish Academy of Science and the Sixth International Geographical Congress in London. His idea was to provide a balloon to carry three persons with necessary instruments, provisions, etc., for four months, and ballast, and that might be kept afloat for thirty days, and be, to some extent, steerable. He had been able by means of a sail and one or more guide-ropes dragging on the ground to cause a balloon to deviate 27° from the direction of the wind. He proposed to erect a balloon-shed on Danes island, Northwestern Spitzbergen, 710 statute miles from the north pole, fill his air-ship with gas in the shed, and await a favorable south wind to waft him and two companions toward the north pole. If the conditions were most favorable he believed he might reach the pole in ten hours. If possible he desired to cross the entire unknown area and make land somewhere, preferably on the North American mainland, depending upon the sledge and boat carried with him to reach some inhabited district. His detailed plans were severely criticised, but he won the respect of learned men by the scientific data and practical experience with which he upheld the plausibility of his scheme of exploration.

The money he desired—\$36,000—was provided mainly by the late Mr. Alfred Noble, the late Baron Osear Diekson, and the King of Sweden. His balloon, the Ornen (Eagle), was constructed in Paris at a cost of \$10,000, and taken to Danes island in the summer of 1896; but Mr. Andrée was compelled to return to Sweden with his equipment, as there was no wind favorable for his purpose during the few summer weeks in which he might start with hopes of success. He enlarged his balloon to a capacity of 170,000 cubic feet. The place for work was the roof of the car, somewhat protected from the weather by a tarpaulin curtain. Here were all the scientific instruments, and here two of the aeronauts were to take observations and manage the balloon, while the third rested in the inclosed car, which was reached through a trap-door.

Mr. Andrée returned to Danes island late in the spring of 1897. His companions for the voyage were Nils Strindberg and Knut Fraenkel. The party was provisioned for nine months. To steer and control the balloon Mr. Andrée had provided three sails, with a total surface of 800 square feet, and three guide-ropes. Arriving at Danes island in May, everything was ready for the start by July 1, but the essential south wind did not come till ten days later. In a brisk south wind the balloon ascended on July 11. It reached a height of about 3,000 feet, moved to the N. E., and disappeared in about an hour.

Four days later a carrier-pigeon alighted on the sealer Alken, and was shot. In a small tube it bore a message in Mr. Andrée's handwriting dated two days after the ascent. It read: "Latitude 82° 2' : longitude 15° 5' east. Good progress eastward; 10° south. All well on board. This is the third pigeon dispatched.—ANDRÉE." Other traces, mostly unable to bear investigation, have been announced from time to time. When he sent his dispatch he was only 145 miles N. and 45 miles E. of his starting-point. Prof. Eckholm assumes that the balloon's slow progress northward in two days was due to the fact that the wind in which it ascended was part of a cyclonic or whirling storm, the air-currents

carrying it into the center or area of calm, whence the airship finally emerged and was borne eastward. It was thought that if the party had made a safe landing it was probably in Franz Josef Land, but no traces of them were found there by Wellman in July, 1898. C. C. ADAMS.

Andrews, GEORGE PIERCE: lawyer; b. in New Bridgeton, Me., Sept. 29, 1835; son of Solomon Andrews and Sibyl Ann Farnsworth, both of Puritan stock; attended the high school, graduated at Williston Seminary, East Hampden, Mass., and in 1858 from Yale College; then studied law in Portland, Me., and after several years' study, with intermissions, was admitted to the bar in New York, where he has since resided. Was appointed assistant district attorney for the southern district of New York under Buchanan's administration, and held the office for six years; from 1872-82 was assistant corporation counsel of New York city, and his distinction in this office led to his nomination and election as justice of the Supreme Court for the first judicial department (New York city) in Nov., 1883, where he served until the close of his term in 1897. He was nominated and elected as justice of the Supreme Court for the same department in 1898. F. STURGES ALLEN.

Annenkoff, Gen. MICHEL: civil engineer and officer in the Russian army; b. in St. Petersburg in 1838; entered the army in 1863, and at the age of twenty-eight had reached the rank of colonel. He was Russian military *attaché* with the German army during the Franco-Prussian war. He served under Gen. Skobelev in the Merv campaign, in which one of his arms was shattered by a shot. Distinguishing himself in the superintendence of strategic railroad-building, he was assigned to the great work of building the Trans-Caspian railroad, the first railroad built through a desert. The new problems involved in this undertaking were ingeniously solved, and the road was built with remarkable celerity, being completed from the Caspian Sea to Samarcand on May 27, 1888. He then devoted himself to the study of the Trans-Siberian railroad project, and was most prominently identified with the building of that road. D. in St. Petersburg, Jan. 22, 1899. C. C. ADAMS.

Ant-thrush: a common name for the members of the family *Formicariidae*, a group of small, sober-colored birds, comprising some 250 species, and eminently characteristic of the forests of tropical South America. The name is given from the fact that they feed largely on ants, and the approach of a band of foraging ants, *Eciton*, is usually announced by the calls and movements of small flocks of these birds. F. A. LUCAS.

Archer, FREDERIC: musician; b. in Oxford, England, June 16, 1838; received his musical education first in London and later in Leipzig; organist of Merton College, Oxford, and later of the Alexandra Palace, London; conductor, on the resignation of Mr. Weist Hill, till 1880, and also conductor, 1878-80, of the Glasgow Select Choir. In 1881 he came to the U. S., and was for a year organist of Plymouth church, Brooklyn, then for a year of the Church of the Incarnation, New York; edited the *Keynote* for several years. Leaving New York, he visited several Western cities professionally, finally settling in Pittsburg, Pa., where he has remained teaching, playing the organ, and conducting a local orchestral society. D. E. HERVEY.

Arens, FRANZ XAVIER: musician; b. in Germany, on the banks of the Moselle, Oct. 28, 1856, and was first a pupil under his father. Came to the U. S. when very young, and when eighteen years old was organist in a small town near Cleveland, Ohio. Later he went to Milwaukee and continued his studies in St. Francis Normal School, taking courses in organ-playing, violin, singing, harmony, and counterpoint. Next he was for three years musical director of Canisius College, Buffalo, N. Y., and then went to Europe, remaining for two years studying under Rheinberger, Abel, Wullner, Janssen, and Kirehner. On his return to the U. S. he became conductor of the Cleveland Gesang Verein and the Cleveland Philharmonic Society. His compositions are mainly in the higher forms. D. E. HERVEY.

Arensky, ANTON STEPANOVITCH: musician of the young Russian school; b. in Novgorod, July 30, 1862; studied in the St. Petersburg Conservatory 1879-82, and from the latter date Professor of Harmony and Composition in the Moscow Conservatory. His compositions are of the most modern school and are very interesting, as well as in many cases very difficult, especially his works for piano solo. D. E. H.

Arnth, ALFRED, Chevalier d': Austrian historian; b. in Vienna, July 10, 1819; studied law in Vienna; was appointed vice-director of the Austrian imperial archives in 1858, and director in 1868. He became known as one of the leading historical authorities for the period preceding the French Revolution. In 1848 he became a member of the National Assembly, in 1861 of the Landtag of Lower Austria, and in 1869 was made a life member of the Austrian Reichsrath, where he was prominent in the debate on the confessional laws. He was elected president of the Vienna Academy of Sciences in 1879. Among his published works are: *Life of Prince Eugene of Savoy* (1858); *Correspondence of Maria Theresa and Marie Antoinette* (1865); *Correspondence of Marie Antoinette, Joseph II., and Leopold II.* (1866); *Jean Christophe Bartenstein and his Time* (1872); *Secret Correspondence of Marie Antoinette and Count Mercy-Argeuteau* (1874). D. in Vienna, July 31, 1897.

Arnold, JURY (YOURIJ VON): musician; b. in St. Petersburg in 1811. In 1827-30 he studied in Dorpat University, and then took up the study of music both in St. Petersburg and Germany. In 1831 he took part in the Polish campaign and was promoted to be an officer of the first rank. After the close of the campaign he resigned his position and devoted himself entirely to music in company with Glinka, Dargomyjsky, Lvoff, Prince Odoevsky, and others. Arnold composed many small pieces for different instruments, and conducted the musical department of the Moscow Vedomosti. He translated many Russian operas into German, and contributed critical and descriptive articles to the *Leipziger Zeitung* and *Neue Zeitschrift*. He lectured on counterpoint and fugue in the Moscow Conservatory at the request of Anton Rubinstein. He composed music for the liturgy of St. John Chrysostom. His *Theory of the Old Russian Church Music* was first published in the *Moscow Musical World*, and subsequently in a volume in 1886. The full title of this work, which is a standard authority on its subject, is *Harmonization of the Old Russian Church Song, according to Greek and Byzantine Theory and Acoustical Analysis*. In the same year he conducted a chorus in Moscow. In 1871 he accepted the position of Professor of Musical History and Theory in Moscow University, which he held until his death on July 19, 1898. He wrote also *Theory of Musical Composition* and *The Æsthetic Laws of Musical Science*. D. E. HERVEY.

Art, Psychology and Philosophy of: The psychology of art constitutes one of the two great divisions of the subject of æsthetics, the other division being the philosophy of art. Both are contrasted with the application of the principles of æsthetics, which constitutes the technical treatment of the fine arts, together with the principles of art criticism. The two departments of æsthetics, known respectively as the psychology and the philosophy of art, have different problems and methods. The former seeks to determine the mental processes involved both in the production and in the appreciation of works of art; the latter seeks to determine what it is in objects which constitutes them objects of art—what, in short, are "beauty," "ugliness," and the other forms of determination connected with them.

I. Taking up the psychology of art, we have to attempt to find an answer to two great questions: first, What are the processes in the artist's own mind?—the question of art from the "producer's point of view"—and second, What are the processes in the mind of the person who sees the work of art and pronounces it beautiful?—art from the "spectator's point of view." In discussing the producer's point of view, we have to consider what is called the "art-impulse" in the artist or producer. This question has been taken up by various writers, both *analytically* (that is, by an analysis of the actual motives in the artist's or inventor's mind when producing a new creation), and also *genetically* (that is, by tracing the history of art from its primitive beginnings among rude peoples, in children, and even in animals, and finding the least degree and kind of mental endowment which will account for the actual form which the art-product has taken on). These two methods of study must go hand in hand, and together they have given a very interesting body of data. The results of the study may be indicated briefly.

The origin of art is to be connected with certain fundamental impulses. Early in the history of the subject it was suggested (Schiller and Herbert Spencer) that the play-impulse was the source of art. According to this theory, as

originally stated, the animal plays when he has a surplus of physical energy (see PLAY), and it is when he has energy and time to play that he and the man fall to doing things to secure and to give pleasure; such productions are the beginnings of art. From the rude beginnings thus made, the more refined and higher forms of art have developed. It had already been pointed out, however, by Aristotle that there is a very large amount of imitation in art. A great class of art-products are distinctly imitative, so much so that a school of art critics say that art is entirely imitative, and that strict realistic reproduction of nature is the sole province of art. Recognizing imitation, Spenceer made it the channel of expression of the play-impulse. In play the child and the animal imitate serious activities, so the play theory of art came to include the impulse to imitate.

This theory has recently been very severely criticised (see especially the work of Gross cited below). The main criticism is that this theory makes art a useless thing, a mere matter of using up surplus energy, a by-play, so to speak, in human evolution. As such, it has no reason for existence or for taking on any consistent and continuous development in the history of man. It is said, moreover, by the critics of this theory that play is not mere using up of surplus energy, but a serious channel of practice to the young in the activities which their adult life requires. If this be true, and if art arise in connection with play, we have a view which brings art within the utilities of life, and confines it to those useful channels which are employed also by the play-impulse. This, we are then told, is the reason that art is to such a great degree imitative—i. e. because imitation, both when playful and when earnest, is the most useful mode of acquisition of the various functions of adult life. Accepting this criticism of the Schiller-Spenceer theory, we have the result, so far, that the art-impulse involves (1) the imitative impulse, but only when (2) it is playfully exercised. The first clause (1) indicates the requirement the artist is under of being in the main true to reality, of imitating a situation which is possible in real life, and the second clause (2) distinguishes his procedure from the strenuous purposes of real life in which his motive is strictly utilitarian. This latter distinction becomes very important when we come later on to take the spectator's point of view.

But both analytic and genetic study agree that this is not all that there is in the artist's attitude when he makes a work of art—not his whole motive or impulse. There is another sort of art which does not seem to be imitative. It is what we call "decorative." When the savage puts a smudge of red paint on his breast, or when the bird displays his gorgeous plumage before his mate—and together with these simple instances we may take the highest triumphs of the "court of honor" and the details of rococo ornamentation—in these cases the producer has another motive and reason for it all: he does it to *excite admiration in others*. In early art, it is almost entirely a matter of showing off to other individuals. This is called in psychology the self-exhibiting impulse. It is found also in very marked degree in the animals. And both in men and animals it is strongest as between the sexes and at the mating season. It may have had its origin in what Darwin called "sexual selection." At any rate, it must be acknowledged as a part of the producer's motive, to win the applause of others. Genetically it probably had its beginning in the sexual life—in the necessity of winning a mate by exhibitions of personal excellence, prowess, beauty, etc. Some writers regard the self-exhibiting impulse as additional to the decorative impulse, since the animals have distinct instincts to decorate. The present writer thinks, however, that in human art, at least, these two things flow together. On this view we may say, finally, that art involves two fundamental motives: *Imitation* and *Self-exhibition*; and that these two motives, when they realize themselves in a playful way, produce art, directing the actual construction by the IMAGINATION (*q. v.*).

The condition that these two impulses work "in a playful way" is seen in what is called by psychologists the "make-believe" state of mind, which is always present in producing and also in enjoying a work of art. Make-believe is a peculiar double consciousness in which one finds himself, consisting in a proper sense of the true realities of serious life at the same time that one allows himself to be absorbed in the situation which the work of art depicts. The best illustration is the so-called "illusion" of the theater. The spectator allows himself to enter fully into the situation of

the plot and to follow it through as if it were a real series of events, but all the while he knows that it is an indulgence of his imagination, a "make-believe" situation, and that he can break off at any time and withdraw. The same is true of the artist and the actor; while throwing himself into his part in order to realize it and perform it well, he at the same time preserves his consciousness that he is really Mr. A., the actor, not Macbeth nor Hamlet. The element of make-believe is also very strong in animal and human play, and seems to be present whenever the sense of beauty is aroused. It contributes a strong feeling of pleasure to all experience into which it enters, and furnishes a motive to art indulgence and pursuit. Some writers emphasize it to the exclusion of all other criteria of the aesthetic (*v. Hartmann, K. Lange*), and so make aesthetics a department of so-called hedonics—the science of pleasure and pain.

Coming to consider art from the spectator's point of view, we have to ask the questions when and why we pronounce an object beautiful. Granted that there is an artist at work before us, working under the impulses of imitation and self-exhibition, and setting up the imaginary situation which throws us into the state of "make-believe," we ask why the result is really pronounced artistic or beautiful by us who look on. This is the question in psychology of the marks or "coefficients" of the beautiful. It is easy to see that all products of imagination are not equally beautiful, some not being beautiful at all; and also that there are several kinds of beauty according as the work is in one or other of several spheres of creation. We have a number of arts, and while we use the term beautiful for all of them, we in each case have in mind a particular and definite product.

The spheres apart, what psychology is interested in is the question, What is it in the thing perceived or imagined which leads us to admire it? Not in the thing itself—that is the philosophical question—but in our perception or imagination of the thing. What are the marks or coefficients involved? First, there must be the criteria of possible truth; that is, we must always feel that the work of art might actually represent real things. This is made necessary by both the art-motives explained above. It represents to the spectator the same mental movements, i. e. imitation, which demands a more or less true reproduction of what actually exists, and also self-exhibition, which demands the agreement of other spectators. This latter is especially important here. The spectator finds what is called the property of "universality" in a work of art. He holds the beauty of it equally valid for all spectators, anticipating that others will approve of what he himself approves. Even in the lower biological world there must be correspondence between those marks, adornments, etc., which the male bird, for example, displays before the female, and those qualities which the female admires; otherwise, there would be no result from the former's display. So we find all through; there are certain relationships, certain formal combinations, which must be present both in the production and in the appreciation of a work of art. These have been developed by various thinkers and may be stated under certain well-recognized principles:

1. *The principle of "unity in variety."* According to this principle, the work of art must be in some evident way a whole, not a mere aggregation of different elements; it must have one meaning or design toward which all the details essentially contribute. Evident examples are relatively complex geometrical figures, in which the whole has an apparent design within which the details are held together on some consistent plan. In the matter of such geometrical forms it is probable that the requirement of unity is in part explained by the relative ease in the movements of the eyes in sweeping over the contour of the figure. That is, it is a matter of motor adjustment in affecting the visual unity in which all the parts are held together. So for the aesthetic forms reported by the other senses. The same general requirement is operative, also, in the higher and more abstract sorts of artistic production, where the attention has a similar adjustment. The need of unity is probably the need of synthesis found in all mental construction and thinking, a unity secured by the motor processes which give concentration to the attention. (See SENTIMENT, ÆSTHETIC.) In the aesthetics of visual form we have a number of minor requirements, all of which involve this principle and its nervous mechanism—e. g., balance, proportion, contrast. (See GOLDEN SECTION.) In "perspective" new elements are introduced by the apparatus of visual "accommodation" and "convergence." In the actual exe-

cution, departures from true measurement are often necessary in order to allow for certain OPTICAL ILLUSIONS (*q. v.*).

2. *The principle of "consistency."* By this is meant the necessity of keeping the work of art in all respects within the particular sphere in which the self-illusion or "make-believe" is begun. If we start out to secure an æsthetic effect on canvas, we can not finish it with music, unless we at the beginning agree that the two arts are to be included in a larger æsthetic scheme. Hence the incongruity to us moderns in painting a marble statue; our plastic sense has become accustomed to neutrality of coloring, and the violation of the convention breaks in upon our sense of imitative make-believe. So in the theater, while we do not respect the unities of time and place as regards the actual dates and localities assigned to this scene and that, yet we do demand consistency in the representation itself—e. g. we do not allow two costumes of different periods on the stage at the same time, nor do we allow the characters of Shakespeare to use the telephone. These things would intrude elements from what is felt to be the background of prosaic reality into the make-believe situation upon which our æsthetic attitudes are terminating.

Within the limits set by these principles we find certain characteristics of art which are insisted upon with different degrees of emphasis by writers on the psychology of art.

The character of "freedom," which attaches to art; as opposed to science and actual experience, follows from the fact that in art we are conscious of a personal indulgence in the make-believe situation, and with it of our ability to put an end to the situation at any time and return to prosaic reality. Art thus becomes a development apart, in this sense, from the stern realities of life, not explainable in terms of direct utility. A large part of the pleasure of art-appreciation comes from this sense of relief from the pressing necessities of our every-day vocations, from the necessity of fulfilling a task, together with the ability to choose the form of æsthetic enjoyment which will bring to the individual the greatest positive pleasure and recuperation.

With this freedom there goes also what is called the "idealization" of art. While held, in the matter of æsthetic construction, within the possibilities of imitative creation by the principles of "unity in variety" and "consistency," there is, however, within those bounds no limit to the carrying out of the tendency to idealization. The actual is not sufficiently complex, or not sufficiently unified, or not entirely consistent; we therefore go on to improve on reality at the same time that we imitate it. Here comes in the artistic device of so-called "suggestion," which is one of the great resources of idealistic art. The actual imitation is made the vehicle of a larger suggested situation in which the progress of the same kind of construction toward the ideal is depicted. Art thus becomes a stimulus to all the higher emotions and sentiments, and a pedagogical instrument of the highest value both to the individual and to society. The mission of the artist is essentially perverted and his functions corrupted when he uses the principle of suggestion to minister to impure or unæsthetic cravings rather than to stimulate and purify the ideals of the spectator.

It is also just at this point that the matter of "association" comes in, of which some psychologists make so much. By association is meant the fact which we see, in exaggerated form, when we find that, with suitable suggestions thrown about it, a thing which is in itself neutral takes on positive æsthetic value. There is a pathetic song entitled *My Mother's Hands*, the emotion suggested being that of gratitude and affection aroused by the suggestion of a life of devotion and a character of beautiful self-denial. A brass gun seems beautiful to the smoke-stained gunner, and the flag which has lost its beauty of color from exposure takes on a deeper sentimental beauty from the very completeness of the ruin wrought in it by shell and bayonet. So far from affording an explanation of art, that it arouses emotional associations—a view which the "association" school of thinkers urge with great insistence—the force of these facts bears toward a theory which construes art in idealistic and sentimental categories. For, as we have seen, but for the tendency of the imagination to build its constructions away from a servile imitative creation, to go beyond strict association, to build up a more perfect and ideal product, the principle of suggestion would not work at all. In fact, we have to invoke first the synthetic or apperceptive function, working under the principles laid down above, before there is room for association to come in at all. Associations which

do not fulfill these requirements do not yield the sort of enjoyment called æsthetic.

II. *The Philosophy of the Beautiful.*—Coming to the second topic, we find a different question asked: the question as to what it is in objects which makes them beautiful. Here, as in other problems of philosophy, we have certain great historical solutions suggested. The realists say that beauty is a positive quality or property inherent in beautiful things. We call an object beautiful because it really is beautiful; this is supported by the fact that we so largely agree in our judgments and appreciations in æsthetic matters. The idealist, however, says: "Quite impossible! Beauty, like the other properties of things, is entirely relative to us. There are certain stimulating conditions which affect us in certain ways, and when an object thus stimulates us, that is the only and the sufficient reason that we pronounce it beautiful." With others still it is possible to admit the result of the psychological analysis of the idealist, and at the same time to make more of beauty than the production of a certain state of mind in the spectator. The point may be made that all knowledge and sentiment are in some way expressions of the reactions of the individual upon reality; and they must be held to reveal in some way what reality is. The æsthetic and other sentiments must have a meaning just as knowledge has a meaning. Inasmuch as these emotional states involve intellectual constructions also, they can not be divorced from the realities which knowledge reveals. So in present-day thought there is a wide-spread view which draws a distinction between the so-called "world of description or science," which deals with knowledge and reality as we are able to get it, and "the world of values or worths," which deals with our attitude of appreciation toward the realities which come to us through knowledge and science. In the world of values we ask, What is this worth?—as in the world of science we ask, Is this true? In the world of values æsthetic worths enter with the religious and moral, as essential parts of a final view of reality. That is, our doctrine of what is the ultimate principle of reality in the world must account not only for the possibility of our having and using the knowledge, but also for our having the æsthetic and other impulses and appreciations of value. This seems to the present writer a necessary position. See PHILOSOPHY AND METAPHYSICS.

Emotions Allied to the Æsthetic.—The violation of certain elements in the requirements of beauty, while the other elements are present, gives rise to distinct emotions. In the *comic* we have violations of the law of consistency. The comic is the æsthetically abortive. A joke turns on a misplaced grammatical or logical relation which would have been æsthetic if properly placed. A comic situation is an incongruity, where the conceptual process demands congruity and anticipates it. Hence the elements of surprise, disproportion, and disharmony in all humor and wit. Not only is the comical the unexpected, as Dunont maintains, but it is that which we have no right to expect, which we have every right not to expect; and negatively, the sense of fun often arises from the simple absence or failure of what we do expect. Another requisite is that the subject be trivial and involve no important consequences. We often say an event would be ludicrous if it were not so serious. The comic is a matter largely of meaning. The *grotesque*, on the other hand, is the comic of form. The *picturesque* illustrates a similar departure from normal beauty, but not sufficiently so to lead to positive inconsistency. It applies especially to form, and is found in the bold, sharp, irregular, unexpected in outline. In the *sublime*, the meaning attaches to particular feelings, those aroused by the large, massive, forceful, and destructive; it seems also to include a coloring of fear and awe.

LITERATURE.—See the general treatises on psychology given under that topic, especially those of Volkmann, Bain, Baldwin, Ladd. Also see Lotze, *Outlines of Æsthetics*; Fechner, *Vorschule der Æsthetik*; Guyau, *Problèmes de l'Esthétique Contemporaine*; Marshall, *Pain, Pleasure, and Æsthetics*, and *Æsthetic Principles*; Gross, *The Play of Animals*; Baldwin, *Social and Ethical Interpretations* (sections on Play and Art); Grosse, *The Beginnings of Art*; Brown, *The Fine Arts*; Bosanquet, *History of Æsthetics*.

J. MARK BALDWIN.

Arthur, ALFRED: musician; b. in Pittsburg, Pa., Oct. 8, 1844; studied in Boston, first under private teachers, and later under Julius Eichberg at the Boston Conservatory of Music. While in Boston he sang tenor in the choir of the

Church of the Advent. In 1871 he settled in Cleveland, Ohio, and taught and directed musical societies there, including the Germania Orchestra. In 1878 he founded the Bach Choir of the Woodland Presbyterian Church, which soon attracted much attention. In 1873 he founded the Cleveland Vocal Society and conducted it. He visited Europe in 1879 and again in 1887. Among his compositions are three unpublished operas: *The Water-Carriers* (1876); *The Roundheads and Cavaliers* (1878); and *Adaline* (1879). Besides these he has composed much in the smaller forms. D. E. H.

Assessments, Municipal: See MUNICIPAL ASSESSMENTS.

Atkinson, JOHN, M. A., D. D.: Methodist clergyman and author; b. in Deerfield, N. J., Sept. 6, 1835. He held pastorates in Newark and Jersey City, N. J., Chicago, Ill., Bay City and Adrian, Mich., and in Haverstraw, N. Y., where he died Dec. 8, 1897. He was the author of the hymn *We shall Meet Beyond the River*. Among his published works are *The Living Way* (1856); *Memorials of Methodism in New Jersey* (1860); *The Garden of Sorrows* (1868); *The Class Leader* (1874); *Centennial History of American Methodism* (1884); and *The Wesleyan Movement in America*.

Attention [from Lat. *ad + tendere*, stretch]: the turning of the mind toward an object or idea indicated by such expressions as "being occupied with," "concentrating upon." The two sorts of attention commonly distinguished are "reflex," "passive," sometimes inappropriately called "spontaneous," and "voluntary," or "active"; attention being reflex when drawn without the subject's foreknowledge by an unexpected stimulation, such as a long peal of thunder, and voluntary when foreseen and intended. To these may be added, though not correlative with them, "primary attention," which indicates the supposed form of attention or its organic analogue in organisms so low as to be incapable of having a life of presentation. It is probably in these low organisms simply a concentration of the vital energies in certain channels appropriate to the particular stimulation.

Other distinctions are marked by the phrases: (1) "Expectant" attention, or "pre-attention," with the variations "preperception" and "ideational preparation," for all which anticipation is synonymous. This state of mind is the necessary preliminary of effort: we must attend very vigorously to the intended act in order to perform it. (2) "Diffused" or "scattered" attention, characteristic of states of indifference, lack of interest, and apathy—all these are terms of degree used (in contrast with "strained," "concentrated," "effortful" attention) in reference to mental objects which are clearly taken in, but quickly passed over. (3) "Selective" attention, having reference to the nature of the outcome which our special attention aims to secure. States of attention are also distinguished by their objects as "sensorial" (attention to a sensation) and "ideational," "ideal," or "intellectual" (attention to an idea of any sort). For example, attention to a toothache is sensorial, while attention to a mathematical calculation, going on in the head, is intellectual.

With some notable exceptions (Wolff, Kant, and James Mill) the attention was greatly neglected until more modern times, notably by the English empiricists. It was considered an unanalyzable attribute of the soul, and direct evidence of the independent activity of the mental principle (Hamilton, Carpenter, McCosh). With Leibnitz it was the essential mode of receiving new experiences, which he termed APPERCEPTION (*q. v.*).

Recent literature, however, is full of theories which may be grouped under certain headings with authorities. There are (1) the affective theories, which reduce attention to feeling (Ribot); (2) the conative, "psychical energy," and original activity theories, which identify it with will (Ward, Ladd, Stout); (3) the motor theories, according to which it is a function of motor habit (Münsterberg, Baldwin); (4) the "intensity" and "re-enforcement" theories (Bradley); (5) the inhibition theory (Külpe).

Each of these theories has reference to some well-known characteristic of the act of attention. These characteristics are briefly as follows: Attention intensifies all the mental or physical processes to which it may be directed. We may interfere not only with our emotions and beliefs by attention, but also with our digestion and our color-perception. This general fact, that attention makes a state of mind more vivid, is called the "re-enforcing function" of the attention. At the same time we find that the re-enforcement of one element in consciousness is at the expense of

other elements. What we do not attend to tends to disappear or to withdraw to the margin of consciousness; in psychological phrase, it tends to be "inhibited," and so the effect of attention in thus reducing the intensity and clearness of those things which are not being attended to is called its "inhibiting function." These two functions, the re-enforcing and the inhibiting, always go together, and no theory of attention is true which does not include them both.

Moreover, attention has not only such effects, but also a mechanism. We feel certain changes taking place when we concentrate attention: changes in the muscles of the eye or ear (or other sense, according as we attend through one or another). The muscles are set, the skin is drawn, the heart-beat is quickened, the respiration-rhythm is changed. By the recognition of these changes many psychologists have been driven to distinguish between the attention as a process and that which is attended to, called the "content." On this distinction the "motor" theories rest, attention being considered a reaction of the motor apparatus upon the mental content. It is on this distinction, also, that the theories are based which consider attention a purely spiritual and ultimate activity.

The differences of opinion on the question as to whether attention is a separate or independent faculty or a function of the content in mind, are now reflected in the question as to whether it be, if a function, a common and constant or a variable and specialized function. It has recently been argued (Baldwin), in opposition to the "constant function" view (Wundt, Külpe), that attention is a variable function; that we have not one attention, but many attentions. On this view, while there is a constant element in the different reactions of attention to different contents, there are nevertheless both "typical" (visual, auditory, etc.) and also individual or special elements characteristic of each. To express this the following attention formula has been proposed by Baldwin:

Att (attention) = A + a + α : a formula showing the mental elements which enter into an act of attention, apart from the object attended to.

A = elements common to all acts of attention.

a = elements special to acts of attention to different classes of objects, but common to acts of attention to all the objects of each class.

α = elements special to acts of attention to a single object, but common to repeated acts of attention to the same object.

This formula was interpreted, when suggested, in terms of "motor elements" entirely. The advantage of the symbols, however, is that they can be used in the discussion of any of the theories of attention—that is, they can be given motor, affective, or intellectual values. It does not even require the view (also supported by its proposer) that all the symbols have positive values; for on the theories which consider attention as a constant faculty or function the formula reduces itself to A = A, the other symbols being each zero.

A question which is very important both in education and in ethics concerns the control of the attention. How far and by what means can we keep our attention under control? Of course this question can be asked only of voluntary attention; for attention which is drawn without our preparatory knowledge and intention is quite outside of our control. Of voluntary attention one theory holds that it is also outside of our control, being a purely reflex thing dictated by the strength of the influences which arise to call the attention in this direction or that. Admitting the fact that we do have a moderate degree of control or management of the direction of the attention, we may distinguish two sorts of such control or management: first, "direct," and second, "indirect" control of the attention. Under the head of direct control those who hold that the attention is a mental principle of absolute power of mental initiation place the case in which we deliberate and then deliberately choose what we will, or what we attend to. They say that all voluntary movement of the body involves attention of this sort; so also all voluntary direction of the stream of thought. In this latter case they hold that we can by turning attention to this or that one of our motives so re-enforce it as to make it the controlling one, and so determine our choice. In current discussion the possibility of the mind's getting in any real initiation of changes in the flow of the mental life is put here—i. e. in the possibility of direct control of the attention.

By indirect control of the attention is meant the view that the mind can not directly, without preliminary motives, reasons, etc., interfere and control the stream of thought, but that its control is always "indirect," or through earlier states of mind. In indirect control we proceed upon motives or reasons for wishing to give the stream a turn in this or that direction; that is, we are under preliminary motives, interests, preferences, even when we by attention re-enforce one of a set of possible alternatives. It is true, say the advocates of this theory, that we choose by attending; but it is also true that the attention is itself determined by an earlier choice, and so on. This preceding choice sets the elements which are really operative, and it is by identifying ourselves with these elements that we get our control. This indirect control is certainly a fact—whether it explains all the cases of seeming direct control or not. It is shown in interesting pathological cases. Patients are reduced to complete inability to move a limb simply because they can not attend to it, and the reason that they can not attend to it is that, through injury to the brain, they have no images to represent the movement. This shows that the attention, so far from being a self-sufficient activity, depends upon getting certain equivalents of what is to be attended to, and by them of controlling or "setting" the direction of the mental life. No acts can be voluntarily carried out, whether by sensorial or by intellectual attention, unless the elements of earlier acts of attention in the same direction can be brought up in mind. These elements are held to be the indirect means by which a particular case of attention is realized and held under control. Put in general psychological terms, the attention is always a function of some content in consciousness, and to carry out an act of attention this content, or something equivalent to it, must be present first.

REFERENCES.—Bradley, *Mind*, xi., p. 305 ff.; Ward, *Psychology* in *Encyclopædia Britannica*, 9th ed.; Stumpf, *Tonpsychologie*, i., p. 33, and ii., p. 280 ff.; Münsterberg, *Die Willenshandlung*; Müller, G. E., *Zur Theorie der Sinnlichen Aufmerksamkeit*; Ladd, *Psychology, Descriptive and Explanatory*, chap. v.; James, *Principles of Psychology*, ii., chaps. xi., xxvi.; Wundt, *Physiologische Psychologie*, ii., chaps. xv., xvi.; Lewes, *Problems of Life and Mind*, Ser. iii., prob. 2, chap. ix., p. 106, and chap. x., p. 184; Ribot, *La Psychologie de l'Attention*; Baldwin, *Handbook of Psychology, Feeling, and Will*, chaps. xii., xvi.; *Mental Development: Methods and Processes*, chap. x., § 3, chap. xi., § 2, chap. xv.; arts. *Attention* and *Control* in Baldwin's *Dictionary of Philosophy and Psychology* (upon which this article is based).
J. MARK BALDWIN.

Atwood, ISAAC MORGAN, D. D.: Universalist minister; b. in Pembroke, N. Y., Mar. 24, 1838; entered the Universalist ministry in 1859; edited the *Universalist* 1867-72, and the *Christian Leader* 1873-75, and since 1875 has been associate editor; in 1879 he became president of the theological seminary connected with St. Lawrence University, Canton, N. Y., and in it is Dockstader Professor of Theology and Ethics. He is the author of *Have we Outgrown Christianity?* (Boston, 1870); *Glance at the Religious Progress of the United States* (1874); *Latest Word of Universalism* (1878); *Walks about Zion* (1882); *Episcopacy* (1884); *Revelation* (1889); *Balance-sheet of Biblical Criticism* (1895).

Aus der Ohe, ADELE: pianist and composer; b. in Germany in 1857; studied piano-playing under Kullak and Liszt. After completing her studies she began a series of concert tours which have included the U. S. From 1886 to the present year (1899) she has visited this country many times, and has always met with great success. Of late years she has done much work in composition, including some songs, but chiefly for the piano; but all her works are of the highest class, as well as very difficult to play.

D. E. HERVEY.

Austin, MRS. JANE GOODWIN: author; b. in Worcester, Mass., Feb. 25, 1831; lived in Cambridge and in Concord, Mass., but nearly all her married life in Boston; was first known as a magazine writer, but afterward mainly as the writer of historical tales of the Pilgrim Fathers and their descendants. Among her books are *Dora Darling* (1864); *Outpost: a Novel* (1866); *Cipher: a Romance* (1869); *The Shadow of Moloch Mountain* (1870); *Moonfolk: a True Account of the Home of the Fairy Tales* (1874); *Mrs. Beauchamp Brown* (1880); *A Nameless Nobleman* (1881); *The Desmond Hundred* (1882); *Nantucket Scraps* (1882); *Standish of Standish* (1889); *Dr. Le Baron and his Daughters*

(1891); *Betty Alden* (1891); *David Alden's Daughter, and other Stories* (1892). D. in Boston, Mar. 30, 1894.

Babcock, JAMES FRANCIS: chemist; b. in Boston, Mass., Feb. 23, 1844; graduated from the Lawrence Scientific School in 1862; was Professor of Chemistry in the Massachusetts College of Pharmacy 1869-74, and in the Boston University; State assayer and inspector of liquors 1875-85; city inspector of milk in Boston, 1885-89. D. in Boston, July 10, 1897. He published many reports on sanitation and the chemistry of food, invented a fire-extinguisher, and was widely known as a scientific lecturer.

Bacon, JOHN EDMUND: b. in Edgefield, S. C., Mar. 3, 1832; graduated at South Carolina College in 1851; admitted to the bar in 1854. His accomplishments as a linguist led to his appointment as secretary of legation at St. Petersburg, Russia, in 1858; he acted as *chargé d'affaires* until F. W. Pickens arrived as minister, and he married ex-Gov. Pickens's daughter, Rebecca Calhoun, in 1859. On the election of Mr. Lincoln to the presidency he resigned, and in 1861 entered the Confederate army as a private, afterward becoming a major. In 1866 he went to Washington with Gov. James L. Orr to arrange for South Carolina's restoration; served a short time in 1867 as district judge; in 1872 was an unsuccessful candidate for Congress; in 1886 was appointed U. S. *chargé d'affaires* in Uruguay and Paraguay. D. in Columbia, S. C., Feb. 19, 1897.

Bailey, LORING WOART, Ph. D., LL.D.: b. in West Point, N. Y., Sept. 29, 1839; educated at Brown University and at Harvard; was assistant to the Professor of Chemistry at Harvard until Sept., 1861, when he became Professor of Chemistry and Natural Science in the University of New Brunswick. The results of his investigations into the geology and natural history of New Brunswick have been published in reports by the Geological Survey of Canada, and he has contributed to various scientific periodicals.

Baker, JAMES HUTCHINS, A. M., LL.D.: educator; b. in Harmony, Me., Oct. 13, 1848; graduated from Bates College. He has served as principal of high schools in Yarmouth, Me., and Denver, Col., and president of the University of Colorado. He was a member of the committee of ten of the National Council of Education on Secondary School Studies, and has been president of the National Council of Education, author of *Elementary Psychology*, and of numerous essays and addresses on educational questions. C. H. T.

Baker, WILLIAM SPOHN: author; b. in Philadelphia, Pa., Apr. 17, 1824; educated in private schools, and practiced conveyancing till 1880, but afterward devoted all his time to historical work, especially with reference to George Washington. D. in Philadelphia, Sept. 8, 1897. He published various works treating of Washington, and his other publications included *American Engravers and their Work*; *William Sharp, Engraver, and his Works*; *The Antiquity of Engraving and the Utility and Pleasures of Prints*.

Balakireff, MILY ALEXEJEVITCH: musician; b. in Novgorod, Russia, 1836; was a student in the University of Kazan, but in music was mainly self-taught. He was for a time conductor of the opera in Prague, and also of the imperial concerts in St. Petersburg. His compositions include overtures and symphonies for full orchestra, and much piano music. His fantasia *Islamey* has the reputation of being the most difficult piano composition ever written.

D. E. HERVEY.

Balatka, HANS: musician; b. in Hoffnungsthal, Moravia, Mar. 5, 1828. At an early age he was a choir-boy in Olmutz Cathedral. He pursued his musical studies while singing in church and conducting societies in Vienna until the revolution of 1848 forced him to flee to the U. S. In 1849 he settled in Milwaukee, where, in 1857, he founded the Milwaukee Musik Verein and conducted it for nine years. In 1860 he went to Chicago and became conductor of the Philharmonic Society there, continuing for six years. In 1862 he became conductor of the Musical Union, in 1862 of the Germania Männerchor. He has conducted saengerfests and musical festivals in Cleveland, 1855; Cincinnati and Milwaukee, 1856; Chicago, 1857, 1868, 1881; Detroit, 1857; Pittsburg, 1858; Indianapolis, 1867; Louisville and Quincy, 1877. In the great Chicago fire of 1871 he lost a valuable music library and moved back to Milwaukee, but returned to Chicago in 1873. The fiftieth anniversary of his service as a musical director was celebrated in 1895 in Chicago, his first conductorship being of the Academical Singing Society of Olmutz in 1845, and at the celebration he conducted the

cantata *Solomon's Temple*, by Titl, being the first work conducted by him fifty years before. His compositions include *The Power of Song*, double choruses for male voices, awarded first prize at the Cincinnati Saengerfest of 1856, *Festival Cantata* for soprano and orchestra, 1869, many fantasias and transcriptions for orchestra, and numerous songs, part songs, and choruses, for both male and mixed voices, with and without accompaniments. D. E. H.

Banister, HENRY CHARLES: musician; b. in London, June 13, 1831. For fifty-one years he was connected with the Royal Academy of Music, London, entering as a King's scholar in 1846, and being re-elected in 1848 for another period of two years, appointed assistant professor in 1851, and soon afterward Professor of Harmony, which position he held until his death. His compositions include four symphonies, five overtures, and many smaller works. His textbook on harmony, entitled *Music*, was published in 1872, and ran through sixteen editions. He also wrote *Musical Analysis*, a *Life of George A. Macfarren*, and many other musical-literary works. D. Nov. 20, 1897. D. E. H.

Bankruptcy: On July 1, 1898, an act of Congress was approved and took effect, which institutes in the U. S. a bankruptcy law intended to afford an opportunity for insolvent debtors to transfer all their property to a trustee for the benefit of their creditors, and to resume their business free from debt. Three such bankruptcy laws have been passed prior to the act of 1898 by the Congress of the U. S.: the first, Apr. 4, 1800, repealed Dec. 19, 1803; the second, Aug. 19, 1841, repealed Mar. 3, 1843; the third, Mar. 2, 1867 (and amendments), repealed June 7, 1878, the last repeal taking effect Sept. 1, 1878. These various acts were amended by various other minor acts relating to them, and the final act taking effect Sept. 1, 1878, removed from the statute-books all bankruptcy laws, and since that time the State insolvent laws have been in force. The purpose of the present bankruptcy laws is threefold: first, to secure to the creditor means to compel the insolvent debtor to undergo liquidation and to punish fraudulent debtors; second, to benefit the public by enabling insolvent debtors to obtain a release from their obligations by an honest application of their entire property to the payment of their debts; third, to benefit the debtor himself by enabling him to conduct his business free from the inconvenience and disability occasioned by prosecutions for the collection of his debts.

Under and by virtue of the Bankruptcy Act of 1898 there were created as courts of bankruptcy the district courts of the U. S. in the several States, the supreme court of the District of Columbia, the district courts of the several Territories, and the U. S. courts in the Indian Territory and the district court of Alaska, with such jurisdiction in law and in equity as would enable them to exercise original jurisdiction in bankruptcy proceedings, in vacation in chambers, and during their respective terms. The power given to these courts was (1) to adjudge persons bankrupt who had their principal place of business, or resided or had their domicile, within their respective territorial jurisdictions for the preceding six months or the greater part thereof, or who, not having their principal place of business, residence, or domicile within the U. S., have property within their jurisdictions, or who have been adjudged bankrupts by courts of competent jurisdiction without the U. S. and have property within their jurisdictions; (2) to allow claims, disallow claims, reconsider allowed or disallowed claims, and allow and disallow claims against bankrupts' estates; and besides these powers such additional powers are given to these courts as are necessary to enable them to carry into practical effect the terms of the Bankruptcy Act and administer the affairs and estates of bankrupt debtors.

Acts of Bankruptcy.—Under the terms of this act an act of bankruptcy by a person consists of his having (1) transferred, conveyed, sold and removed, or permitted to be sold or removed, any part of his property with intention to hinder, delay, or defraud his creditors or any of them; or (2) transferred while insolvent any portion of his property to one or more of his creditors with intent to prefer such creditor over his other creditors; or (3) having suffered or permitted while insolvent any creditor to obtain a preference through legal proceedings, and not having at least five days before a sale or final disposition of any property affected by such preferences vacated or discharged such preference; or (4) made a general assignment for the benefit of

his creditors; or (5) admitted in writing his inability to pay his debts and his willingness to be adjudged a bankrupt on that ground.

The petition must be filed against the bankrupt within four months after the commission of the act of bankruptcy; but it is a sufficient defense against such a petition to prove that the alleged insolvent debtor is not insolvent.

Who may Become Insolvent Debtors.—Any person who owes debts, except a corporation, is entitled to become a voluntary bankrupt. Any natural person except a wage-earner or a person engaged chiefly in farming or the tillage of the soil, any unincorporated company, and any corporation engaged principally in manufacturing, trading, printing, publishing, or mercantile pursuits, owing debts to the amount of \$1,000 or over, may be adjudged a voluntary bankrupt. Private bankers may be adjudged involuntary bankrupts, but not national banks or banks incorporated under State or Territorial laws. A partnership may be adjudged bankrupt during the continuance of its business, or after its dissolution and before the final settlement thereof, and jurisdiction over one of the partners confers jurisdiction upon all, and over all of the partnership and individual property.

Exemptions of Bankrupts.—The act does not affect the allowance to bankrupts of the exemptions which are prescribed by the State laws in force at the time of the filing of the petition in the State where the bankrupt has had his domicile for the six months, or the greater portion thereof, immediately preceding the filing of the petition.

The bankrupt is required, among other things, to execute and deliver to his trustee transfers of all his property both in the U. S. and in foreign countries, and to assist them to schedule all his property, and to comply with all lawful orders of the court in the settlement of his estate; but he can not be required to attend a meeting of his creditors or an examination more than 150 miles distant from his home or principal place of business, or to examine claims except when presented to him, except by order of the court.

Protection and Detention of Bankrupts.—A bankrupt is exempted from arrest upon a civil process except for contempt or disobedience of a court of bankruptcy, or for an action in a State court upon a debt the claim from which his discharge in bankruptcy would not have been a release. The judge may at any time after the filing of the petition in bankruptcy and before the expiration of a month after the qualification of the trustee restrain the bankrupt from leaving the district in which he resides or has his principal place of business for the purpose of avoiding examination, where such departure may defeat the proceedings in bankruptcy.

During the pendency of proceedings in bankruptcy all suits against the bankrupt from which the discharge in bankruptcy would effect a release are stayed and the trustee may be directed by the court to appear and defend any suit pending against the bankrupt, and the trustee may, with the approval of the court, prosecute as trustee any suit commenced by the bankrupt. Suits can not be brought by or against a trustee of a bankrupt's estate subsequent to two years after the estate has been closed.

Compositions of the Bankrupt with his Creditors.—A bankrupt may not offer terms of composition to his creditors until he has been examined in open court or at a meeting of his creditors and has filed in court the schedule of his property and the list of his creditors required to be filed by bankrupts. An application for the confirmation of a composition may be filed after it has been accepted in writing by a majority in number of all creditors whose claims have been allowed, representing a majority in amount of the claims allowed; and the judge must confirm the composition if he be satisfied that it is for the best interests of the creditors, and that the bankrupt has not been guilty of any of the acts or failed to perform any of the duties which would be a bar to his discharge, and that the offer and its acceptance are made in good faith and have not been procured by any means or acts forbidden by the law. Upon the confirmation of such a composition the consideration must be distributed as directed by the judge, and the case dismissed.

Discharge in Bankruptcy.—A bankrupt may, after the expiration of one month, and within one year subsequently to being adjudged a bankrupt, file an application for a discharge, and the judge must hear the application, and after the hearing upon due notice to all parties concerned must discharge the bankrupt, unless he has committed an offense punishable by imprisonment as provided by the law, or has

with fraudulent intent concealed his true financial condition, and in contemplation of bankruptcy destroyed, concealed, or failed to keep books of account or records from which his true condition might be ascertained. The confirmation of a composition acts as a discharge of the bankrupt from his debts, other than those agreed to be paid by the terms of the composition and those not affected by the discharge.

Co-debtors of Bankrupts.—The liability of a person who is a co-debtor with, or guarantor or in any manner a surety for, a bankrupt shall not be altered by the discharge of such bankrupt.

Debts Not Affected by a Discharge.—A discharge in bankruptcy does not release a bankrupt from debts which are (1) due as a tax levied by the U. S., the State, county, district, or municipality in which he resides; or (2) due as judgments in actions for frauds, or obtaining property by false pretenses or false representations, or for willful and malicious injuries to the person or property of another; or (3) debts which have not been duly scheduled in time for proof and allowance, with the name of the creditor, if known to the bankrupt, unless such creditor had notice or actual knowledge of the proceedings in bankruptcy; or (4) debts created by his fraud, embezzlement, misappropriation, or defalcation while acting as an officer in any fiduciary capacity.

Courts and Procedure.—The procedure under which the Bankruptcy Act is administered is specially prescribed by statute, and under the authority of the statute by the supreme court of the U. S., the method of procedure so prescribed substantially conforming to that which was followed in the administration of the Bankruptcy Act of 1867. The supreme court of the U. S., the circuit court of appeals of the U. S., and the supreme courts of the Territories are vested with appellate jurisdiction for bankruptcy proceedings.

Officers, their Duties and Compensation.—By the terms of the act, referees in bankruptcy and trustees in bankruptcy are created, and the courts of bankruptcy are required to appoint referees for a term of two years, designating the district or limits within which the said referees shall act. Any such referee must not be an office-holder under the U. S. or any State, or be related within the third common-law degree of consanguinity or affinity to any of the judges of the courts of bankruptcy or circuit courts or appellate courts of the districts wherein he is appointed, and must have his residence and office in the district for which he is appointed. These referees are invested with the power to consider the petition in bankruptcy referred to them by the clerks, and may exercise the powers vested in the courts of bankruptcy for administering oaths and the examination of witnesses and documentary evidence, for taking possession and releasing property, and for doing certain other acts necessary to the proper performance of their duties.

The creditors are vested with the right of appointing one or three trustees; or, upon failing so to do, the court is vested with the right to appoint as trustees persons or corporations competent to take this office. The trustees are required to receive, administer, and account for the estate of the bankrupt and receive as full compensation for their services a fee of \$5 deposited with the clerk at the time the petition is filed (except when a fee is not required from a voluntary bankrupt), and such commissions on sums to be paid as dividends and commissions as may be allowed by the courts, not to exceed 3 per cent. on the first \$5,000 or less, 2 per cent. on the second \$5,000 or part thereof, and 1 per cent. on sums in excess of \$10,000. In the event of there being three trustees instead of one the fees and commissions are apportioned by the court according to the services actually rendered, so that the total sum paid shall not be greater than in the case of one trustee.

F. STURGES ALLEN.

Banks, Mrs. ISABELLA VARLEY: poet and novelist; b. in Manchester, England, Mar. 25, 1821. She managed a successful school in Manchester for some years, and in 1846 was married to George Linnæus Banks, a journalist and poet. In 1844 she had published *Ivy Leaves: a Collection of Poems*, and a volume of poems by her and her husband was entitled *Daisies in the Grass* (1865). Soon after marriage she published a *Lace-knitter's Guide*, and her next book, after a long interval, was *Light Work for Leisure Hours*. Her first novel, *God's Providence House* (1865), made her famous as a novelist. Among her later works are *Stung to the Quick* (1867); *The Manchester Man* (1872);

Glory (1877); *Caleb Booth's Clerk* (1878); *Ripples and Breakers*, poems (1878); *Wooers and Winners* (1880); *More than Coronets* (1881); *Through the Night: Tales of Shades* (1882); *Forbidden to Wed* (1883); *The Watchmaker's Daughter and other Tales* (1883); *Sybilla and other Tales* (1884); *In His Own Hand* (1885); *Geoffrey Oliphant's Folly* (1886). Mr. and Mrs. Banks wrote many popular songs. D. in London, May 5, 1897.

Banner, MICHAEL: violinist; b. in Sacramento, Cal., Oct. 20, 1868, and began the study of the violin when five years old. On the recommendation of Wilhelmj he was sent to Cincinnati to study under Jacobsohn, where he made rapid progress. In Feb., 1882, he played at one of Dr. Damrosch's symphony concerts in New York. In October of that year he went to Paris for further study, and in 1884 was awarded the first prize at the Conservatory. D. E. HERVEY.

Baptist Young People's Union of America: a union representing the various societies of young people connected with the Baptist churches in the United States and Canada. Its constitution states that "The object of this union shall be to secure the increased spirituality of our Baptist young people; their stimulation in Christian service; their edification in Scripture knowledge; their instruction in Baptist doctrine and history; and their enlistment in all missionary activity through existing denominational organizations." Active members take the following pledge: "Relying upon Divine help, I hereby promise to strive to be true to Christ in all things and at all times; to seek the New Testament standard of Christian experience and life; to attend every meeting of the union, unless hindered by reasons approved by a good conscience, and to take some part in the services, aside from singing, if it is possible to do so with sincerity and truth." The local societies composing this union number about 5,000, with a membership of 250,000.

Baracoa, bā-ra-kō'a: a town of Santiago de Cuba province, north coast of Cuba, not far from the east end of the island. The first Spanish settlement in Cuba was founded near this town by Diego Columbus, son of Christopher, in 1511. It was near this town that Antonio Maceo and nineteen followers landed (Feb. 25, 1895) and started the revolution that resulted in the liberation of Cuba from Spain. Its remoteness from the fertile central districts, its unhealthy climate, and dangerous navigation in the channel leading to the harbor have kept the place small. It does some trade with the U. S. in tropical fruits, produces cocoa and cocoa-oil, and the caves near the town are remarkable for their stalactites and fossil human remains. Pop. 5,200.

C. C. ADAMS.

Barnes, EARL, M. S.: educator; graduated from Oswego Normal School; studied at Cornell University 1886-87, 1888-89; at the University of Zurich 1887-88; graduated from Indiana University 1890; M. S. Cornell University 1891; Professor of History, Indiana University, 1889-91; Professor of Education, Leland Stanford Junior University, 1891-97; author of *Studies in Education* (1897), and joint author, with Mary Sheldon Barnes, of several text-books in history. He is a leader in some of the newer fields of educational activity, particularly child-study. C. H. T.

Barnett, JOSEPH ALFRED: one of a well-known family of English musicians, younger brother of JOHN BARNETT (*q. v.*), and father of JOHN FRANCIS BARNETT (*q. v.*); b. June 15, 1811. When a boy he possessed a beautiful soprano voice, and was frequently engaged for operatic performances and concerts. As a composer he was largely self-taught. He was for many years a teacher of singing in London. He composed a number of popular songs and duets and some Roman Catholic Church music which attained much favor. D. Apr. 29, 1898. D. E. HERVEY.

Barrett, WILLIAM ALEXANDER: journalist and musician; b. in Hackney, London, Oct. 15, 1834; was chorister in St. Paul's Cathedral at an early age, afterward choirmaster at St. Andrew's, Wells Street, and Magdalene College, Oxford, from 1859 to 1865. While at Oxford he edited a monthly paper called the *Penny Post*. Took the degree of Mus. B. 1871. In 1866 he was appointed assistant vicar choral in St. Paul's Cathedral. In 1867 he became music critic of the *London Morning Post*, remaining till his death. He was also successively editor of the *Orchestra*, the *Monthly Musical Record*, and the *Musical Times*, holding this last position at his death. He was a fellow of many societies. He received the degree of Mus. D. from Trinity College, Toronto. He composed only a few pieces, but his literary

works are all of high authority. They include a *Life of Balfe*, *The Choristers' Guide*, *English Church Composers*, *English Folk Songs, Glees, and Madrigals*, an edition of standard English songs, a *Dictionary of Musical Terms* (with Dr. STAINER, *q. v.*), several albums of songs, and many articles and critiques in various papers and magazines. D. Oct. 17, 1891. D. E. HERVEY.

Bartlett, HOMER NEWTON: musician; b. in Olive, N. Y., Dec. 28, 1846; studied in New York under S. B. Mills, Max Braun, Jacobson, and others for seven years, fitting himself both as a pianist and organist. He has always resided in New York city, teaching, playing the organ in church, and taking part in numerous concerts. He has composed much in many forms, including many songs, piano pieces, part songs and choruses for both male and mixed voices; *La Vallière*, opera (1885); *The Lost Chieftain*, cantata (1888); *Samuel*, oratorio (1888); quartet for harp, organ, violin, and violoncello (1888); several pieces for orchestra, sextet for strings and flute, and a concerto for violin and orchestra, first performed at the meeting of the Music Teachers' National Association in New York, June, 1898. D. E. HERVEY.

Barus, CARL: physicist; b. in Cincinnati, Ohio, Feb. 19, 1856. Studied at the Columbia College School of Mines and at the University of Würzburg, where in 1879 he received the degree of Ph. D., and where he was assistant to Prof. F. Kohlrausch. In 1880 he became connected with the U. S. Geological Survey, and then devoted himself to the examination of problems in physical geology under Prof. F. W. Clarke. Twelve years later he was appointed Professor of Meteorology in the U. S. Weather Bureau and took up the study of the condensation of atmospheric moisture. In 1893 he entered the service of the Smithsonian Institution and was given charge of the work in physics there, continuing this work for two years, when he returned to his studies on atmospheric moisture under a special grant from the Smithsonian Institution. In June, 1895, he was elected Hazard Professor of Physics in Brown University, Providence, R. I., where he has since remained. He was elected a member of the National Academy of Sciences in 1893, and during 1894-95 he was a member of the Congressional committee for drawing up specifications for the electrical standards of the U. S. Besides membership in various scientific societies he was in 1883 elected a member of the American Association for the Advancement of Science, and in 1896 chosen one of its vice-presidents, delivering an address on *Long-range Temperature and Pressure Variables in Physics*. In 1899 he was elected a corresponding member of the British Association for the Advancement of Science. The results of his various investigations are for the most part contained in Government reports, especially in those of the Geological Survey, to whose series of bulletins he has contributed *The Compressibility of Liquids* (Washington, 1892); *The Mechanism of Solid Viscosity* (1892); *The Volume Thermodynamics of Liquids* (1892); and *High Temperature Work in Igneous Fusion and Ebullition, chiefly in Relation to Pressure* (1893). He has also been a large contributor to the *American Journal of Science* and other like periodicals. MARCUS BENJAMIN.

Bassford, WILLIAM KIPP: musician; b. in New York, Apr. 23, 1839; received his entire musical education in New York from local teachers. He has always resided in that city, practicing as pianist, organist, and teacher. His compositions are numerous, mainly songs and piano pieces. In 1874 he produced a fine mass in E flat. He composed a two-act opera, *Cassilda*, which still remains in manuscript. He was selected by the widow of the late William Vincent Wallace to complete that composer's opera *Estrella*, left unfinished at his death. D. E. HERVEY.

Batabanó, baa-ta-ba-no': a small port on the south side of Cuba, in Havana province, 45 miles from Havana, with which it is connected by rail. It is over against the Isle of Pines, where a military station was established in 1828 to defend the approaches to Havana from the south side. Pop. 1,800. C. C. ADAMS.

Bayamo, baa-yaa'mō: the chief town in the basin of the Cauto river; Santiago de Cuba province, Cuba; 94 miles N. W. of the city of Santiago. A few miles S. W. the ten years' war (insurrection of 1868-78) began, and the town figured prominently in Garcia's campaigns in the insurrection of 1895. It is in the midst of the great eastern plain of the island, whose surface is broken by groups of

mountains, and is a trading center for the grazing and farm districts around it. Pop. 3,634. C. C. ADAMS.

Beach, Mrs. H. H. A. (maiden name, AMY MARCY CHENEY): composer; b. in Henniker, Merrimack co., N. H., Sept. 5, 1867; showed musical talent at a very early age, and soon began writing little compositions. Her first teacher was her mother. Later she studied pianoforte under Junius W. Hill, C. L. Capen, Ernst Perabo, and Carl Baermann, and harmony under J. W. Hill, of Wellesley College. Then she took up counterpoint, fugue, form, and instrumentation, studying by herself with the aid of text-books. She made her first public appearance as a pianist on Oct. 24, 1883, in Music Hall, Boston. Since that date she has appeared regularly almost every season at concerts and recitals, playing many important concertos and other works. She was married in 1885 to Dr. H. H. A. Beach, of Boston, and since then her principal musical activity has been in composition. She has published a mass in E flat, sung by the Boston Handel and Haydn Society in 1892; *The Rose of Arontown*, cantata for female voices; *Gaelic Symphony*; *Festival Jubilate*, for mixed voices; *The Minstrel and the King*, ballad for male voices; many songs and piano pieces, and a sonata for piano and violin. D. E. HERVEY.

Bear: Several new species have been described from North America. The most remarkable of these is the glacier bear, *Ursus emmonsii*, a species related to the black bear, but smaller and resembling in color a silver fox. It appears to be confined to a small area in the vicinity of Mt. St. Elias. The great Kadiak bear, *Ursus middendorfi*, of the Alaskan peninsula, is the largest of living bears, the cranium being 18 inches long. It is brown, and is related to the brown bear of Kamchatka. F. A. LUCAS.

Beaven, ROBERT: statesman; b. in Leigh, Staffordshire, England, Jan. 28, 1836; engaged for several years in gold-mining on the Pacific coast, afterward settled in Victoria, B. C. He was first secretary of the Confederate League in the agitation for confederation with the Dominion of Canada, and after the union, in 1871, became a member of the first British Columbian Assembly. He was chief commissioner of lands and works for several years, and afterward Minister of Finance and Premier.

Beck, JOHANN TOBIAS; Protestant German theologian; b. in Balingen, 40 miles S. W. of Stuttgart, Feb. 22, 1804. He studied at Tübingen 1822-26, was a pastor 1827-36, Professor Extraordinary of Theology at Basel 1836-43, and the rest of his life Ordinary Professor of Theology at Tübingen and also chief preacher. He lectured on dogmatic, ethic, New Testament exegesis, practical and pastoral theology. He founded no school, but had some devoted followers. His life was essentially unworldly, and he rebuked sin and called to repentance like a Hebrew prophet. He won more respect than affection, for many failed to learn his kindness of heart and heard only his denunciations. He was particularly severe with what he considered the departures from Christianity which he observed all about him. His own theology was strongly biblical and anti-speculative. In English he appeared his *Outlines of Biblical Psychology* (Edinburgh, 1877) and *Pastoral Theology of the New Testament* (1885). D. in Tübingen, Dec. 28, 1878. See his biography by B. Rigenbach, Basel, 1888. S. M. J.

Begg, JAMES: Free Church of Scotland minister; b. in New Monkland, Lanarkshire, near Edinburgh, Oct. 31, 1808; graduated at Glasgow University; entered the ministry of the Church of Scotland and held various charges before the Disruption (1843), when he joined the Free Church and became minister of the Free church in Newington, a suburb of Edinburgh. He received the honorary degree of doctor of divinity from Lafayette College, Pennsylvania, 1847, and was moderator of the Free Church General Assembly 1865. He was the leader of a formidable and fanatical minority, mainly composed of Highlanders, united in a tireless and sometimes successful effort to make the Free Church as closed to all progress as possible. He and his sympathizers opposed the union of the Free and the United Presbyterian Churches, the use of hymns and of church organs, and any relaxing of the strictest sabbatical ordinances or of the terms of subscription for office-bearers. The mere mention of the name of the Church of Rome greatly excited them, for all that was bad was to their minds centered in her. He won in this way an unenviable reputation; but as he thought himself the divinely appointed guardian of religious purity, he considered reproach by the majority a

compliment. D. in Edinburgh, Sept. 29, 1883. See his biography by Prof. Thomas Smith (London, 1885-88, 2 vols.).

S. M. J.

Belief and Faith: the consciousness of the personal indorsement of something thought of as being real. It is one of the conquests of modern psychology that it has marked off the field of belief and so brought to an end the historical controversies which turned upon differences of definition. These differences have characterized certain great ways of distinguishing belief from other mental states: (1) Belief has been used to include all states of mind in which the object presented was not explicitly declared unreal. This made it possible to say that we believe in our sensations as well as in our reasoned conclusions, in our intuitions as well as in our hopes. Under this definition the uncritical attitude of the child in not rejecting anything is called belief or credulity. (2) Belief is considered by another school of thinkers as a positive indorsement, not merely a negative acceptance, of something as real—that is, it is an attitude over and above the uncritical consciousness of bare experience itself. On the basis of these two forms of definition theories of belief have fallen into two great classes.

According to the first class of theories, belief is considered a spontaneous and immediate attribute of consciousness, a "first intention," and as such it has been considered a form of feeling (Hume, in the *Enquiry*), of will (Bain, in *Emotions and Will*), or of intelligence (James Mill, Herbart). Opposed to this general way of looking at belief is the second class of theories, which consider it a matter of reflection, a "second intention," a new phenomenon added to the mere presence of presentative consciousness. According to this view, belief is only present when a certain complexity of the mental life affords the requisite conditions. The line of development made possible by this distinction is rapidly gaining ground. It is well to recognize the distinction of fact between the lower form of acceptance of experience, on the one hand, called by Bain "primitive credulity," and described more explicitly by Baldwin under the term "reality feeling," and, on the other hand, the higher attitude of mind which accompanies the weighing of evidence, the attaining of conviction, and the asserting of a reflective judgment. The latter alone should be called belief. The distinction is the same as that long current in logic between "simple apprehension" and judgment.

As thus defined, belief is explained in various ways by different authorities. It is held (1) that belief is a sentiment, an "emotion of conviction" (Bagehot), aroused by a complex interplay of presentations and ideas; or a feeling of "vividness" and intensity in ideas (Hume, in the *Treatise*, Taine, Dugald Stewart). Or (2) it is an intellectual fact (Bain's second view, in *Mental and Moral Science*, Appendix, p. 100), an irresistible or inseparable "association" (James Mill). Or (3) it is an active determination, either voluntary or spontaneous, of a personal attitude toward the play of presentations. This last view is possibly the best supported to-day and is becoming dominant, either taking the form of the postulate of an ultimate principle of "assent" (J. S. Mill), or of making the attitude of belief the result of an assimilation of new elements into the group of motor processes which constitute (Royce, Baldwin) or express (Stout) the activity of the personal self. This view may be expanded in some little detail (following the writer's work on *Feeling and Will*).

Kinds of Belief.—Broadening our outlook, we are able to distinguish several aspects or phases of belief, which we may call respectively *belief in the external world*, *belief in memory*, *logical belief*, *belief in ideals*, etc. The "motor" theory set forth holds that in each case there must be an impulse or tendency to a particular kind of experience, and that belief in the reality of the object of that experience must depend upon its capacity to satisfy the tendency involved. Calling, in each case, this ability to satisfy, the "coefficient," we have as many coefficients of reality as there are fundamental tendencies toward objects.

Belief in External Reality: its Coefficient.—A few words may be said about external reality as contrasted with the other kinds of reality in which we believe. The question suggests itself: What, in consciousness, is the sensational coefficient? Granted such a nervous process whenever a real object is present, what mental changes does it work?

The grounds of belief must be the marks which give the semblance, the coefficient, of reality. Most generally speaking there are two, first *very high intensity* and second *uncontrollableness*. Whenever a mental state is intense, be it

sensation or image, and resists all endeavor of ours to modify or banish it, it carries our belief, it is real, so far as sensational tests are concerned, i. e., so far as the sensational coefficient goes. I may often have grounds for distrusting such a state—other coefficients which I invoke as of more worth to me in deciding the case than the sensational tests; but if I had only the latter, if I were merely a being of sensations and reactions, intense persistent states would always and invariably sum up reality for me.

Of these two elements of the sensational coefficient, however, the latter is more important and essential. Simple reality feeling attaches to intense and feeble images alike, provided no impulse arise which fails to find its satisfaction in the feeble ones. But in the element of uncontrollableness we have a confirmation of the impulse origin of all belief. Our impulses, our life-needs, are fixed and permanent, not subject to our will or control: so are their satisfactions, the realities we have reached in our life-experience.

Even seeming contradictions in such sense-reports are not sufficient in themselves to controvert belief. Do I hear a voice when my eyes tell me no one is near—hear it with its coefficient of reality? Then I believe it, and believe my eyesight too. The principle of consistency, of such supreme importance in logical belief, has only a subordinate application here. If I do compare my senses and judge which of them to believe, it is either because one or more of them has not the energy or persistence of others, or because I appeal to higher considerations—coefficients—to help me out. In actual fact we do find a class of sensations which realizes the coefficient most directly and distinctly, and thus becomes the arbiter or referee of sensible reality.

Primacy of Muscular Sensations as Giving External Reality.—Touch—with muscular sensibility—has been called the "controlling sense," because questions of reality are referred to it for decision. We now see why this is so. It is through muscular movement that will and impulse and appetite, that all outgoing processes, are realized. If natural satisfactions therefore are the basis of belief in external reality, then the medium of such satisfactions must be the medium also of the sense of reality. And further, motor-reaction is itself an impulsive, original thing, and takes place largely through the stimulus of resistance: consequently the presence of resistances is itself the gratification of the need of motor-development—perhaps the most general and fundamental sensational need that we have. If we could get satisfactions without muscular sensations, then the latter would not be tests of external reality.

Primary Criterion of External Reality.—Consequently it is only what we would expect that sensations of *resistance* become the primary criterion of all external reality. Anything that resists my will is believed to have present reality. And it is not simply resistance through contact, but, by generalization, resistance in any of the classes of sensation. A stifling smoke resists my will to be rid of it, that is, the physiological effort I make to banish it shows me that I have no control over it. But that this is derived from muscular resistance is seen in the fact that I confirm my belief derived from the smell of smoke by searching the house to find the fire.

It is clear that it is the element of *present* reality in the external world that sensations of resistance guarantee, not, to a great extent, future reality. The element of *persistence* in the world without depends rather upon the memory-coefficient, to be next discussed. Persistence comes through the sensational coefficient only as far as resistances have duration, i. e., stand constant in opposition to prolonged effort or in gratification of prolonged appetite. There is also probably an element contributory to the notion of persistence in the accidental recurrence of old resistances when we do not expect them; but such accidental anti-associational occurrences also come in the shape of pure imaginations, and the test of present resistance is the final appeal in cases of such unexpected experiences.

To the objection that pure imaginations may have the quality of uncontrollableness (fixed ideas), it may be pointed out that in most cases they can not stand the test of actual muscular resistance, and that when they are abnormally imperative they *are* considered as realities—i. e., we have the beginning of delusion.

Belief in Memory: the Memory-coefficient.—By memory-coefficient is meant the coloring of reality which some images have, as representing former states of consciousness: that by which I distinguish a memory from a dream or a

creature of the imagination. Belief in memory is the feeling which attaches to images recognized.

As feeling two very distinct forms of reality-consciousness attach to memory: first, what we may call the simple sense of revival or recurrence, and second, the belief that what is thus recognized was itself a real objective experience. I may remember a dream, recognize it, and believe in it as a real memory, and yet be in doubt as to whether it was a dream or a real occurrence when I first experienced it.

The memory-coefficient of belief attaches properly only to the first of these states: it answers the question, What shall I recognize? The further point of feeling—that which attaches to the answer to the question, Is what I recognize a reality?—requires further inquiry into the nature of the memory in question. Does the memory recognized include memory of the sensational coefficient? Did I believe it to be a real object when I first experienced it? This question determines whether I shall feel it to be the memory of an objective thing or no. So with any other of the higher kinds of reality-coefficients yet to be spoken of. Do I recognize a former image of a beautiful face? Yes; but do I recognize it as a living beautiful face? That depends upon the kind of coefficient, sensational, imaginery, æsthetic, etc., of my earlier view of the face. The dependence of belief in many cases upon the sensational coefficient is well put by Hume in his definition of belief as “a lively idea related to or associated with a present impression (sensation).” (*Treatise*, pt. iii., § 7.) He also points out that false images may get the sensational coefficient by repetition and emphasis. (*Loc. cit.*, pt. iii., § 5.)

Memory-coefficient Proper.—The question then, Why do I recognize anything consciously at all? has its answer in the memory-coefficient proper, viz. *because I can reproduce it voluntarily by starting a chain of associations leading up to it.* I have control over it in this sense, that it is at my command for reproduction. My past is mine only in as far as I can utilize it in my present. I refresh my memory by rehearsing details, and thus bringing up points which, if simply suggested to me without their earlier connections, I might have failed to recognize. So we reach two kinds of present reality: present external reality, guaranteed by its independence of my will, and present memory-reality, guaranteed by subjection to my will. Moreover, there are further modifications of memory due to volition. We can by attention bring out details of outline, strengthen, intensify, or, by neglecting, practically banish a memory: all of which influences external things stubbornly resist.

Completed Criterion of External Reality.—Besides the primary criterion of external reality found in feelings of resistance, a secondary criterion is therefore supplied by memory. Of the two kinds of memories, both having the memory-coefficient, those which represent external realities and those which do not, the former are important factors in the development of our idea of the world without. Among the trains of association by which memories may be voluntarily brought up are certain muscular trains themselves accompanied by resistances, and the memories brought up by them also resist. It is only these muscular resisting trains terminating in a resisting experience which carry belief in external things remembered. For example, I remember equally a salesman and a merman. I can get the shopman again as a present (resisting) reality by reproducing the series of muscular (voluntary, but resisting) sensations required to revisit his shop. But I can only get the merman as an image (unresisting) by a train of ideal (voluntary, non-resisting) associates. The former alone I do and must consider externally real. The secondary criterion of external reality, therefore, is *my ability to reinstate resisting experiences at will.*

In this secondary criterion the element of persistence included in our idea of external things seems to take its rise. In saying things are, we mean also that they continue. That is, as we have seen, we mean that we are able to go and find them again, and find them with the same resistance they showed when we experienced them before. To a creature without memory, reality would be simply successive resistances: but with memory as recognition comes also persistence.

The history of opinion regarding belief in objective things shows that the twofold nature of the complete criterion has been generally overlooked. Hume, Mill, Pikler, James, emphasize the voluntariness (memory side) of reality. The same is seen in Mill's famous definition of external reality as “the permanent possibility of sensation.” Bain, Spencer,

Stout, Lipps, give corresponding emphasis to the resistance side. The latter certainly are more just, since resistance is the last test even of images which persist: but the memory side of externality just as certainly requires due recognition, and a true view means the theoretical union of the two. Of recent writers, the treatment of Lipps and Stout is, in the writer's opinion, among the most adequate.

Belief in Concepts and Thought: Thought-coefficient.—The demand of thought in general is agreement, consistency; its opposite is contradiction: this it can not abide and be satisfied. Consequently, consistency, the absence of presentative or conceptual contradiction, is the thought-coefficient of belief. Where no other coefficient conflicts, mere consistency carries intellectual assent. But by intellectual assent, it must be carefully noted, is meant formal assent, logical assent. My belief is evidenced from the fact that I go right on and form my general class, until some inconsistency leads me to break it up.

Emotional Belief.—No detailed argument is required to show that strong emotion has an influence on belief. So evident is this that the emotional method of persuasion is universally recognized. An idea which strongly excites us to some definite emotion, hope, fear, anger, love, is easily believed in, and the cherishing of the emotion is a means of intensifying conviction in reference to its object.

The emotional coefficient therefore consists, like the sensational coefficient, in *intensity* and *uncontrollableness*. While mere intensity does strengthen conviction, yet it may be questioned whether it is not mainly because it is through intensity that we lose control. As soon as we can get our emotion under our will, and can say to ourselves, “think calmly,” the distorting influence of feeling disappears.

It is necessary for completeness of treatment to indicate that there are beliefs in æsthetic and moral truths; that these beliefs accompany satisfactions which arise from the gratification of corresponding æsthetic and moral impulses.

General Conclusion on Reality and Belief.—The consideration of the different coefficients of belief leads us to conclude that there are as many kinds of reality. There is moral and æsthetic reality no less than logical and sensational reality; and there is the same reason for believing in one that there is in another, for both rest upon the fact that our mental nature demands certain kinds of satisfaction, and we find it possible to get them. Sensational reality will not satisfy our logical demands, for nature is often refractory and illogical. Neither will logic satisfy our moral and æsthetic demands, for the logically true is often immoral and hideous. It is well, therefore, to write large the truth that logical consistency is not the whole of reality, and that the revolt of the heart against fact is often as legitimate a measure of the true, in this shifting universe, as is the cold denial given by rational conviction to the vagaries of casual feeling.

Composite Realities.—The outcome of our life of belief is the more or less complete adjustment of these kinds of reality to one another. We find ourselves constantly denying, minimizing, scouting the external world, as we abstract our higher selves from connection with it. Idealistic philosophy is more a revolt from the sensational coefficient in the name of the moral coefficient, than the logical system of belief which as philosophy it claims to be. Materialism, on the contrary, is the worship of the sensational coefficient as more real than any other. Religious truth either tells us which to put under and which to embrace, or bids us await a future state when all the demands upon us will be harmoniously adjudicated.

What I, as an individual, therefore, believe, is a composite thing, a mixture of truths representing the degree of harmony I have succeeded in reaching among things which, taken singly, I am obliged to accept. Among them the largest place is given to external or sensational reality. I bring things wherever possible to the test of sensation. No doubt this is because my connection with the external world is most intimate and direct, and the penalties of its disregard are most quick and sure. Next in practical importance is the world of logic or demonstrable truth, which holds its sway imperatively when sensation does not vote a negative. The disregard and violation of æsthetic, moral, and religious truth is due to the difficulty of deciding just what these coefficients are and of disentangling them from the swarm of temporary emotional states which have not the same claim to satisfaction.

Self the Ultimate Reality.—Amid the variations of composite and varying reality, the most fixed point of reference

is now seen to be the feeling of *self*. This is as far as psychology can go with its analysis of belief and reality. All reality is given us through our own experience, and the center of experience is self and its needs.

In "disbelief" we have belief in a negative truth. It involves the same sort of reflective determination as positive belief, and so it does not differ psychologically from it. Logically expressed, disbelief is the same as "negative judgment." The negative of belief is, accordingly, not disbelief, but *doubt*.

"Conviction" is a loose term whose connotation, so far as exact, is near to that here given to belief. "Making up one's mind," "being convinced," "weighing evidence," etc., are phrases describing the complex play of ideas preparatory to belief.

As compared with the term "judgment," we may say that belief is the psychological and judgment the logical side of the same state of mind, called succinctly by Stout the "yes-no" consciousness.

What we mean by *faith* in relation to belief is a much-discussed matter. Faith properly attaches to statements, thoughts, etc., which are taken to be worthy of belief on the authoritative assurance of some one else, or on the basis of some general belief which guarantees the lesser matter of faith. Faith, therefore, seems to be belief of the kind which acknowledges its inability to secure personal conviction or knowledge, but rests in a condition of trust. It is evident that the room for emotional and voluntary determination is great in faith, since it comes into play in a region where the logical coefficient is not exclusively invoked. This is especially evident in religious thought, where the attitude of faith is contrasted with the "rational" attitude.

LITERATURE.—HUME, *Treatise on Human Nature*, §§ 7 ff., and *Enquiry*, § 5, pt. ii.; James Mill, *Analysis of the Phenomena of the Human Mind* (ed. J. S. Mill); J. S. Mill, *Notes* in preceding, i., p. 412 f.; *Dissertations*, iii.; *Examination of Hamilton*, chap. xi.; Dugald Stuart, *Philosophy of the Human Mind*, pt. i., chap. iii.; Fehner, *Drei Motive und Grunde des Glaubens*; Ulrici, *Glaube und Wissen*; Newman, *Grammar of Assent*; Bain, *Emotions and Will*, "Belief," and *Mental and Moral Science*, Appendix; Ward, *Encyclopædia Britannica*, article *Psychology*; Brentano, *Psychologie*, ii., chap. vii.; Lipps, *Grundriss der Seelenlehre*, chap. xvii.; James, *Principles of Psychology*, vol. ii., chap. xxi.; *The Will to Believe*; Stout, *Analytic Psychology*, bk. i., chap. v., and bk. ii., chap. xi.; Baldwin, *Handbook of Psychology: Feeling and Will*, chap. vii.; art. *Belief* in *Baldwin's Dictionary of Philosophy*; Balfour, *The Foundations of Belief*; Adamson, *Encyclopædia Britannica*, art. *Belief*; Verbrot, *Die Psychologie des Glaubens*; Bagehot, *Literary Studies*, i., p. 412 f.; Royce, *Religious Aspect of Philosophy*, chaps. ix., x.; Höfding, *Outlines of Psychology*, v. d.

J. MARK BALDWIN.

Bendix, MAX: violinist; b. in Detroit, Mich., Mar. 28, 1866: first instructed by his father, then by Richard Arnold 1876-78, and S. E. Jacobsohn at Cincinnati 1879-81. Theodore Thomas chose him as concertmaster of his orchestra, and he was the assistant of the great violinist Ysaye on his concert tour. He has been for several years the leader of the violins in Thomas's Chicago Orchestra, and is in charge of the violin class in the Chicago Conservatory.

D. E. HERVEY.

Benham, ANDREW ELLICOTT KENNEDY: naval officer; b. on Staten Island, N. Y., Apr. 10, 1832. He entered the Naval Academy in 1847; while serving on the *Dolphin*, in the East India squadron, was slightly wounded in the capture of a piratical Chinese vessel; became passed midshipman 1853; was commissioned master and promoted to lieutenant 1855; served in the Coast Survey 1857-58; was attached to the *Crusader*, home squadron, 1860-61, and at the beginning of the civil war became executive officer of the *Bienville*, in the south Atlantic blockading squadron, taking part in the capture of Port Royal, S. C.; was made lieutenant-commander 1862, and commanded the *Penobscot*, of the western Gulf blockading squadron, until the close of the war, during which service he blockaded the coast of Texas for thirteen months without entering port: was advanced to commander 1866; after duty at the Brooklyn navy-yard, as lighthouse inspector and as commander of the ironclad *Canonicus* from 1874 to 1878, he rose to the rank of captain 1875; commanded the flagship *Richmond*, Asiatic station, 1878-81; was promoted to commodore 1885, and had charge of the

Mare island navy-yard; was made rear-admiral 1890, and was on waiting orders 1891-92; commanded the south Atlantic station 1892; in 1893 was ordered to Rio de Janeiro, Brazil, where a revolution was then in progress, to protect American interests, and was retired in 1894.

Benjamin, MARCUS, A. M., Ph. D., F. C. S.: chemist and editor; b. in San Francisco, Cal., Jan. 17, 1857; graduated in the chemical course of the School of Mines of Columbia College in 1878. After various minor engagements he became, in 1882, editor of the *American Pharmacist* and then of its successor, the *Weekly Drug News*. In May, 1883, he was appointed chemist to the U. S. laboratory of the apaiser's store in New York, which place he held until 1885, and then for a short time was a sanitary engineer on the New York Board of Health. Meanwhile, during 1884-86, he was lecturer on chemistry at the New York Woman's Hospital Medical College, also, during 1883-86, he prepared the chapters on *Mineral Paints* for the yearly volumes of the *Mineral Resources of the United States*, issued by the U. S. Geological Survey. He then joined the editorial staff of Appleton's *Cyclopædia of American Biography*, and has since served on the staffs of the *Standard Dictionary*, for which he prepared the definitions in chemistry, *Johnson's Universal Cyclopædia*, the *Encyclopædic Dictionary*, and the *American Educator*. In 1895 he was called to Washington to assist Dr. G. Brown Goode in the preparation of a history of the half-century of the existence of the Smithsonian Institution, to which work he contributed the chapters on *Chemistry* and *Meteorology*. On Apr. 1, 1896, he was appointed editor of the U. S. National Museum in Washington, in charge of the annual volumes of the *Proceedings and Reports*, and *Bulletins*, which place he still holds. The degree of A. M. was conferred on him by Lafayette College in 1888; that of Ph. D. by the University of Nashville in 1889. He is a life fellow of the London Chemical Society and of the American Association for the Advancement of Science, of which latter he was elected a vice-president in 1898. Besides membership in other scientific societies, he has been active in various patriotic societies, and is now historian of the Society of the Sons of the American Revolution and of the Society of Colonial Wars, president of the Society of the War of 1812, and vice-president of the Society of Mayflower Descendants in the District of Columbia. He served on the international jury of awards at the World's Fair in Chicago in 1893, and was a member of the jury at the Tennessee centennial exposition in 1897, and of the Trans-Mississippi and international exposition in 1898. He has been a large contributor to the technical journals of the country, serving at various times on staffs of the *Oil, Paint, and Drug Reporter* and *Engineering and Mining Journal*, and has contributed to the *Chautauquan*, *Harper's Weekly*, *Popular Science Monthly*, and other periodicals. He compiled *May Time*, a collection of poems (New York, 1889); and edited *Gems and Precious Stones* (1890); *Dictionary of New York City* (1890); *Handbook of Winter Resorts* (1890-96); *General Guide of the United States and Canada* (1891-99); *Handbook of Summer Resorts* (1891-97); *Picturesque America* (revised edition, 1894); and the *Canadian Guide Book* (1898-99).

Bent, JAMES THEODORE: traveler; b. in Liverpool, Mar. 30, 1852; graduated at Oxford in 1875; superintended excavations in Greece for the British Museum and the Hellenic Society. Among his writings are *A Freak of Freedom, or The Republic of San Marino* (1879); *Genoa: How the Republic Rose and Fell* (1880); *Life of Giuseppe Garibaldi* (1881); *The Cyclades, or Life among the Insular Greeks* (1885). D. in London, May 6, 1897.

Beresford, Lord CHARLES WILLIAM DE LA POER: rear-admiral; b. in Philpottown, County Dublin, Ireland, Feb. 10, 1846; entered the British navy in 1859; lieutenant 1868; commander 1875; captain 1882; rear-admiral 1896. He accompanied the Prince of Wales as naval aide-de-camp to India in 1875. During the bombardment of the forts of Alexandria in 1882 he commanded the gunboat *Condor*, and was specially active in organizing and controlling a police system, which was prominent in the suppression of looting. In 1884 he accompanied Lord Wolseley up the Nile, and commanded the naval brigade that went with Sir Herbert Stewart across the desert. He was a member of Parliament 1874-80 and 1885-86. Lord Salisbury appointed him Junior Lord of the Admiralty in 1886, but he resigned in 1888 because of disagreement on matters relating to the strength of the navy, and again entered Parliament. In 1889 he was

assigned to service in the Mediterranean in command of the armored cruiser *Undaunted*. He was sent to China in the summer of 1898 to obtain information as to the value of recent British concessions in that country.

Berti, DOMENICO: statesman; b. in Cumiana, Italy, Dec. 17, 1820; acquired an education with great difficulty, because of poverty, but at an early age taught in the normal school at Novara; wrote political letters to a Liberal journal in 1846, and in 1848 was elected to the Chamber of Deputies from Savigliano. In 1849 he became Professor of Philosophy in the University of Turin, and during his professorship of ten years he wrote a *History of Philosophy in Italy from the Time of St. Thomas, Pico de la Mirandola, and Giordano Bruno: His Life and Works*. He edited Cavour's unpublished letters and wrote studies on Gioberti, Cesare and Vittorio Alfieri, and King Carlo Alberti. He was at several times Minister of Instruction, and of Agriculture, Industry, and Commerce; proposed various measures of reform in the relations of capital and labor, including employers' liability and accident insurance. From 1871 to 1877 he was Professor of the History of Philosophy in the University of Rome. He was nominated as Senator in 1895. D. in Rome in April, 1897.

Bethune. Rev. CHARLES JAMES STEWART, M. A., D. C. L.: b. in West Flamboro, Ontario, Aug. 11, 1838; educated at Trinity College, Toronto; ordained deacon in the Church of England 1861, and priest 1862; was curate of St. Peter's, Cobourg, Ontario, and afterward of Carlton, Selby, Yorkshire; head master in Trinity College School, Port Hope, Ontario,

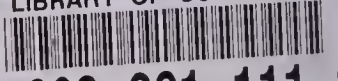
since 1870. He was editor of the *Canadian Entomologist*, a monthly magazine, for a while edited the entomological department of the *Canadian Farmer* and of the *Weekly Globe*, and resumed the editorship of the *Canadian Entomologist* in 1886. His annual reports on entomology have been printed by the Ontario Legislature. He was for five years president of the Canadian Entomological Society, is a fellow of the American Association for the Advancement of Science, and a corresponding member of various scientific societies in the U. S.

Bezenberger, bet'sen-bārch-er, ADALBERT: philologist; b. in Cassel, Germany, Apr. 14, 1851; educated at the gymnasium in Cassel and at the universities of Göttingen and Munich; has been tutor and assistant professor in the University of Göttingen and professor in the University of Königsberg. Among his published works are: *Beiträge zur Geschichte der litauischen Sprache* (1877); *Litauische Forschungen* (1882); *Lettische Dialektstudien* (1885); *Über die Sprache der preussischen Letten* (1888); *Die jurische Nehrung und ihre Bewohner* (1889).

Bhagalpur, baw-gal-poor', or Bhaugulpur (also *Bogli-poor*): a city of India; capital of a district of the same name; in Bengal; on the right bank of the Ganges, here seven miles wide in the rainy season (see map of N. India, ref. 7-H). It is about 265 miles by rail N. W. of Calcutta. It has several mosques and an English seminary; also manufactures of coarse silk fabrics. Here are two curious round towers, the origin of which is unknown. Pop. (1881) 68,238; (1891) 68,780.

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